The 5th SEA-DR (South East Asia Development Research) International Conference 2017 (SEADRIC 2017)

Proceeding

The Editors
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The rapid advancement of science, technology and information demands the readiness of human resources who are excellent in all fields. Globalization should inevitably be faced by preparing a highly competitive and creative young generation to win the competition. In facing this challenge the world of education is trying to improve the quality of teaching and learning in schools through research and publication of research results in the area of innovative teaching and learning. The South East Asia Development Research as a forum communication design development research in collaboration with the Department of Mathematics and Science Education FKIP Unlam is addressing this effort by implementing a fifth international seminar with the theme "Developing Competitiveness through Innovation and Creativity Teaching and Learning".

Please click here for the conference website.

Preface

The 5th South East Asia Development Research (SEA-DR) International Conference is a conference held by the Mathematics and Natural Science Education major, Teacher Training and Education Faculty, Universitas Lambung Mangkurat on 3–4 May, 2017 at Aria Barito Hotel Banjarmasin, Indonesia. This year's theme is "Developing Competitiveness and Creativity through Innovative Teaching and Learning" as nowadays globalization demands high competitive and creative young generation. In fulfilling this demand, the world of education is trying to improve the quality of teaching and learning at schools and universities through research. As one of the efforts, this conference plays role to create a venue for the exchange of knowledge, information, and best practices among teachers, lecturers, researchers, and practitioners as well as becomes the medium of publication of the research results worldwide.

This annual SEA-DR International Conference is our commitment in bringing together all the diverse best development research conducts and practices in natural science, physics, chemistry, biology, mathematics, computer, and other non-science fields to a forum of sharing, collaborating, and understanding. In this conference there are 140 submitted papers with 88 accepted papers for publication in the conference proceedings. In the review procedure, the papers were first reviewed by the content reviewers. Then, they were then sent to the language reviewers and finally to the template reviewers. In short, there were three reviewers who have reviewed the selected papers for publishing.

For the quality assurance, decision has also been made to involve the presence of highly distinguished speakers Prof. Dr. Kees Hoogland from SLO, Netherlands Institute for Curriculum Development, Dr. Abdul Halim Abdullah from Faculty of Education Universiti Teknologi Malaysia, Dr. Wanty Widjaja from Deakin University Australia, Prof. Dr. H. Ahmad Fauzan, M.Sc. from Universitas Negeri Padang, and Prof. Dr. Sutarto Hadi, M.Si., M.Sc. from Universitas Lambung Mangkurat.

At last, on behalf of the Organizing Committee, our sincere gratitude goes to everybody who is involved in this conference, the Rector of Universitas Lambung Mangkurat, the Dean of Teacher Training and Education Faculty, the Head of Mathematics and Natural Science Education Major, honorable speakers, distinguished delegates and guests, fellow participants, all the organizations involved in the conference: Utrecht University, Deakin University, Universiti Teknologi Malaysia, Universitas Lambung Mangkurat, Universitas Sriwijaya, and Universitas Negeri Padang, and last but not least all the Organizing Committee for their hard work during the preparation and the running of this conference. Let me finally wish you all the best in your active participation to share knowledge, practices, as well as establish relation to one another in developing competitiveness and creativity through innovative teaching and learning during this two-day International Conference for the betterment of the education.

The Editors
Dr. Chairil Faif Pasani
Dr. Atiek Winarti
Dr. Mustika Wati
Dr. Fatchul Mu'in

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Content

Dayung Context in Fraction

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***Abstract*—The students face often difficulties in understanding fraction lesson. It is because the students never get learning basic concept of fraction. This research aimed to get learning trajectory that can help students understand the addition and subtraction of fraction by using dayung context in Asian Games. The research subjects were the six graders of MIN 2 Palembang. The research method that used was design research with three phases, namely preparing for the experiment, the design experiment, and retrospective analysis. However, in this research, the step of the design experiment was until the pilot experiment. The data were the collected by using video recording and photos when doing discussion with the teacher, pilot experiment, written test, observation and interview during the learning process with the students as the subjects in this research. Hypothetical learning trajectory (HLT) designed is compassed to Actual Learning Trajectory (ALT) or students' answers when doing pilot experiment. Based on retrospective analysis and teachers discussion, the learning trajectory is re-revised to be held in the next step of teaching experiment, Moreover the use of dayung can enlarge the students' thought and can make the students understand the addition and fraction subtraction.**

Keywords—Design Research, Dayung Context, Fraction, Hypothetical Learning Trajectory

I. INTRODUCTION

In Indonesia, the curriculum currently applied is the 2013 curriculum. One of the approaches consistent with the 2013 curriculum is PMRI. PMRI is a learning approach adapted from Freudenthal known as Realistic Mathematics Education (RME) and has been developed in Indonesia. Since 2001, PMRI has been widely used in improving the students' interests, attitudes and learning outcomes [1].

PMRI has three main principles, namely Guided reinvention, didactical phenomenology, and Self-developed models [2]. The principle of guided-reinvention in PMRI is aimed at guiding students to re-find mathematical concepts [3]. Didactical principle of phenomenology emphasizes learning by using contextual issues in introducing mathematics to the students [1]. Self-developed model is a bridge between the informal to the formal mathematics.

PMRI is one of the learning approaches that will lead students to understand the math concepts by constructing by themselves through the previous knowledge related to their daily lives, by finding the concept by themselves [4]. This is in line with the statement by Freudenthal that students should be given the opportunity to experience or be directly involved in the learning process [5].

Fractions can be met based on the situations of the same size portion of the whole, the base or part of the groups or can be called as a comparison [6]. Fraction is one of the most complex concepts, but it is needed in students' learning in elementary school [7].

However, in many times, students have difficulties in understanding the fractions material. This is due to the fact that students never receive any knowledge form of the basic concepts of fractions. Students are more likely to be introduced with the use of formulas without involving the concept itself, and the learning is separated from the experience of students' daily lives [8].

Therefore, concrete effort is needed to explore a variety of situations or contexts that are accordance to students' cognitive abilities in mathematics. One of the contexts that can be used is the context which is related to daily life, that is rowing. Mileage of athletes on the start line to finish can present units of a base and able to build students' thinking about the concept of fractions. Besides, the comparison of distance and time to help students in understanding the concept of fractions, and the difference in mileage of athletes build students' thinking about the addition and subtraction of fractions using the model set [9].The use of context in learning mathematics can make a mathematical concept becomes more meaningful because the context may present an abstract mathematical concept in the form of representation that is easy to be understood by students [8].

Previous studies about fraction materials which using PMRI explain that PMRI can help students to understand the concept of fraction used fraction circle. Based on the description above, the problem of this research was: how learning trajectory can help students in making set of models by using the dayung context? The purpose of this study was to produce a learning trajectory that can help students make set of models by using the context of the dayung.

II. METHODS

This study used design research. Design research is a systematic study of designing, developing and evaluating the educational interventions (such as programs, strategies and learning materials, products and systems) as solution to solve complex problems in educational practice, which also aims to improve our knowledge of characteristics from those interventions and the process of the design and development [10]. In design research, research implementation process was guided by an instrument called Hypothetical Learning Trajectory (HLT). When learning does not conform to the design that has been designed, it is necessary to be re-designed (thought experiment) towards HLT for later re-testing to HLT (instruction experiment). This process takes place continuously depending on the time of doing experiments.

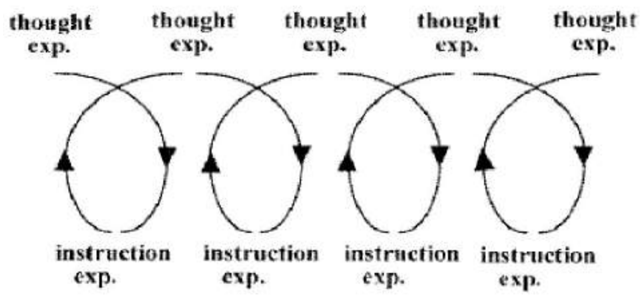

Fig. 1. An iterative process of micro design cycles [11]

There were three stages in the design research, namely: preparing for the experiment, the design experiments, and retrospective analysis [12]. Data collection techniques used were interviews, video recordings and photographs, written tests, observations, and field notes. Through interviews with students, the researchers could ask questions to the students to see whether research objectives by the researchers were achieved. The clinical interview was used as one of the methods to collect the data in this study because it has two main advantages which support the aim of this study. First, it is allowed to make interventions to encourage the students to elaborate on their statement. Second, the clinical interview also provides a continual interaction between inference and observation [13].

III. RESULT AND DISCUSSION

A. *Preparing for the Experiment*

The researchers evaluated the literature about the addition and subtraction of fractions materials based on the 2013 curriculum. Lesson plan of the fourth grade in mathematics must stand on its own without having to use Thematic. Linkages the rowing context with the material to be taught, the model set in the addition and subtraction of fractions, the fractions material based on curriculum, PMRI approach, and research design were used in the research method. Furthermore, the researchers discussed together with mathematics teacher who would be a model to learn more about the condition and capabilities of students.

The researchers also discussed the instruments that have been designed consisting of lesson plan (RPP), teacher's guide, students' activity sheets (LAS), pretest and posttest and observation sheets, and adjusted the research schedule with the teacher.

In addition, the researchers also observed the activities of students during the learning process that will be the subject of the research. Observations conducted by the researchers aimed to determine the students' prior ability so that HLT was designed to be more appropriate.

B. *The Design Experiment*

At this design experiment stage, researcher tested the Hypothetical Learning Trajectory (HLT) that has been designed.The design experiment stage was divided into two cycles, namely pilot experiment and teaching experiment.

In the pilot of the experiment stage, the researchers only tested the activity sheet that has been designed at the preliminary design stage. At this stage, the researchers acted as the teachers along with six 4th grade students. The names of the students in the pilot experiment stage can be seen in Table 1.

TABLE I. STUDENTS' NAMES INPILOT EXPERIMENT

No	Student's Name	Ability
1.	DHY (Student A)	High
2.	SBL (Student B)	High
3.	HAB (Student C)	Medium
4.	RGN (Student D)	Medium
5.	AFN (Student E)	Low
6.	AZA (Student F)	Low

The activities in the pilot experiment stage conducted during the first week consisted of three activities: (1) activity 1in which students were able to know the elements of the model set, that is the rows and columns that were used to equalize the denominator; (2) activity 2 in which students were expected to add two fractions with different denominators; and (3) activity 3 in which students were asked to write the comparison of the mileage which has been through by athlete in a certain recorded time and students could complete the subtraction of fractions with different denominators.

At this stage, the researchers observed and analyzed about what happened when a series of activities were undertaken in the HLT. Here are description results obtained from trials to students.

In activity 1, the students were asked to know the factors of compilation model, those were line and colom used to make deminator the same, and to write the problems into their own illustrate. One of students' answer can be seen in Fig. 1.

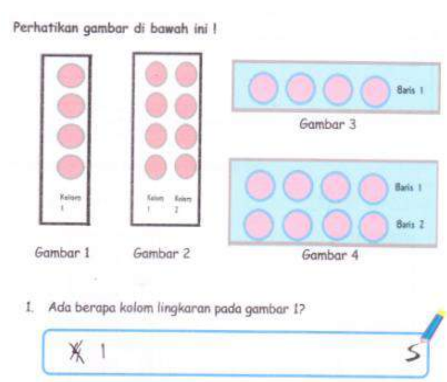

Fig. 2. Students' answer in activity 1

In Fig.2, it can be seen that the students did not understand what the column was. The students only counted the circle, yet they did not count the column.

Activity 2 in LAS 1 was based on the learning purpose in addition of fraction with different denominator. At first, the students could easily understand the problem in activity 2, but when they were asked to group the circle in each compilation box based on the instruction given, the students got difficultly in doing it. The students' answer can be seen in Fig.3 as follows:

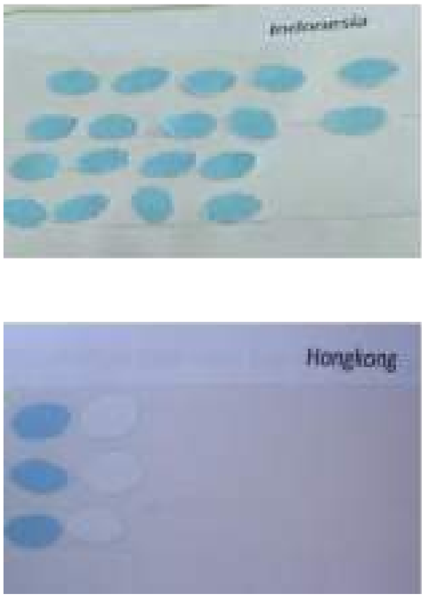

Fig. 3. Students' answer in activity 2

The students' answer in Fig. 3 showed that they knew the number of the column in the blue circle in the compilation box of Indonesia, which was 5 and 1 for Hongkong. However, the students were not careful in understanding the instruction to group the circle that the circle in each compilation box had to be same. It was not suitable with the planned HLT, so it needed HLT correction. After discussing with the teacher as a model, it is concluded that the students have to understand what the line and column were and that it is better that the teacher demonstrate it to show what the line and column.

In activity 3, the students were able to group the circle in the compilation box. The students were getting more careful in understanding and applying the steps used in grouping the circle in compilation box. It can be seen in the video recorded during the learning process. At first the students made mistake to decide line of the pink circle. Based on the instruction, the number of pink circles was 2 lines, but the students wrote 4 lines. However, after the students were asked to reread the instruction, they realized that their answer was incorrect. For more detail, Fig. 4 below is the students' answer during the learning process.

Fig. 4. Students' answer in activity 3

The change of HLT was affected by difficulties that students encountered during the learning process so that students' answers did not correspond to what that the researchers wanted them to achieve. The changes of HLT occurred on the language question on the Students' Activity Sheets, and there were several activities that students needed to add.

At the teaching experiment phase, the revised HLT was tested on 38 students who were the subjects of the research. In the first activity sheet, there were two activities, activity 1 in which students were able to know the elements of the model set, namely the rows and columns used to equalize the denominator, and the activity of both students to add two fractions with different denominators. In the first activity, the students have understood the row and column in the model set.

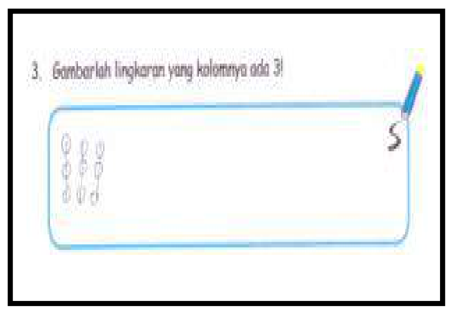

Fig. 5. Students' answer in activity 1

In Fig 5, it can be seen that students were able to create model of circles by describing circles that the number of columns was 3. One of the strategies of group 5 used to remember column was by outlining a circle from top to bottom.

The objective of activity 2 was how students could complete the addition of fractions with different denominators. As the problems given in this second activity, students were asked to determine the total of the mileage of row of the two countries.

On that problem, there were two fractions with different denominators. Those two fractions were the mileage of the rowing athlete, who was from Indonesia and Malaysia. On this problem, the students were already able to determine that the arithmetic operation used was the addition because the question was about the total distance. Therefore, to add two fractions, the students were required to equalize the denominator first using a set of model. In this second activity, by using the HLT that has been designed, students would arrange the circle based on the rules of the column, the number of the circle in each box should be the same, the number of blue circles columns represent the numerator, and the number of the whole columns represent denominator.

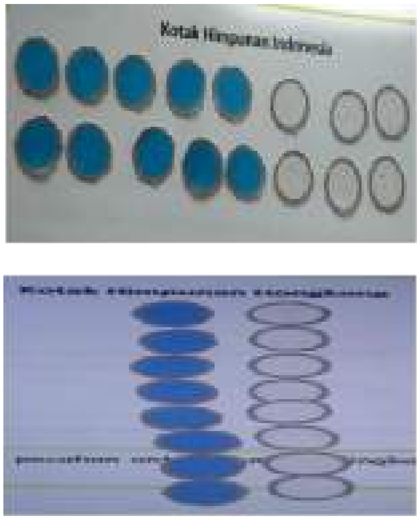

Fig. 6. Students' answer in activity 2

In Fig 6, the box set of Indonesia by the distance of athlete was 5/8. Thus, the numerator was five, and the number of blue circle columns should also be 5. Similarly, the denominator was eight, so the number of the whole columns in the box set of Indonesia was 8. Meanwhile, for the box set of Hongkong, the mileage of rowing athlete was ½. Thus, the numerator was one, and the blue circle column should also be 1. The denominator was two, so the total number of columns in the box set of Hong Kong was 2. For more details, it contained in the conversation transcript with group 3:

Researcher: why is the form of the box set of Indonesia like this?

Student 3: because the numerator is 5 and denominator is 8

Researcher: from this picture, which one is numerator?

*Student 1: this one *pointing to the blue circle **

Researcher: What color? How many columns?

Student 3: blue, there are 5

Researcher: Which one is 8? What color?

*Student 3: * pointing each circle column*, blue and white*

Student 1: So how many columns all are there?

Student 4: 8

Researcher: Why is the box set of Hongkong like this?

Student 1: because the fractions is ½, the blue circle is 1 column and the whole are 2 column

Researcher: what is the blue? Denominator or the numerator?

Student 2: numerator

Researcher: then how many denominators are there?

Student 5: 2

In Fig. 6, it can be seen that after the process of drafting, two fractions with the same denominator were obtained, those are 10/16 and 8/16. Therefore, the addition of the two fractions can be obtained which was 18/16.

The objective of activity 3 was how students could complete the subtraction of fractions with different denominators. As the problems given in this second activity, students were asked to determine the difference in mileage of rowing athlete of the two countries, Tiongkok and Indonesia.

In this third activity, the students arranged the circle based on the rules of the column. The number of the circle in each box had to be the same. The number of pink circles columns represented the numerator, and the number of the whole columns represented denominator.

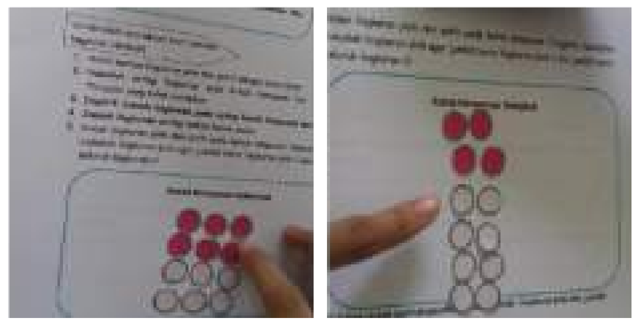

Fig. 7. Students' asnwer in activity 3

In fig.7,the box set of Indonesia by the mileage of athlete was 2/4.The numerator was two, so the number of blue circle rows should also be 2. The denominator was four, so the total number of rows in the box set of Indonesia was 4. Meanwhile, for the set box of Tiongkok, the mileage of rowing athlete was 2/6.The numerator was two, so the pink circle rows must also be 2.The denominator was six, so the total number of rows in the box set of Tiongkok was 6. For more details, it can be seen in the following conversation transcript:

Researcher: then, why is the form of the set box of Tiongkok like this? Why are the pink 2 rows and the whole 6 rows?

Student 1: because the distance of Tiongkok was

Researcher: So what does the number 2 mean in the box set?

Student 3: pink circles, there are two rows

Researcher: Which one is 6?

*Student 3: * pointing each circle row*, pink and white*

In Figure 5, it can be seen that after the process of drafting, two fractions with the same denominator were obtained, those were 6/12 and 4/12. Thus, the subtraction of two fractions can be obtained which was 2/12.

C. The Retrospective Analysis

At this stage, HLT was used as a reference guide in answering research questions. HLT was compared to what goes on in the learning to investigate and explain how students can generalize from rowing activity using the model set to the addition and subtraction concepts which have the different denominator. HLT was also compared with the data obtained to describe the development of strategies used by students and the process of students' thinking in understanding the addition and subtraction of fractions concepts which have the different denominator.

A series of activities during the learning process was designed using PMRI approach. Activities which were designed aimed to produce a learning trajectory conducted in every cycle. Those were the pilot experiment and teaching experiment. In the pilot experiment, it was obtained an unpredictable new conjecture by the researchers. In the conjecture, that was set before so that it became additional to the next revision on the first activity sheet. When the researchers asked students to determine how many colors of the circle on each box set, most of the students mentioned pink and white circles. This was not by the HLT which has been designed by the researchers. The researchers hoped the answer was two since the goal was to engage students in preparing circles into the model set. Thus, the researchers made improvements on the language question so that students' answers were suitable to researcher's expectation.

Also, the other conjectures which were unpredictable by the researchers were when the researchers asked the students to write the comparison of blue circle column with the total number of columns. The students wrote a comparison of the number of the blue circle with the number of the whole circle on the model set. The objective of these questions was to guide students to arrange the circle by rows or columns of a given fraction. In the teaching experiment, the researchers conducted HLT revision so that the conjecture of students' thinking which was not suitable for the pilot experiment phase did not happen again in the teaching experiment.

Learning activities designed also reflected five characteristics of PMRI. The first characteristic is the use of Contexts for Phenomenologist exploration where learning activities begin with contextual problems frequently encountered by students as activity-based experiences.

Each activity in the learning used the problems of rowing context. The context provided in a series of activities showed that most students had to understand and know the rowing context so that it can be integrated into the learning.

The second characteristic is the use of models for mathematical concepts construction where the use of this model aims to connect students' understanding from the abstract form to the real which is commonly known as the transition from the informal to the formal form [2]. There are four levels in RME, namely situational level, referential level, general level, and formal level [2]

The third characteristic is the use of students' creation and contribution. The third characteristic is seen during the process of addition and subtraction of fractions learning from a series of activities provided. The teacher gave appreciation for the contribution of the students in the learning process in both the group and individual activities. Students were given the freedom to express and answer questions using their strategies. Learning became more meaningful and caused the variation in students' answers appearing in resolving the problem. Moreover, students who have been able to find strategies for solving problems of addition and subtraction of fractions can guide other students in the group during the discussion. It appeared in activity 1-3. Also, on each activity, the teacher plays role as a facilitator and not overly dominates learning, so students can be creative according to their understanding.

Furthermore, the fourth characteristicis students' activity and interactivity in the learning process. In the first cycle of learning, interactivity between group members does not appear due to the fact that students in the pilot experiment never followed the learning using the teaching method of discussion, so it is difficult for them to cooperate with the other members of their group. Meanwhile, on the second cycle, the interactivity among students and between teachers and students appeared on every activity both in discussions and individuals. Students in this teaching experiment were very cooperative so that learning could run smoothly.

In the implementation of instructional design, there are some social norms prevailing in the classroom during the learning process, as students discussed in groups and asked the members of the group when they did not understand the meaning of the questions. It was also with the interaction between teacher and students; the teacher asked students about solving strategies used in solving the problems given, the teacher guided students to ask/argue during class discussion. So, it can be said that the implementation of math learning used PMRI approach and the rowing context can bring social norms in the classroom. It was in accordance with the [14] who state that teachers are aware that they had been using some of the activities, including the social norm in the class like guiding students to question and argue. By discussions and interviews, the researchers and teacher tried as much as possible to strive for social norms during the learning process.

IV. Conclusion

Based on the results and discussion that have been described previously, it can be concluded that the application of HLT in this study is a learning trajectory that could help students in learning percentage by using the dayung/rowing context. The elements in the trajectory of learning in this study help students as follows:

a. Experience in meaningful learning and fun activities in which students are asked to write down fractions from a problem related to mileage of rowing from start to finish because the mileage of rowing in the certain time can present units of the whole by the definition of fractions.
b. To add two fractions, students use a set of model. Students were asked to arrange the circles consisting of two colors arranged based on the rule of rows and columns. In LAS 1, the circle consisted of blue and white with the rules of the column, while LAS 2 consisted of pink and white circle with the rule of row. The fractions which are summed are arranged with the rules of column by the number of blue circles column representing the numerator and the number of circles representing denominator. The number of circles between the two fractions must be the same.

Thus, learning trajectory which has been implemented in this study is one of a positive contribution to the development of the Local Instructional Theory (LIT) in learning fraction by set of models in the context of rowing/dayung.

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The Development of Mathematics Instruction Using Color Chips at Elementary School Based on Lesson Study

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***Abstract*— This research aims to develop the mathematics instruction using color chips at elementary school based on Lesson Study. This research was conducted at fifth grade of State Elementary School 23, Padang Timur. The development is adapted from Plomp's model. There are three phases of the development: preliminary research, development/prototype phase, and assessment phases. This research is focused on development/prototyping. The first step of the research is to distribute questionnaires to three teachers for the sake of getting some information about the problems in mathematics instruction at the school. The problem is that the teachers still have the difficulties in showing the real process of addition and subtraction operations on the integers. The second step is to prepare the color chips and create the booklet about the use of color chips. In this prototyping phase the booklet is corrected by the teacher and expert. This phase had micro-cycle until the teacher and the students find the booklet useful. In the first prototype, validation is conducted by self evaluation and expert's review. After the revision of the first prototype, the second prototype is created, and then it is used to know its practicality through implementation in small group evaluation.**

Keywords—Booklet, Color Chips, Elementary School, Lesson Study

I. Introduction

This paper describes how color chips can be used to help teacher to show the real process of addition and subtraction operation on the integers. Mathematics is one of the subjects studied at Elementary School. Students at Elementary School are around 7-11 years old. They start thinking on logic of Mathematics. Piaget said that student logically thinks based on manipulation of an object [1]. For the purpose of this study, teacher can use booklet and color chips to teach student in real situation. Students can used color chips to understand about the real process in addition and subtraction operations on the integers.

Based on the regulation of Minister of Education and Culture, mathematics instruction is started from the real situation (contextual problem). The term manipulative is defined as item that students use to support hands-on learning [2]. Color chips provide visible models that help students solve problems and develop concepts.

In recent years, especially in Mathematics, many parties have questioned whether manupilatives are beneficial and some have suggested that manipulatives are over-rated as a teaching resource [2]. Manipulatives can range from paper and plastic. Manipulative materials are objects designed to represent explicitly and concretely the abstract mathematical ideas. They have both visual and tactile appeals and can be manipulated by learners trough hands-on expriences [3]. Research suggests that manipulatives can help students develop mathematical concept in a concrete and visual form for the learner [4]. Lesson study is an activity that can improve the instruction quality.

Lesson study (or kenkyu jugyo) is a teaching improvement process originating from Japanese elementary education, where it is a widespread professional development practice. Working in a small group teachers collaborate with one another, meet to discuss learning goals, plan an actual classroom lesson (called a research lesson), observe how it works in practice, and then revise and report on the results, so that other teachers can get benefit from it [5]. Participants share their observations and examine additional evidence from the lesson, such as students' written work, searching for pattern revealing important insight in teaching practice and student learning [6].

II. METHODS

The development is adapted from Plomp's model. The procedure is to develop the useful booklet for teacher and students to describe and understand about the real process of addition and subtraction operations on the integers. It covers preliminary research and development/prototype phase. At the step of preliminary research, the researcher distributes questionnaires to three teachers to get some information about the problems in mathematics instruction at the fifth grade. The problem is that the teachers still have the difficulties how to show the real process of addition and subtraction operation on the integers. The second step to prepare the color chips and create the booklet about the use of color chips. This research is conducted at fifth grade of an state elementary school 23 in Padang Timur.

III. RESULT

The development of booklet has two phases; these are preliminary and prototiping phases. There are three main steps in preliminary phase: structure analysis, concept analysis and teacher need analysis. The structure analysis focus based on cognitive, affective and psychomotor indicator. The concept analysis focused on addition and subtraction operation at integer. The second step was preparing the color chips and creating the booklet about how to use color chips. In this prototyping phase the booklet was corrected by teacher and expert. This phase had micro-cycle until the teacher and the students find the booklet useful. In first prototype, validation was conducted by self evaluation and expert review. After the revision of the first prototype, the second prototype was created, and then it was used to know about its practicality by implementation in small group evaluation.

In the first prototype, booklet have been revised based on result validation from mathematics and language experts.

TABLE 1: RESULT BOOKLET VALIDATION FOR USING COLOR CHIPS FROM EXPERT

No	Expert	Evaluation	Validity (%)	Category
1	Mathematics	Content	95.50	Very valid
		Language	85	Very valid
		Presentation	87	Very valid
		Picture	93.75	Very valid
2	Language	Sentence	90.25	Very valid

The second prototype was created based on self evaluation and expert's validation, and then it was used to know about its practicality by its implementation in small group evaluation. The try out for practicality have been done to six students at fifth grade at elementary school. They are two students in higher level, two students in middle level, and two students in lower level.

Figure 1. Students practice using color chips

Based on observation since the students has practiced, they look very interested and happy done the problems for addition and subtraction operation at the integers.

Figure 2. Students' expression when using color chips

After small group evaluation, a questionnaire is given to the teacher about the practicality of booklet to practice using color chips.

TABLE 2. QUESTIONNAIRE ANALYSIS FROM TEACHER

No	Aspect	Practicality (%)	Category
1	Usefulness	95	Very practical
2	Benefit	95	Very practical
3	Time appropriateness	75	Very practical

The teachers involved give the various reasons for using manipulatives. One of these is that the use of manipulatives is more enjoyable than when doing soley mathematics, both abstract and symbolic one. This is substantiated by the teachers's observation showing that the students were active, engaged and interested in lessons when manipulatives were used.

IV. DISCUSSION

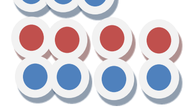
n operations of addition and subtraction on the integers, color chips can be used to show the real situation. Before using the color chipss, we have to agree with the regulation that red color is for negative numbers and blur color is for positive numbers.

 Symbol for positive numbers

 Symbol for negative numbers

 Means -2

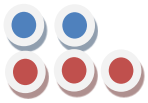
 Means 3



If the red and blue chips have the same numbers (as a couple), these can be called zero.

The addition and subtraction on the integers can be shown some examples bellow:

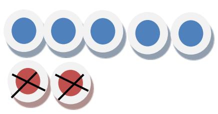
1) *2 + (-3) = ...*



To find the answer of combining the red color and the blue color, two couple of the red and the blue become zero, and reminder is one red color, so the result for 2 + (-3) = -1.

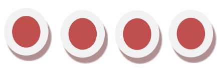
2) *q3 – (-2) = ...*

There are three blue chips. Two red chips are taken away; we do not have red chips. In this process it has to be added zero (couples of red and blue chips),

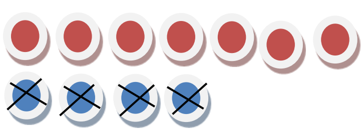


we can take away (-2), so the result is 3 – (-2) = 5.

3) *(-3)-4= ....*



There are three red chips. Four blue chips are taken away; we do not have blue chips. To solve the problem, it has to be added zero (couples of red and blue chips),



Now we can take away 4, so the result is (-3) – 4 = (-7).

In addition and subtraction of the integers, we have to explain that addition means compounding and subtraction means taking away. Students are enjoying and glad when doing mathematics using color chips.

The teachers have to give more exercises for students to make them understand more about the concept in addition and subtraction operations on the integers. To motivate teachers and students, lesson study can be implemented. Attitude toward mathematics can infleunce the quality of learning [7].

V. CONCLUSIONS

The use of color chips and booklet in mathematics instruction especially for addition and abstraction operations on the integers gives some advantages. That is to say that manipulative can be powerful means to support sense making. Mathematical thinking and reasoning when used as a means to support the process rather than as adjuncts to blindly follow a teaching procedure to find answers. Lesson study is a strategy that can be used in mathematics instruction.

ACKNOWLEDGMENT

I would like to say thank you for all people who help and give me a chance to do my research. Thank you for the director of research and public services for funding my research. The teacher and students at elementary public school no 23 Padang Timur and also my research team. I can't tell one by one to any body who company with me in this activity.

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The Development of Teaching Media Based on PREZI Application at Fluid Dynamic Subject

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***Abstract*—The development of science and technology creates a variety of media that can present data. One of them is the Prezi application. The strength of Prezi application is that it can be used online. This research aimed to describe: (1) the validity of teaching media using Prezi, (2) practicality of teaching media using Prezi, (3) the effectiveness of teaching media using Prezi. This research is a research and development which refers to the model of ADDIE development. Trial subjects were students at class XI IPA 3 SMA Negeri 9 Banjarmasin. Data were obtained through the sheet of media validation, sheet of feasibility teacher activities, and learning outcomes test. The research results showed (1) the teaching media is valid category, (2) practicality of teaching media is very good, and (3) the effectiveness of teaching media is effective. The conclusion of the research is that the teaching media are feasible and effective to use.**

Keywords—Teaching Media, Prezzi Application, Fluid Dynamic

I. Introduction

Educational activities are related to teaching and learning process. The learning process is essentially a process of communication, which is a process to convey the message of the source of the message via a specific channel or medium to the message recipient. Media, message, source of the message, and the recipient are the components of the communication process [1]. Media in the learning process have a quite important meaning because in these activities obscurity of material submitted can be clarified by using the media as an intermediary. Differences in learning styles, interests, limitations of senses power, intelligence, disability or geographic distance barriers, distance, time and others can be helped and overcome with the use of education media [2]. However, in fact teachers rarely use the media.

Most teaching and learning activities in schools rarely use instructional media, including in SMA Negeri 9 Banjarmasin. Based on the facts in the field observed by investigators undergoing the practice field experience at SMA Negeri 9 Banjarmasin, it was found that the school has a fairly complete educational facilities as well as internet networks, computers, and projectors which were actually able to support learning to be easier and more efficient. Yet, its utilization is still not optimal. In addition to the problem of not maximized utilization of the facilities, the learning model used is always the same model without a variety of media. The media are simple and conventional, such as blackboards, textbooks, and others. The use of less varied media causes students to become bored and show a lack of attention.

One way to maximize these facilities is by using interesting instructional media which have never been seen to understand lesson particularly in Physics subject that requires motivation and innovation in the teaching-learning process so that students do not get bored easily while studying. The development of instructional media usage is now leading to e-learning based media. One of the e-learning based media is prezi media that have superiority to accommodate learning styles. Prezi media can be programmed to display the media in the form of visual, audio, or animation. A new presentation software tool, Prezi, sets itself apart by employing a new metaphor, the "infinite canvas" and the zooming user interface. Prezi's infinite canvas is a theoretically endless two-dimensional surface upon which text, graphics, video clips, and other visual aids are arranged. Prezi's interface allows for smooth and seamless zooming of the canvas, supporting views as wide or as narrow as the presenter desires [3]. Zooming User Interface ZUI offer new techniques for managing multiple versions of a presentation, providing interactive presentation navigation, and distinguishing levels of detail. These zoomable presentations may also offer several cognitive benefits over their commercial slide show counterparts [4].

The availability and utility of this instructional media are expected to help teachers cope with media utilization of innovative learning and help students access the material more easily. Prezi gives greater possibilities to improve the learning process to be more effective and efficient, so students' learning outcomes can be improved. Prezi was a more effective instructional medium for knowledge acquisition compared with traditional instruction [5]. Conducted a cultural comparison between the United States and Norway regarding Prezi application in group projects and determined that Prezi changed the traditional thinking process of students in preparing presentation slides [6]. Surveyed the experiences of college students in using Prezi in the classroom and indicated that students reported that Prezi might improve their learning outcomes [7] .

Based on the abovementioned description, we need media that can enhance student motivation. The purpose of this research in general was to produce learning media based on proper Prezi application in learning. The specific objective of this research was to describe the validity, practicality, and effectiveness of the developed media.

II. METHOD

Research and development was the research type conducted in this research. This research developed a teaching media based on Prezi applications in class XI at the second semester on dynamic fluid topic. The steps in this development were the research development model of ADDIE (Analysis, Design, Development, Implementation, Evaluation). The learning media was tried out in the classroom using the design of pre-test and post-test group.

The subjects in the trials were students of class XI IPA 3 at SMA Negeri 9 Banjarmasin. The research was conducted from January to July 2016. The research setting was SMA Negeri 9 Banjarmasin located at Jl. Tatah Bangkal Luar RT. 32 No. 1.

Data analysis techniques in this research were assessments of the developed media. The data included the results of the module validation; the results of the feasibility of teacher activity; student learning outcomes from test.

III. RESULTS AND DISCUSSION

A. Validation Results of Prezi Teaching Media

Table 1 shows that the validation of the teaching media.

TABLE I. RESULTS of THE VALIDATION of THE TEACHING MEDIA

Aspects of assessment	**Score of validation**		**∑Perh Aspect**	**Average**	**Category**
	1	***2***			
Variations in presentation	3	3	6	3	Good
	3	3	6	3	Good
Feasibility	3	3	6	3	Good
	4	4	8	4	Very good
	3	3	6	3	Good
Completeness of media	3	4	7	3,5	Very good
	3	3	6	3	Good
Design Media	3	3	6	3	Good
	3	3	6	3	Good
The overall appearance	3	3	6	3	Good
Total	32	34	63	31.5	
Average	3.1	3.2		3.15	Valid
Reliability	0.62			Good	

Teaching media used was a presentation teaching media (Prezi) as an application that can create a design with a zooming slide presentation to support learning in order to achieve the learning objectives. The teaching media was validated by two validators from academician and practitioner. Validation of the teaching media consists of variations in presentation, feasibility, completeness of media, design media and the overall appearance. Based on Table 1, the validation results of the media showed the validity level at good category. The reliability coefficient of teaching media was 0.62 with good category. The validation results indicate that the media is proper to be used and reliable. Effective learning requires good planning[8]. Good planning includes methods and media to be used in the learning process.

B. The Practicality of Teaching Media

The practicality of teaching media can be seen in the feasibility of teacher activities in content and observed by two observers. Table 2 shows that the feasibility results of teacher activities.

TABLE II. FEASIBILITY RESULTS of TEACHER ACTIVITIES

Aspects	**Average for Each Meeting**				**Average**	**Category**
	1	2	3	4		
∑ Overall	73.0	72.0	70.0	74.5	72.38	
Average	3.65	3.60	3.50	3.73	3.62	Very good
Overall reliability	0.78	0.79	0.80	0.88	0.81	Very good

Table 2 shows that the average of the feasibility of teacher activities in each meeting is in the range of 3.5 to 3.73. This result is classified as a very good category. Thus, it can be concluded that learning with Prezi teaching media has been performed very good.

Overall the developed teaching media can be considered practical in terms of the feasibility of teacher activities. The overall average of reliability was 0.81. Thus, for the reliability in the feasibility of teacher activities in the whole meeting was stated in reliable caegory. The used sheets of teacher activity feasibility have consistency and steadiness in terms of measuring the practicality of the developed teaching media and can be used repeatedly to measure the same thing. Practicality means easy implementation, easy examination and includes instructions that can be administered and implemented by people [9].

C. The Effectiveness of Teaching Media

The effectiveness of teaching media was investigated through achievement test. Student learning outcomes in this study were obtained through a pre-test and post-test and calculated using normalized test and the value of 0.63.

TABLE III THE EFFECTIVENESS of TEACHING MEDIA

Total Students	**Average Gain**	**Category**
32	0.67	Moderate (Effective)

From the analysis, it can be seen that most of the students were in moderate category, so that learning can be stated to be effective. Effectiveness refers to the level of success in achieving the intended purpose [10]. Most of the students reported that Prezi was an effective learning tool for enhancing their learning process [11].

Based on the results of validation, the practicality and effectiveness of teaching media, the developed teaching media base on Prezi are feasible and effective in learning. Teaching media have an effect on student learning outcomes. Prezi might improve students learning outcomes [5][6][7].

IV. CONCLUSIONS

The results of the development of teaching media are: (1) the teaching media is valid category, (2) practicality of teaching media is very good, and (3) the effectiveness of teaching media is effective. Based on these results, the developed of teaching media base on Prezi Application are feasible and effective for used in the learning process at the fluid dynamic.

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The Development of Kayuh Baimbai Cooperative Learning Model for Elementary School Students

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***Abstract*—This research was conducted to develop Kayuh Baimbai cooperative learning model based on local wisdom of Banjarese community. This cooperative learning model was applied on Bahasa Indonesia subject in fourth grade students. Kayuh Baimbai cooperative learning model emphasized on togetherness or collaboration in group. The preliminary philosophy of cooperative learning model is buying and selling activity on floating market in Banjarmasin. This cooperative learning model could enable learners to be active in learning activity. The research used Borg and Gall design that has three main steps, which are collecting research and information, planning product, developing a preliminary and operational product testing. This research was conducted at SDN Pemurus Dalam 1 on fourth grade with 23 students. The results of the validators pointed out that model is valid and can be used for field testing. The instruments used were pretest and posttest by Levene's test for equality of variances. The results showed the value was P = 0.103 > 0.005 included into the category of homogeneous. So, the instrument is qualified to be tested. The result calculated t-test significance level at 5%, and the t-test on student achievement has showed value less than 0.05 (p <0.05). Therefore, kayuh baimbai cooperative learning model gives impact on student achievement and is effectively used.**

Keywords—cooperative learning; kayuh baimbai

I. Introduction

This Floating Market is the hallmark of a tourist destination in South Kalimantan. Banjarese people have been buying and selling products on boat in the river before sunrise. This activity has been going on for hundreds of years and it continues to survive until today. It reflects the deep local culture of Banjarese community. They are very close to the river life and have a high togetherness. Togetherness is very much needed even in the digital era, and therefore, it should be attempted to embed it to the younger generation as early as possible. Formal education is a very appropriate place for instilling values of togetherness to the children in the current global era. Education should not only lead to the development of the individual, but also how to make them work together to build their environment better. The learning objectives in the curriculum should provide the knowledge and skills to solve social problems for improving quality of life [1]. However, instilling value is not necessarily through the learning materials. The learning activities in the form of indirect learning model can also be used as a means of instilling value.

The best appropriate approach to do that is through cooperative learning. This approach is very effective to train students to work in groups. Various studies have proved that this approach is able to provide many positive effects for students. Cooperative Learning enable students to practice learning skills in general. The students believe that the cooperative learning is effective enough to make them master the skills they are learning in general [2]. Students' achievement also increases after the cooperative learning is implemented. Students show satisfaction when working in groups. Cooperative learning is generally proven to help improve student achievement [3].

Students who work in groups will require adjustments and earnest effort to succeed. Cooperative learning does require an adjustment in the beginning, but if it is successful, learning outcomes would likely be better than individual learning system. Ref [4] found out the test results in his research that in the beginning it was more effective individualistic learning because at that time the team development was going on in the learning group. However, in a longer period, cooperative learning becomes more effective than individualistic learning. In addition, the working in group is also more favorable to students. Ref [5] strengthens the excellence of cooperative learning. His research proves that students are much happier to learn and complete the task in groups. They can develop a positive attitude that is unthinkable with a suitable environment so that an increase in the student's skills may occur. Nonetheless in the future, the next generation should be able to interact in a global team to achieve the same goal.

Kayuh Baimbai learning model belongs to the cooperative learning. This learning requires cooperation among students and interdependence in the structure of task achievement, goals, and rewards [6]. *Kayuh Baimbai* is derived from two words; those are "kayuh" which means paddle and *baimbai* which means together. Literally, the word means paddling together. This term is taken from cultural philosophy of Banjarese people which means doing various activities together to achieve a goal.

Kayuh Baimbai model was adopted from two cooperative models, the model of Student Team Achievement Division (STAD) and Quiz-Quiz Trade. STAD adopted stage lies in the assessment system in which answers are counted as the value of the group. STAD is proven to improve students' skills. Ref.

[7] showed that STAD proves to be more effective than traditional methods of activating students. Each member is required to participate in learning activities to answer any questions in turns. The group score is obtained from the total number of answers given by each member. This system would make every group has a responsibility to answer the questions they get. Adopted Quiz-Quiz Trade phase lies in the exchange system of material question. The main principle of this model is student quiz, get the quiz from a partner, and then trade cards to repeat the process with a new partner [8]. This system will encourage interaction between one group and another group so that learning becomes more attractive.

Kayuh Baimbai model is an illustration of Banjarese people activity at floating market that is located in South Kalimantan. Students are directed to play as a trader on a boat in floating market. They trade goods to fulfill their needs. They row together to a market in the river with holding shoulder of each other. In the market, they interact each other to exchange goods. In this model, this exchange was showed in the form of questions or lesson material. A group is one unity; therefore, to get a high score they must work together.

There are seven phases to be conducted by the students when practicing Kayuh Baimbai mode, i.e. groups, asking questions, exchanging, answering alternately, counting scores, and awards. The discussion of each step is as follows.

Phase 1: Grouping. Students form groups of 3-5 students. A group reflects a boat. Each member mutually needs each other to get the best title.

Phase 2: Material Explanation. The teacher gives each group a material that would become their specialty. Each group is asked to present the material and the other group listens. Each group would try to understand the material of each group to determine who they would choose at the later stage.

Phase 3: Receiving questions. Each group receives a question that has been designed by teachers based on the number of group members. Questions refer to the theme and the material they have presented. Each question includes the name of the group. It encourages the participation of each member to complete the tasks assigned by the teacher. The question would be given to another group. Instead, each group receives questions from other groups to be answered.

Phase 4: Exchanging. Each group goes to the middle of the class along with holding their peers' shoulder and meets other groups to exchange questions. Holding the shoulder reflects a boat and every member paddles together to run it.

The exchange should be done equally. Every member must get questions from members of other groups. Questions should not be taken from one group only. The number of questions obtained determines the number of points they can get for the group. At least one question must be possessed by every group. The rest can choose which group they prefer, so the possibility of correct answer is going to be higher. In addition, the exchange must be in continuous motion. Exchange in the floating market occurs in the streams that move so that the exchanging groups are also conditioned that way. This regulation would also provide challenges for students so that activity becomes more interesting.

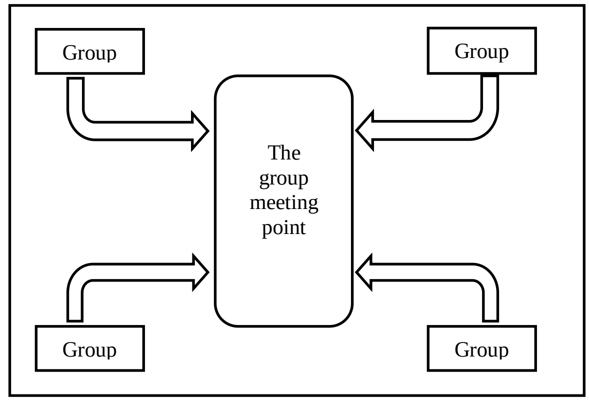

Fig. 1. Exchanging questions of each group

Phase 5: Answering alternately. Each group in turn answers the questions. Questions are answered by the members of each group when the exchange occurs. The questions they get should be answered by himself and cannot be represented. However, the correct answer would benefit the group so that other members also take responsibility to help answer these questions.

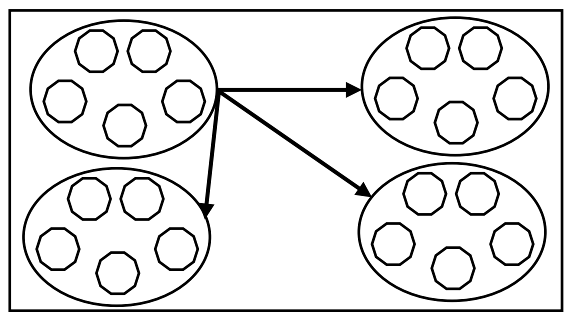

Fig. 2. Every group answers other groups' questions

Fase 6: Accumulating Individual Scores and Group Scores. Scores are divided into two, namely the individual score and the group score. Each member has to get the same initial score, which is 50. Each correct answer gets 10 points for individuals who answer and extra points for the group. If the answer given is wrong, the individual will lose 5 points so that points of the group are also reduced. Each member must ensure that their friends are able to answer the questions. Calculation of individual scores can be observed in Table 1.

TABLE I. THE CALCULATION OF INDIVIDUAL SCORE

Category	Score
10 points under the initial score	0 point
1 - 10 points under the initial score	10 point
1 - 10 points above the initial score	20 point
10 points above the initial score	30 point

The beginning of each individual score will increase successfuly if they answer questions correctly. The total points of the group members will determine the group score. The calculation of the group score can be observed in Table 2.

TABLE II. GROUP TITLE

Average of individual score	Title
$0 \leq x \leq 5$	-
$5 \leq x \leq 15$	Good team
$15 \leq x \leq 25$	Great team
$25 \leq x \leq 30$	Super team

Score is derived from the number of overall group score of each group member divided by the number of group members. Total scores will determine reward they will earn.

Phase 7: Reward. The group who gets the most points will be awarded. The higher score the group get the higher reward will be given. Rewards are given to groups rather than individuals. It will show how the interest of the group is more valued than the individual.

II. METHOD

The method used in this study was research and development (R & D). This method is a strategy or research method that is powerful enough to improve practice [9]. Ref. [10] said that R & D bridges the existing gaps between basic and applied research by bringing the finding of the basic and applying research together to create the conceptualized and tested product ready to be used in classrooms.

This research was classified as development research that adapted Borg & Gall model, so it is divided into 6 stages of research. The steps are; (1) research and collecting information (research and data collection), (2) planning (planning) (3) developing a preliminary form of the product (the development of the initial draft products) (4) preliminary field testing (early field trials); (5) revising the main product (revie the results of the initial field trials); (6) testing the field (field trials).

However, there were only some steps used in this research, due to the limited time, effort, and research funds. Generally, this research method was divided into three main stages, namely the introduction, design, and development and evaluation. The preliminary stage consisted of literature studies, field surveys, and drafting products. The design stage included the initial design model in the form of lesson plan, lesson material and assessment, which were reflected on Lesson Plan and the atributes. Development and evaluation stages included trials product which consisted of testing experts and field trials. The purpose of testing expert was to get advice and input from initial design product. The field trial was conducted in one class to see the level of practicality. The results of field trials become the basic model repairment before being a final product.

Design validation of learning model was performed by two people, namely 1 lecturer (as expert validator) and 1 teacher (as user validator). The field trial was conducted in SDN Pemurus Dalam 1 in the fourth grade with 22 students in order to determine the effectiveness of the learning model developed.

SDN Pemurus Dalam 1 was chosen as the research site because this school is located in urban areas. This location reflects the nature of the heterogeneity of the students because urban area is engaged by various groups of people from various ethnic groups, the level of social, economic, education, and culture. This condition was very compatible with the goal of cooperative learning that tries to combine the different.

III. RESULT AND DISCUSSION

A. Expert Validity

Model validation process included the initial product assessment carried out by two validators. The result of validation tests showed high levels of validity or accuracy of the phases of learning models. The recapitulation of validation results can be observed in Table 3.

TABLE III. THE RECAPITULATION OF EXPERT AND USER VALIDATOR

No	Validator	Scores	Category
1	Lecturer	92	Highy valid
2	Teacher	83	Valid

The data in Table 3 showed that Kayuh Baimbai learning model was highly valid. Therefore, it chould be tested on a small scale. In addition, the validation results of teachers/users also indicated that Kayuh Baimbai cooperative learning model was valid (it chould be used with minor revisions before been tested on a small scale).

B. Field Testing

Kayuh Baimbai learning model was tested on a small scale in SDN Pemurus Dalam 1 Banjarmasin. This trial used experimental design with one group pretest-posttest. The implementation of field-testing could be observed on the following design [11].

O1	x	O2

Figure 3. One group pretest-posttest design

Where are O1 : prettest, O2 : posttest, and X : Treatment implemented by Kayuh Baimbai Model

The effectiveness testing of the Kayuh Baimbai learning model used test instrument in multiple-choice form. Before the data were analyzed using t-test, the data were analyzed by using normality and homogeneity tests.

The results of the pretest were tested using Kolmogorov-Smirnov $P = 0.356 > 0.005$ so that the value was considered normal. The results of posttest were analyzed using the Kolmogorov-Smirnov test with a value of $0.163 > 0.005$, so the value was categorized normal.

The pretest and posttest results were computed using Levene's test for equality of variances $P = 0.103 > 0.005$. In short, the data were homogeneous. Thus, the data of student learning outcomes were qualified and to be tested using a t-test aided SPSS version 20. The effectiveness of the model was determined by using the t-test in SPSS version 20. Based on analysis of t-test on prettest and posttest, the *p*-value was smaller than 0.05 ($p < 0.05$). It indicated that Kayuh Baimbai learning model affected students' achievement. In other words, Kayuh Baimbai learning model had effectiveness.

C. Discussion

Kayuh Baimbai learning model seems very helpful at field trials to improve motivation and ability of students to learn. The material choosen in this trial was about intensive reading. This material was choosen because reading requires the students' ability to concentrate on finding answers. This material requires the students' ability to find the main idea in each paragraph, answer questions related to the text, and identify the unfamiliar vocabulary. Reading is a receptive language skill that is very basic to be mastered by students before other productive skills.

The initial model design had been through a revision once because of the validator's feedback. Revision lied in the exchange stage. First, the exchange took place as it did without any special requirements and the exchange should be balanced between one group and another group. Users suggested that the exchange take place within a certain time limit so it is not protracted. Method used was by singing together. Many of the positive impacts that arouse when the song was sung together were that the students were more excited, they learned togetherness, and brought out local culture for the selected songs because the songs were Banjarese songs which contain values of togetherness. It also encouraged the students to try to immediately redeem their card with another group because of the limited time available.

Music on a number of studies had indeed shown a positive impact for the listener. Music is proven to build the cognitive process as the segmentation of spoken words into phonemes [12]. Syncronizaion movement with physical movement also proved a positive effect on the ability of the task [13].

The students were very excited when the teacher explained the awards for the best group. Students were not told what gifts they would get, but it did not diminish their enthusiasm to answer questions. The important thing was the appreciation for what they have earned. This attitude seemed much different from the attitude of students taking the pretest. The awards would keep students motivated because their efforts would produce good results.

The third stage of Kayuh Baimbai model, namely receiving questions, also made students interested in taking a series of learning activities. Questions were distributed in the form of cards with four different colors, namely red, green, orange, and blue according to the number of groups. The colors chosen were bright color; therefore, it attracted attention. Most students felt proud and happy to get the color they wanted. On the contrary, others felt sorry for not getting the color they desired. They did not wander for the question they obtained, yet for the color of the card. This had to do with the age of the participants who were still children. Students at this age like the color that attracts attention so much. Color in the research of [14] proved to be a powerful tool to improve the acquisition of textual information.

In the fifth stage, the students took turns to answer questions that they had acquired. They helped each other to answer the questions obtained by each member. The students asked the members of the group when the question was too difficult, so cooperation was completely formed at this stage because when the answer arrived, they were not allowed to ask back to other friends. The assessment process had been done openly on the board, so it was transparent. They could know and control the acquisition of the score they got from the beginning to the end. The teacher straightly wrote down the value they gained or reduction, so all students focused not only when they got a turn, but also when other members answered the questions. Extra score from the start and the reduction when the answer was wrong made students answer the questions very carefully when they took their turn. The success in answering correctly would contribute to the group, while the error would result in a loss not only for the students, but also members of other groups as a whole. The students were very enthusiastic when the question was successfully answered correctly. On the contrary, when their friend made mistake, they look worried because it would drop their positions.

The issue occured when the points collected by the students had been summed. When the trial was going on, there were two groups who received the same score. The solution to resolve this problem was to provide a supplementary question by means of conquest. However, not all students were allowed to answer. The teacher only provided an opportunity for the two groups who received the highest points. In addition, there was only one representative student from each group who was allowed to. Besides, it was easier for the teacher to determine who raised their hands first. This way would also train students to entrust their victory to the group leader or member who was trusted to have the most excellent text mastery. Seizure questions also gives a sense of a fair fight because each group gets an equal chance to succeed.

Kayuh Baimbai model is very useful to train students teamwork in the form of fun cooperative learning. This model would encourage them to learn, but still give pleasure because of the element of the game. They would be encouraged to think creatively so that the group could win the competition. Thus, the students can be trained on the importance of working together to achieve the goal so that the coming generation become a person who is not only concerned with personal interests, but also the interests of the group.

IV. Conclusion

Kayuh Baimbai learning model reflects local wisdom of Banjarese societies that form imitation activities as trading-selling in floating market. Imitation of activities shows powerful cooperation on Banjarese societies to achieve their goals. Kayuh Baimbai cooperative learning model is more efficient to practice at schools. Based on expert validation, this model has good validity. At the phase of tested product, this model has normality and homogeneity on pre-test and post-test data in order that the data are able to be analyzed by using t-test. The result of t-test showed that Kayuh Baimbai learning model has significance toward student achievement. Furthermore, this model is effective to implement on the school.

This model was revised by suggestion of expert validator and user validator. This model is able to be developed by other researchers. The suggestions from the researchers are as follows: (1) the next researcher can implement Kayuh Baimbai learning model on different subject matter, (2) implementation of Kayuh Baimbai learning model can be implemented on different grade and level of education, (3) implementation of Kayuh Baimbai learning model can be accompanied by traditional music or tradisional song which is appropriate to school condition.

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The Development of "Chemtective" Game-Based Medium on Chemistry Learning

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Abstract*—The purpose of this study was to develop "Chemtective" as a game-based learning medium which was valid, practical, and effective in improving students' interest and motivation in learning Chemistry. "Chemtective" is a computer game-based medium designed by collaborating "chemistry subject" and "detective stories". The method employed in this study was Research and Development (R & D). The validity of the medium was evaluated by three media experts. As many as 34 students of SMA Negeri 2 Banjarmasin were selected as the try out subjects. The data of validity, practicality and effectiveness of the medium were collected by using validity sheet, observation sheet, students' responses and students' interest questionnaire. The practicality of the medium was evaluated by three observers and the effectiveness was evidenced by the improvement of students' interest in learning chemistry. The analysis of the data used percentage method. The result showed that "Chemtective" was valid, can practically be implemented, and was effective to improve students' interest in learning chemistry.

Keywords*—chemtective; game-based medium; students' interest

I. Introduction

Learning is a process of delivering a message from the source to the recipients by using particular media [1]. However, there are several factors that become barriers of this process. One of them is psychological barrier related to interests, attitudes, opinions, beliefs, intelligence, and knowledge. Students who are interested in the lesson, topic, and teacher would have different learning outcomes compared to those who are not interested in it or do not like it.

Reference [2] stated that students' interest and motivation will influence the quality of learning outcomes in particular subject. The more the students' interest is, the more intensive the students' focus. As a result, students learn more actively in gaining achievement. On the contrary, lack of interest and motivation to learn will make students less motivated to be involved in the learning process.

This problem is often encountered in Chemistry subject, one of which is on Periodic Table of Elements (PTE) subject matter. Periodic Table of Elements is one of the essential subject matters in Chemistry. It is generally studied in the beginning of the 10^{th} grade of senior high school to introduce basic chemistry. PTE material consisted of four parts, namely; modern periodic system, development of the basic grouping of elements, periodic properties of the elements, and some classes of elements in the periodic system. A study conducted by [3] showed that PTE is one of the considered difficult subject materials because it consisted of too many memorized materials. Meanwhile, according to [4] PTE is an abstract material, so it requires media as a learning tool. This is compounded by the use of a common lecture method in teaching PTE subject that makes students become quickly bored and not interested in studying. As the impact, the students' learning outcomes are not in line with the expectations.

According to [5], teachers and instructors have a responsibility in designing learning tasks in such a way so that students have the opportunity to gain experience and a sense of personal achievement, as well as awards. The personal satisfaction will increase students' interest and motivation. Reference [6] states that interest can be built by designing the subject matter into a package of interesting information presented in interesting instructional media.

Problems encountered in learning Periodical Table of Elements (PTE) will be resolved by designing an interesting game-based instructional medium. According to the study conducted by [7], game-based instructional medium has a lot of benefits to students, such as facilitating difficult concepts to grasp, increasing the attractiveness of the subject matters, and providing fun learning solutions to solve problems. A study conducted by [8] revealed that students who played game-based media in learning science demonstrated improvement learning outcomes. Game -based learning also encourages students to explore science concepts.

Therefore, to overcome the lack of interest and motivation of students to PTE material, this study intended to develop "Chemtective"; a game-based instructional medium that is valid, practical, and effective. "Chemtective" is a game-based medium which is expected to help students to solve problems regarding the difficulties of the PTE material. The game-based learning medium was called "Chemtective", because the game uses chemistry along with detective stories as the background. "Chemtective" contains three basic media elements; sound, images, and text, presented as a game with the clear storyline. The use of game-based medium containing detective stories as a background makes "Chemtective" compatible with nearly all the students' learning style, whether visual, audio, kinesthetic, and audio-visual. By using an informal and entertaining game such as "Chemtective", students' interest and motivation to learn PTE material can be increased. Thus, students' achievement will be increased as well.

According to [6], the use of a good game program design improves students' interest and motivation. This idea is reinforced by research conducted by [9] concerning the use of audio-visual media as a teaching tool at schools. The research established that instructional activities using multimedia give the higher learning outcomes than the instructional teaching without media.

II. METHOD

The applied method in this study was Research and Development (R & D) by Borg & Gall design [10]. The try out of "Chemtective" was conducted at SMAN 2 Banjarmasin. The sample consisted of 34 of 10th grade students. The validity of the medium was evaluated by three experts. The data were collected by using validation sheet, observation sheet, and students' interest questionnaire. The validity of the medium is determined by using the validity criteria 1 <M <2 (poor), 2≤M <3 (invalid), 3≤M <4 (valid), and 4≤M <5 (very valid). The practicality and effectiveness of the medium were analyzed by using percentage technique. This medium is categorized as practical and effective if the percentage result of students and teacher activities when applying the medium, students' response, and students' interest to the medium are more than 40%.

III. RESULTS AND DISCUSSION

A. Results

1) Validity

The validity of "Chemtective" was evaluated by assessing the quality of the content, language, and medium display using validation sheet. Questions about the content consisted of eight aspects, the language consisted of three aspects, and the medium display consisted of five aspects. The result of validation conducted by three experts can be concluded as follows.

TABLE I. VALIDATION RESULT OF "CHEMTECTIVE"

Aspects	Score of Validator			Mean	
	I	II	III	Score	Aspect
Content	32	31	30	31	3.9
Language	12	11	9	11	3.6
Display	21	18	19	19.3	3.9
Means					3.8

The means of the medium validity scored by validators was 3.8 or valid. Based on the validation of the three experts, it can be concluded that "Chemtective" is worth to be used with minimal revision. In general, Chemtective has been good in terms of content and display. Of the three factors, quality of the content and medium display gained the highest score, while language gained the lowest score and should be revised. Typeface, the use of color, and the story still need to be improved in order to look more attractive.

The quality of the content and medium display received high score from all validators. The content of the medium and the medium elements such as pictures and text were attractive. Indeed, "Chemtective" contains various interesting cases which are challenging to be solved, such as theft, kidnapping, and bombing. In order to get the clues for solving the cases, the player must answer the questions about chemical elements. The difficulty level of the questions is related to the number and the importance of the clues. Those who succeed to answer difficult questions will get more clues to crack the case. Therefore, the attractiveness of the game content lies on the combination of the chemical concept mastery, the setting strategy, and the cooperation in solving problems. It is relevant to [11] that the interesting games used in learning is a game designed by combining aspects of cognitive, affective, motivational and sociocultural.

2) Practicality

In the trial step, the practicality of "Chemtective" was indicated by students' activities and interaction between students or teachers and the medium during the lesson. Observation of students and teacher activities was conducted by five observers during the lesson. "Chemtective" was piloted on two lessons, lesson 1 was conducted before revising and lesson 2 was conducted after revising the medium. Based on the observation result, the practicality of the medium was explained as follows.

TABLE II. THE OBSERVATION RESULT OF THE MEDIUM APPLICATION

No.	Indicators	Total score	
		Lesson 1	Lesson 2
1	Students look happy when playing the game.	26	28
2	The rule of the game is clearly explained, showing by no questions asked by students when playing the game.	27	27
3	The games are easily to be applied.	28	28
4	Chemtective takes an important role in learning process.	26	27
5	Students can quickly answer the questions.	19	26
6	The medium helps students' to practice solving the problems.	27	27
7	The use of chemtective improves students' activity.	26	27
8	The use of the medium helps teachers to efficiently manage the time.	20	26
9	The set of chemtective engaged students attention.	28	28
10	The medium is suitable with the PTE material.	29	29
Amount		256	
Percentage		73%	

The data on Table II above shows that the practicality of the medium in the first trial was 73%. It means that this medium can be categorized as practical. Yet, there are several factors of the medium that need to be improved for example the time allocation. Based on observation result number 5, it was found that answering question activity takes much time. Students can not answer the questions quickly. That is why in the second trial, time for answering questions activity was extended. It appears that in the second trial the practicality of the medium slightly increased. Thus, from both trials it can be concluded that "Chemtective" is easily used and understood.

3) Effectiveness

The effectiveness of "Chemtective" was indicated by students' responses toward the medium and the capability of "chemtective" to improve students' interest in learning chemistry. Students' responses were selected by giving questionnaire to five students. The students evaluated the use of language and the medium display viewed from the color, font type and size, and also the illustration. Students' responses of "Chemtective" can be seen as follows:

TABLE III. VALIDITY COEFFICIENT AND AVERAGE SCORE OF THE MEDIUM APPLICABILITY

No.	Indicators	Score				
		1	2	3	4	5
A. Language						
1	The words are clear and easy to understand.				2	3
2	It uses correct grammar of Bahasa Indonesia.				4	1
3	It uses effective and efficient words.				3	2
B. Medium Display						
4	The color is attractive.				1	4
5	It uses appropriate lay out, font type and size.			1	2	2
6	It uses attractive illustration, graphic, figures, and pictures.					5
7	It uses attractive and varies design.				1	4
8	It uses illustration, graphic, figures, and pictures that do not contain elements of violence, pornography and SARA				2	3
Amount		**183**				
Percentage		**92%**				

In the preliminary assessment, the obtained of average percentage of medium practicality was 92%. In other words, the language of "Chemtective" was easily understood and the medium display was attractive. The clarity of the language got a lower response (88%) than the medium display (94%). It means that the display becomes the main interest of the media. Students also gave some suggestions about the time allocation for finishing the questions. Some questions seemed difficult and consume a lot of time to answer. So, the time should be extended in order to give students more opportunity to finish the problems.

After revising the medium of this study, in the second trial, "Chemtective" was tested to 34 of 10^{th} grade students. Students' motivation was measured by giving questionnaire fulfilled by all students. In the questionnaire, the students expressed their interest toward "Chemtective" and to what extent they were motivated in learning chemistry using "Chemtective" medium. Students' interest toward "Chemtective" in the second trial is shown by the following table.

TABLE IV. STUDENTS INTEREST TOWARD "CHEMTECTIVE"

No	Statements	Scores				
		1	2	3	4	5
1	Learning PTE using Chemtective makes me easier to understand chemistry.		2	4	15	13
2	Exercises in "Chemtective" really help me to better understand the chemistry concepts.		1	4	22	7
3	Chemtective medium motivates me to learn chemistry.			8	23	3
4	Chemtective medium makes learning chemistry more attractive.			3	18	13
5	Chemtective medium makes me easier to follow Chemistry lesson.		2	5	21	6
6	The use of Chemtective in learning chemistry is not confusing.			10	23	1
7	Chemtective makes me feel happy while learning Chemistry.		2	5	20	7
8	Chemtective makes me more excited to learn Chemistry than ever.		1	6	20	7
9	Chemtective makes me more confident in learning Chemistry.		5	8	17	4
10	Chemtective helps me remember the lesson longer.	1		16	14	3
Percentage		82%				

Table IV shows that, in general, students' interest toward "Chemtective" is positive. Statement number 4 "*Chemtective medium makes learning chemistry more attractive*" received the most positive feedback than any other statements. Instead, statement number 10 "*Chemtective helps me remember the lesson longer*" obtain the fewest positive response. Even though only 50% students who agreed with this statement, most students agreed that "Chemtective" helps them to better understand of chemistry concepts. From the students' responses and students' interest in the table above, it can be concluded that Chemtective is effective. Chemtective is also attractive and helps students learning chemistry better because it motivates students to enjoy chemistry.

B. Discussion

Chemtective is a game-based learning multimedium in which students solve mysterious cases by applying the knowledge of Periodical Table of Elements (PTE). Any clues to solve the cases such as the theft, the kidnap or the bombing were obtained by answering questions about the PTE. During chemistry lesson using "Chemtective", the students seemed enjoy it. They were also engaged to the lesson until the class finished. Students engagement to the lesson was due to "Chemtective" application as stated by [12]. As many as 1.2 billion people tend to play games, that is why a game like "Chemtective" gained positive perception from most students and showed high practicality. Besides having the challenging cases, the attractiveness of "Chemtective" is also caused by the presence of exciting game play elements such as pictures, color, figures and storyline. Data in Table 3 show that, in general, students were interested on “Chemtective” because of the use interesting media elements such as illustrations, graphics, pictures and color. According to [13], besides engaging motivation, the use of moving images, color and illustration that form certain patterns also have a great influence in the process of entering information. The more visuals that were used, the higher the quality of learning is. The use of this visual medium should have an effect on the ability to remember.

Indicators of medium practicality were evident from the students’ responses when interacting with the medium during the lesson. Data on Table 2 show that students seem cheerful when playing the game. Students also found it easy to play, so “Chemtective” is able to engage students’ attention. In general, “Chemtective” is very suitable for teaching Periodical Tabel of Elements material.

Students positive response to “Chemtective” that was found in this research was similar to the study conducted by [13]. In this previous study, the respondents consisting of 72 high school students had positive perceptions toward the game-based instruction and its learning efficiency. They also felt the game-based instruction was much more interesting than traditional didactic lectures.

The attractiveness of the game including images, sounds and storyline puzzles makes students are motivated to learn. It is able to attract students attention during the lesson as well. Indeed, the usage of games game-based learning is an effective instructional strategy for engaging learning and motivating students [14].

IV. Conclusion

Based on the findings of this study, it can be concluded that “Chemtective”, the game-based instructional medium developed in this study, was valid, practical, and effective to improve students interest in learning Chemistry particularly on Periodic Table of Elements (PTE) subject matter.

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Sprint Context of Asian Games in the Division of Fractions

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***Abstract*—This study used sprint context on Asian games for Learning Trajectory (LT) that can help students understand the division of fractions in grade 5 of elementary schools. This study was conducted on 30 students in class V-e of MIN 2 Palembang, South Sumatra Province, Indonesia. This study used design research method with three research stages, namely the first preliminary design/ preparing for an experiment which was the stage of designing Hyphotecal Learning Trajectory (HLT) and instruments needed, design experiment namely HLT test phase consisting of pilot experiment and teaching experiment and the third one, retrospective analysis. Instruments for data collections were video recordings, documentation, and interviews, observation sheet, pre-test and post-test. Hypothetical Learning Trajectory (HLT) of learning division of fractions has been designed into Learning Trajectory (LT), so it can function as a Local Instructional Theory (LIT) which can be developed to provide the materials of the division of fractions for students. The results of this study indicated that the trajectory of learning produced can help students understand the division of fractions. Therefore, it will be able to contribute positively to the various parties who have an interest in the education such as teachers, students, schools and the government. Furthermore, it also can be used as a reference in the teaching and learning and developing materials of teaching mathematics.**

Keywords*—Divisions Of Fractions, HLT, Sprint, Model Bar, Design Research

I. INTRODUCTION

The learning process in schools links the materials and real life studied by the students everyday. One factor of the learning process which can familiarize students in problem-solving is context. Context can be the start for learning mathematics [1]. The context in an area may be different from other areas, so using a real right context is preferred because it can help the students give the perception and can interpret information easily as a basic knowledge of students [2].

The previous concept also applies to learning division of fractions since fraction is one of the fundamental concepts in mathematics and science associated with the environment. According to several studies, one of the concepts of fractions which is difficult to understand is the concept of division of fractions, for the fractional division is one of the hardest materials in arithmetic [3][4][5].

In studying fractions, there are five levels of fractional operation which are: knowing fractions in accordance with students level, strategizing delivery of fractions material, arranging the rules in operating the fractions equation, operating addition and multiplication independently by the students and making the results of their own by following the rules for the accurate result [4].

Some research conducts had been done to build an understanding of fractional division material. As the first example, [4] conducted by using contextual situation and some real objects for students to learn fraction for the first time. The main focus of his research was the calculation of division and only showed informal solving strategy of the division problem. Another example, [6] used ribbon context in the 4th grade in the fractions division materials relating to fraction division. The given problem was "Holiday Bows". Moreover, [5] conducted a study at MIN 2 School Palembang with an entitled issue "Souvenir for Kartini day" to develop students' understanding of the inverse relationship between multiplication operations with fractional division operation from measurement division problems and positive division. Reference [7] conducted a study on measurements and created a partition to solve multiplication and division problems. Research by [3] separated the issue of division into two main problems, measurement and partition division.

Based on the description, the researchers used different ways to teach fraction, in this case, fractions division, by using Asians Games context held in Palembang, South Sumatra, Indonesia. The context used was sprint form of the athletic sport. There were several reasons why the researchers used the context of sprint sport at the Asian Games. The study using this context which has never been done would give the impression of something new and different. Asians games will be held in Indonesia in 2018, and in particular, some sports are held in South Sumatra that are more familiar among the public, especially for fifth grade students. The researchers wanted to provide information to the entire community, especially prospective teachers and mathematics teachers in teaching fraction. The context of the sprint context is a reference because the students are very familiar with this sport.

The purpose of this study was generating Hyphotecal Learning Trajectory (HLT) to help students in understanding the fractional division material through the context of Asians Games Athletics Sports. Major problem of this study is 'How can HLT help students understand the fractional division material using Asians Games Sprint Sports context?

The benefits of the research can be categorized in two ways, namely, practically benefit and theoretically benefit. Theoretically, this study contributes to a grounded instructional theory in fractional division learning, namely the use of Van de Walle theories which are dividing by measuring and dividing by partitioning, in this case using partition bars. Practically, this research provides an overview for teachers and researchers on how to design a study that emphasizes understanding, especially on the topic of a fractional division. The benefits of the research can be categorized in two ways, namely, practically benefit and theoretically benefit.

II. METHODS

This research used design research method which had cyclical process of a thought experiment and instruction experiment ([8], [9], [10]). A process of cyclic (repeated) is a thought experiment to learning experiment in diagram form with experimental idea illustrations which shown from the image below [11]:

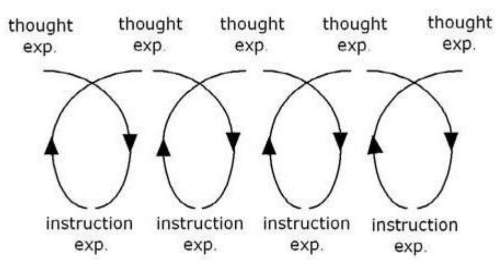


Fig. 1. Reflexive correlation between theory and experiment

Instructional design is done by designing and using three phases, namely Phase I which is preliminary design/ preparing for the experiment, Phase II which is the design experiment, and Phase III which is retrospective analysis [2][10][13]. Data collection was done using video recording, photo, observation, interviews, and documentation. Design Research is a qualitative research method, so the techniques of data analysis in this study were conducted qualitatively based on the results of data collection that have been done.

III. MAIN RESULT

This study used Design Research method by following the three stages that exist, namely Preliminary Design/ preparing for the experiment, the Design Experiment, and Retrospective Analysis. This study was designed to produce a Learning Trajectory (LT) in using a fractions division bar with the context of the World Sprint Record and implemented in MIN 2 Palembang involving three students at Pilot Experiment and 30 students at the Teaching Experiment. The results obtained in this study can be described as follows.

A. Preliminary Design/Preparing for Experiment

This stage began with the design of Hyphotecal Learning Trajectory (HLT) on the material division of fractions. Context sport at Asian games was selected for the track of presented bar and Asian games were familiar among students because it will be held in 2018 in Palembang, Indonesia. The previous researchers first reviewed the literature on the division of fractions. The concept can be used as a support for teaching material division of fractions (such as: material ratio, simplifying fractions, equivalent fractions, the operation of addition and subtraction of fractions and multiplication operation fractions). The concept was also used to examine the context of sport in Asian games, review instructional materials division of fractions in the curriculum, review PMRI approach, and examine design research used as the research method. Furthermore, the researchers discussed with the mathematics teacher who was the model of the HLT that has been designed and made allegations about the students' thinking activities. In addition to HLT, the researchers also designed lesson plans, teacher guidance, and assessment instruments. The HLT which has been designed is as follows.

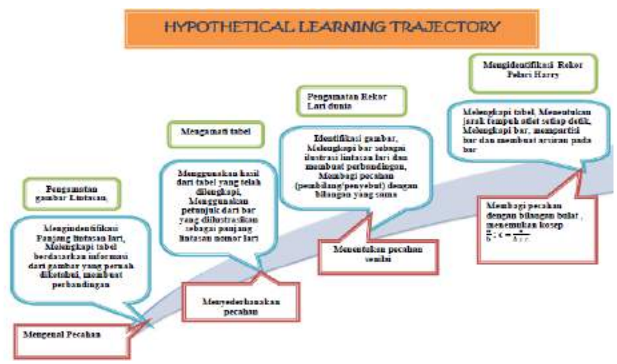


Fig. 2. Hyphotecal Learning Trajectory

B. The Design Experiment

On this stage, there are two sub-cycles of cycle 1, known as Pilot Experiment and second cycle known as the Teaching Experiment. However, this study was limited to the first cycle of design research.

In cycle 1, 3 students have been categorized as having good ability, moderate and low. All three students were given activity sheets that have been designed and validated by their subject teachers at stage 1. Then, the students' works were observed and interviewed to see the thinking in resolving the problems that exist in each activity. The results of the students' work can be described as follows.

1) Activity 1 (Introduction of fraction)

The purpose of this activity was to recognize fractions. At this stage, the context of the image track was given, and the students' background knowledge was dug up. The result can be seen from the transcript of the interview follows: (P = researcher), (S = Student)

Transcript 1.

1. P: "Read the questions, please" (pointing to the questions)
2. S: "Do you know how long the sprint, middle and long-distance track is?" (while reading the questions)
3. P: "What's your answer?"
4. S: "sprint track 100m, 200m, 400m. Middle distance track 800 m, 1500 m, 3000 m, long-distance track 5000m, 10,000m "
5. P: "How did you know?"
6. S: "from PE (Physical Education) class"

From the interview transcript 1 at point 4, the student has known the length of the track, and the information of the length was obtained from Physical Education class. Thus, the students' knowledge was partly used as a starting point for introducing fractions to students on the second activity. Student's work on activity 1 can be described as follows.

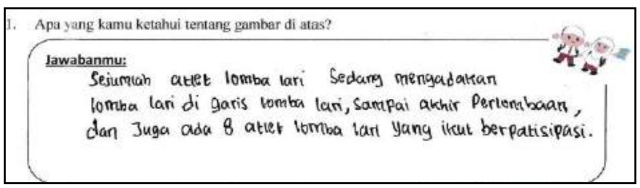


Fig. 3. The results of student's answer to question number 1 of activity 1

In question number 1, students wrote down what they knew and what they saw from the pictures. They have been able to describe the meaning of the rendered image so that it can explore students' initial knowledge about the context used.

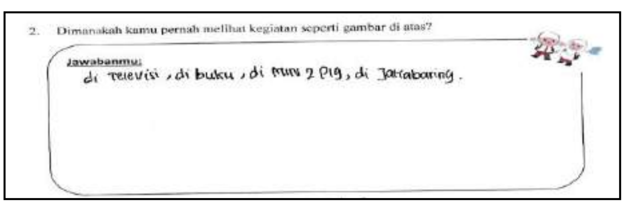


Fig. 4. The results of student's answer to question number 2 of activity 1

From the results of student's answers to the question number 2 of activity 1, it is known that the student knew the sprint sport through television, books and their experiences at school. Therefore, the context used was already well known by all students and it would be easier for students to be able to complete the next question.

Fig. 5. The results of student's answer to question number 3 of activity 1

From the results of students' answers to the question number 3 of activity 1, the student already knew more about the context given. The student also turned out to have known that the sprint sport was conducted in the Asian Games.

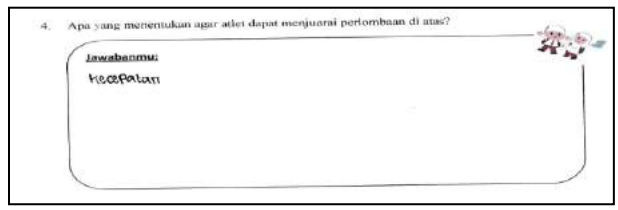


Fig. 6. The results of student's answer to question number 4 of activity 1.

The results of student's answer showed that they had good understanding about the track. The student have learned that the winner of sprint race is on speed, meaning that students will not have trouble completing the next activity. The students' knowledge about the context used in this activity is fairly good.

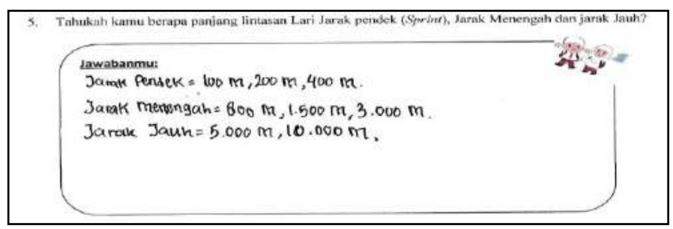


Fig. 7. The results of student's answer to question number 5 of activity 1.

From the results of student's answers, the student was able to explain the length of each running track. It was known by the students from Physical Education lesson. With the knowledge, they will not have difficulty in completing the next activity.

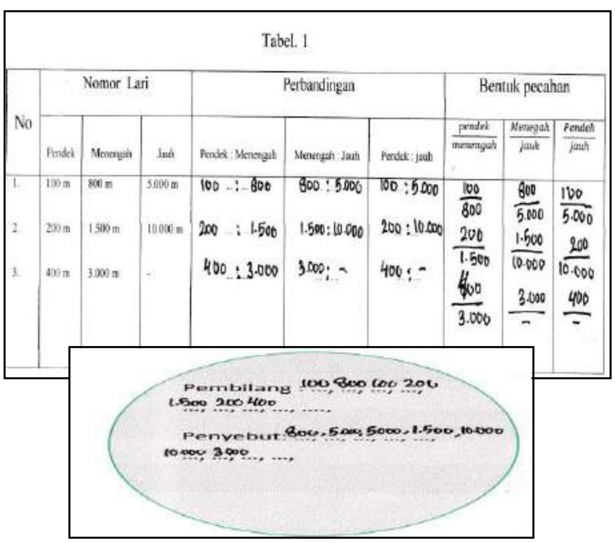
2) Activity 2 (Recognizing Fractions)

The purpose of activity 2 was to enable students to recognize fractions. In this second activity, students' knowledge about the sprint sport was used for completing the table provided to introduce fractions to students. The results of activity 2 can be seen from the transcript of the interview below. After students completed table 1 on activity 2, there was a process of interview.

Transcript 2

1. P: "Why can it be 100: 800?"
2. S: "100 for the sprints, 800 for middle-distance race"
3. P: "How can you make such comparison?"
4. S: "I have learned the ratio material"
5. P: "Why do you state 100:800?"
6. S: 'because this is a fraction form "(while explaining the results obtained)
7. P: "Have you learned about fractions?"
8. S: "I've learned it in 4th grade"
9. P: "It means you've known about fractions? Can you mention the numerator and denominator? (Pointing to a table equipped)
10. S: "I can" (student describes his work results)

From the interview, it is known based on points 1-4 in the transcript 2 that the the researcher asked where the student get the answer 100: 800, and then the student explained that the answer was obtained from the knowledge he had about the track, then the researcher asked back why the student can make the comparison. Apparently, based on point 4 at transcript 1, the student have learned the material in the previous class. Furthermore, in point 5, the researcher asked the student to give the reason for the answer of 100 : 800. The student explained that 100 : 800 was a fraction form he has learned in grade 4. Therefore, based on the transcript, the student has been able to determine the form of fractions and can determine numerator and denominator of the fraction. The work of the student in the second activity can be seen from Fig. 8.


Tabel. 1

No	Nomor Lari			Perbandingan			Bentuk pecahan		
	Pendek	Menengah	Jauh	Pendek : Menengah	Menengah : Jauh	Pendek : jauh	pendek/menengah	Menegah/jauh	Pendek/jauh
1.	100 m	800 m	5.000 m	100 : 800	800 : 5.000	100 : 5.000	100/800	800/5.000	100/5.000
2.	200 m	1.500 m	10.000 m	200 : 1.500	1.500 : 10.000	200 : 10.000	200/1.500	1.500/10.000	200/10.000
3.	400 m	3.000 m	-	400 : 3.000	3.000 : -	400 : -	400/3.000	3.000/-	400/-

Pembilang 100, 800, 100, 200, 1.500, 200, 400
Penyebut 800, 5.000, 5000, 1.500, 10.000, 10.000, 3.000

Fig. 8. The students' answers on fraction recognizion

From the results of students' responses, it appears that students have been able to make comparisons based on information about the length of the track from activity 1. After that, the students changed the comparison into the form of fractions. The students have been able to determine the numerator and denominator of the fraction in the given questions.

3) Activity 3 (simplify fractions)

The purpose of activity 3 was to find if students could simplify fractions. This activity was beneficial to students in finding equivalent fractions and fractions of the division. The results from activity 3 can be seen from the following interview transcript:

Transcript 3

1. P: "Why can it be 1/8?" (While looking at student work in simplifying the form of 100:800)
2. S: "because 100: 100 = 1, 800: 100 = 8"
3. P: "Why is it divided by 100?"
4. S: "because 100 is a factor of 100 and 800"
5. P: "There is 8/50, could it not be simplified any more?"
6. S: "It can be 4/25"
7. P: "What is your conclusion?"
8. S: "to simplify a fraction, the numerator and denominator are divided by the same number"

From the interview transcript 3 on point 1, the researchers asked where the student obtained 1/8, while initially the fraction was 100/800. The student explained on point 2 that the numerator and denominator of 100/800 were divided by 100. Then the researchers asked on point 3 of the transcript that why fractional numerator and denominator must be divided by 100. The student explained based on point 4 that 100 was a factor of 100 and 800. Furthermore, the researchers explores deeper into the student's work, and the researchers asked whether 8/50 fraction can be further simplified. The student explained that fractions 8/50 can be simplified into 4/25 that is divided by a factor of 8 and 50. According to point 8 of the transcript, it is known that the students have been able to make conclusions about how to simplify a numerator, namely by dividing fractions with denominators of equal numbers or factors.

The work of students in three activities can be described as follows. Students have completed table of activity 2. The next denomination results obtained by students in the activity of two were simplified by using the instructions presented by bar on the activity 3 as follows:

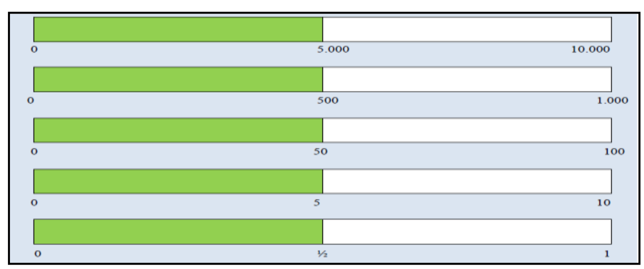


Fig. 9. The bar used as a hint to simplify fractions

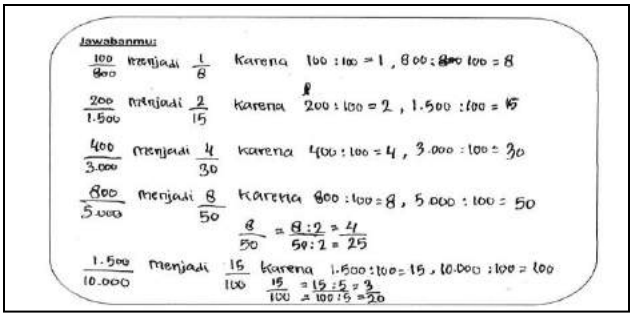

Jawabanmu:
100/800 menjadi 1/8 Karena 100 : 100 = 1 , 800 : 100 = 8
200/1.500 menjadi 2/15 Karena 200 : 100 = 2 , 1.500 : 100 = 15
400/3.000 menjadi 4/30 Karena 400 : 100 = 4 , 3.000 : 100 = 30
800/5.000 menjadi 8/50 Karena 800 : 100 = 8 , 5.000 : 100 = 50
8/50 = 8 : 2/50 : 2 = 4/25
1.500/10.000 menjadi 15/100 Karena 1.500 : 100 = 15 , 10.000 : 100 = 100
15/100 = 15 : 5/100 : 5 = 3/20

Fig. 10. Students work on simplifying fractions in activity 3

4) Activity 4 (Fraction Value)

The purpose of activity 4 was to find if students could determine equivalent fractions. Equivalent fractions are important to assist students in determining the division of fractions. The results of the activity 4 can be seen from the transcript of the interview below.

Transcript 4

1. *P: "based on the picture, now what was it?" (Pointing to provided bar)*
2. *S: "10, 20, 30 ...*
3. *P: "yes, write it down" (the students write the answers to fill in the blanks on a given bar)*
4. *P: "Which is the equivalent fraction of the fraction you mentioned?"*
5. *S: "10/100 = 1/10"*
6. *P: "Why 10/100 = 1/10?"*
7. *S: "because 10/100 was divided by the same number, namely 10, so 10/100 = 1/10"*
8. *P: "ok"*
9. *p: "What can you conclude from equivalent fractions?"*
10. *S: "Equivalent fractions have 2 fractions of equal value, meaning that one fraction is the simplest form of other denominations"*
11. *P: "Equivalent fractions are two fractions which have same value, meaning that one fraction is simplified from other fraction*
12. *S: "for example 10/100 can be simplified to 1/10"*

From the interview above, based on point 1 in transcript 4, the researchers asked students the contents of each bar on activity 4 based on the sprint context. On point 2, the student explained that the contents of the bars were 10, 20, 30, etc. to 100. The answer was obtained by the students based on illustrations presented. Then, when the researcher asked the equivalent fractions, the student explained on point 5 that the fraction value was 1/10 from 10/100. Furthermore, on point 6, the researcher asked further why 10/100 was equivalent to 1/10. The student explained that by using the knowledge obtained from activity 3, 10/100 is divided by the same number, namely 10. Therefore, the numerator and denominator of 100 were divided by 10 and the result was 1/10. According to the conclusions, two equivalent fractions have the same value in which one fraction is the simplest form of other denomination. The student thought that 10/100 was equivalent to 1/10, for 1/10 was a simple form of 10/100 showed by point 12 at transcript 4.

The work of students at 4 activity can be described as follows: In activity 4, the students presented a picture of the 7 world records including the fastest sprinter Usain Bolt as follows

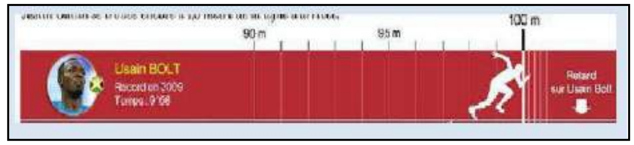


Fig. 10. The world record for the fastest runner

Then illustration above is used to supplement bars presented on four activities. The students' work can be seen from Fig. 11

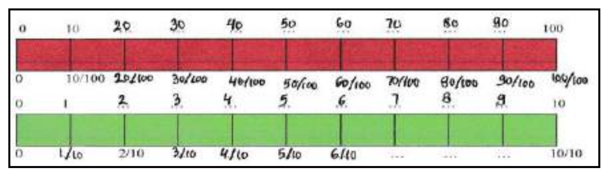


Fig. 11. Students' answer on the bar of activity 4

The student's answer on the bar in Fig. 11 was based on information obtained from the image presented by the student and also based on the track length of 100 meters. In the first bar, students would fill each box with a value of 0-100 based on a multiple of 10, and then the students would make a comparison. At the bar, two students will calculate the values in each box with the numbers 0-10 based on a multiple of 1, and then the students would also make comparisons. The results of the comparison made by students on both bars will be a reference for students to determine equivalent fractions. After the students completed the bar, then students would answer questions presented in activity 4. In question number 1, the students were asked to determine which equivalent fractions were. The results of the students' answers are as follows.

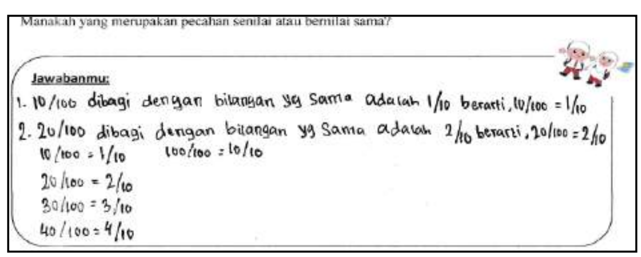

Manakah yang merupakan pecahan senilai atau bernilai sama?
Jawabanmu:
1. 10/100 dibagi dengan bilangan yg sama adalah 1/10 berarti, 10/100 = 1/10
2. 20/100 dibagi dengan bilangan yg sama adalah 2/10 berarti, 20/100 = 2/10
10/100 = 1/10 100/100 = 10/10
20/100 = 2/10
30/100 = 3/10
40/100 = 4/10

Fig. 12. The student's answers for question number 1 of activity 4

From the students' answer for question 1, it is known that the students have been able to determine equivalent fractions as well as the reason why fractions that can be categorized worth.

On question 2, students were required to conclude on equivalent fractions according to their perception. The result of the students' answer is shown in Fig. 13.

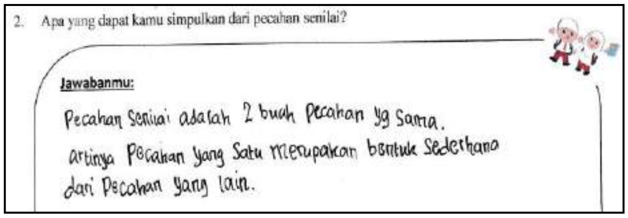


Fig. 13. The students' answers for question number 2 of activity 4

5) Activity 5 and 6 (Division fraction with integer)

The purpose of the activity 5 and 6 was to find if students can determine the distribution of fractions with integers. The results of activity 5 can be seen from the interview transcript below.

Transcript 5.

1. *P: "can you simplify 4/10?*
2. *S: "Yes, 2/5"*
3. *P: "how?"*
4. *S: "4: 2 = 2 and 10: 2 = 5"*
5. *P: "What is the results of ½ divided by 2?" (Student replied with a complementary bar)*
6. *P: "Why the contents of one box 10?"*
7. *S: "because there is a box, divided into 10 sections, can be seen from the picture above, from 0 to 100"*
8. *P: "What about the value that shaded-in?"*
9. *S: "25"*
10. *P: "how many part that be shaded-in?"*
11. *S: "2"*
12. *P: "How about results obtained?*
13. *S: "This is the same as 1/2 50/100, 50: 2 the can 25, so 25/100 = ¼, so ½: 2 = ¼"*
14. *P: "Ok, what can you conclude?"*
15. *S:* "$\frac{a}{b} : c = \frac{a}{bxc}$"

From the interview, the students have been using their ability to simplify fractions. The researcher then asked how the if the fraction ½ was divided by 2. To answer the question of the researcher, the measurement taken by the student was to equip the bar and fill each box with number 10. Then the researcher asked why there was number 10 on every box on the bar? The student explained that the bar was divided into 10 squares and based on the image presented on activity 6 that its value ranging from 0 to 100 based on track length of 100 meters. The student shaded the bar and determined the position of ½ by dividing 100 into 2 parts in which each part scored 50. The student determined that equivalent fraction of ½ namely 50/100, and divided 50 into two parts, respectively 25. Subsequently, the student determined the simplified form of 25/100 which was ¼. Based on the work, the student could conclude by making common form of division of fractions based on his work in activity 6 namely $\frac{a}{b}$: c = $\frac{a}{bxc}$. It can be concluded that the students have been able to solve the division of fractions with integers. The strategy of the student in completing a given activity sheet was finally found. The student's work can be described as follows.

At activity 5, the students were asked to observe the sprint record image of Armin Harry. The students were required to complete the point of the track on the image, and complete table 3 provided on activitiy 5. Once the students completed the table, they were asked to infer from the results. The results of the students' answers are as follows.

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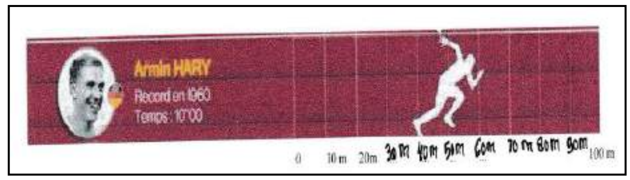

Fig. 14. Student's answer on the track points

No	Waktu (dalam detik)	Jarak tempuh (meter)	Perbandingan jarak tempuh tiap detik terhadap panjang lintasan
1.	1 detik pertama	10	$\frac{10}{100} = \frac{1}{10}$
2.	2 detik pertama	20	$\frac{20}{100} = \frac{2}{10}$
3.	3 detik pertama	30	$\frac{30}{100} = \frac{3}{10}$
4.	4 detik pertama	40	$\frac{40}{100} = \frac{4}{10}$
5.	5 detik pertama	50	$\frac{50}{100} = \frac{5}{10}$
6.	6 detik pertama	60	$\frac{60}{100} = \frac{6}{10}$
7.	7 detik pertama	70	$\frac{70}{100} = \frac{7}{10}$
8.	8 detik pertama	80	$\frac{80}{100} = \frac{8}{10}$
9.	9 detik pertama	90	$\frac{90}{100} = \frac{9}{10}$
10.	10 detik pertama	100	$\frac{100}{100} = \frac{1}{10}$

Fig. 15. The work of students completing the table at activity 5

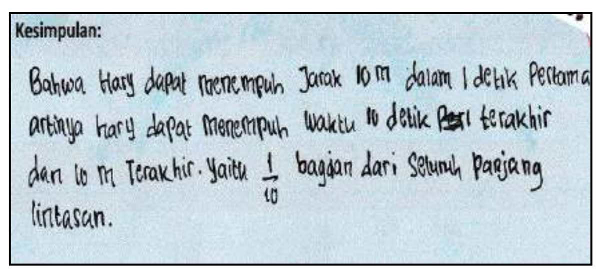

Fig. 16. Conclusions students about the activity of 5

From the work of activity 5, to complete the first table, all students observed the image on the sprint record of Harry at the final point of 100 meters and it was known that Harry takes 10 seconds to be able to reach the track of 100 meters. Based on this information, the student can determine that every second on average Harry is able to travel 10 meters, then the students would make a comparison of mileage on every second to the length of the track. The results of the comparison made were simplified by the students. The results were used to help them to complete the work in activity 6. The work of students in activity 6 can be described as follows:

From the results of activity of 5, the average distance which is taken by sprinter Armin Harry every second is 10 meters. The students were required to complete the bar given in activity 6 based on illustrations presented before to answer questions in activity 6.

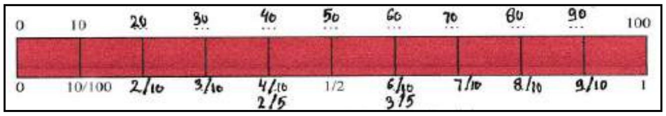

Fig. 17. The work of students in activity 6

Furthermore, the students answered the questions on the activity by seeking the division of 6 fractions with integers using the bar. The students were also required to shade the bar provided to determine the division.

In question 1, the students were looking for value ½: 2 as shown in Fig. 18.

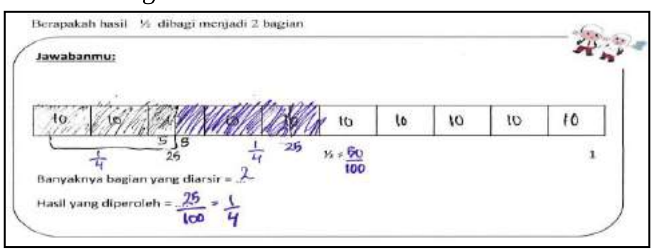

Fig. 18. The results of students' answers to question number 1 of activity 6

From the results of students' answers, to find the result of ½: 2, the students completed the bars provided. Each box was filled with a value of 10, so there were 10 boxes which means 100 as the total. The students filled in each box with number 10 because it is based on an illustration of the context of the sprint record on activity 5. Then, the next students' strategy was dividing 100 of the total value of all boxes on the bar with 2. In order to get 100: 2 which results in 50, 50 is considered as ½ part of 100, namely 50/100. Next, to determine ½: 2, the students divided 50 into two parts, so they got 25, and 25 is ¼ part of 100, namely 25/100. Thus, they found that ½: 2 was ¼.

In question number 2 of activity 6, students were asked to find 3/5: 3. The results of the students' answers are as follows.

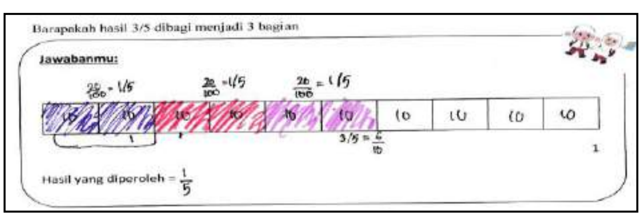

Fig. 19. The results of students' answers for question number 2 in activity 6.

From the results of students' answers, to find the value of 3/5: 3 in the same manner as the first task, the students filled in the boxes on the bar provided with the number 10. Then, the students determined the equivalent fractions of 3/5, namely 3/5 = 6/10 = 60/100, and then the students took 6 boxes of the bar with the total of 60, meaning 60/100. Furthermore, the students divided 60 by 3 = 20. Therefore, 20 is 20 parts of a 100 equivalent to 20/100 = 1/5. Meaning 3/5: 3 is 1/5.

In question number 3 in activity 6, the students were asked to find the value of 1/5 divided by 2. The results of the students' answers are as follows.

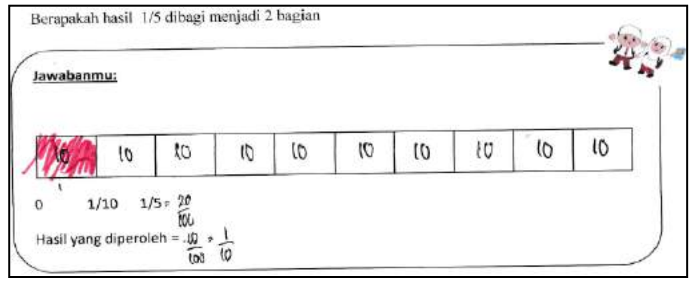

Fig. 20. The results of students' answers for question 3 of activity 6.

From the results of students' answers, to find the value of 1/5: 2, the students used the same strategy when answering questions 1 and 2, so the students could easily determine the value of 1/5: 2 = 1/10.

Furthermore, students were asked to infer the general form of the division of fractions with integers. The results of the students' answers are:

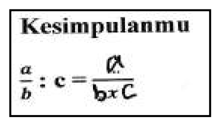

Fig. 21. The conclusion of the students in activity 6.

C. Restrospektif Analysis

From the work of the students, in general, the students could understand the activities which have been designed well enoughsince they used information obtained from the previous activities. Therefore, the students were able to find the results of division of fractions by partition bar provided as a guide. Based on the results in activity 1, 2, 3, 4 and 5, the students could conclude the general form of the division of fractions. There was no difficulty for students to solve any questions presented in corresponding activities with the HLT.

IV. DISCUSSION

The design of learning trajectory was designed and conducted by researchers to understand the division of fractions using the theory of Van de Walle. It is divided by using partition bar covering 6 learning activities that have been performed on the process of students' learning. By using PMRI approach, a series of activities to generate a trajectory study was carried out in every cycle, namely cycle 1 and cycle 2 for Pilot Experiment and Teaching Experiment.

This learning was based on the implementation of PMRI in designing each learning activity that shows the characteristics of PMRI at each activity. In general, from the first to the last activity, the students have done a whole set of measurement activity and create a partition in PMRI by using bar.

V. CONCLUSION

Based on the results and the discussion, it can be concluded as follows.

1. Hypothetical Learning trajectory that has been implemented in this study has become the Learning Trajectory that can help improve students' understanding of the lesson.
2. The Learning Trajectory implemented in this study is one of a positive contribution to developing the Local Instructional Theory (LIT) in learning division of fractions.

In general, the designed HLT has become the Learning Trajectory that helps students learn in performing operations of the division of fractions. Therefore, the researchers suggest the Learning Trajectory of divisions of fractions in this research results be implemented and developed in teachers' own learning activities. Teachers are also expected to be actively involved in designing the lesson to other materials using the suggested lesson to the curriculum that applies. Students should be more active and brave in expressing their opinions, thoughts, and ideas so that they will be able to get the ultimate the learning process in participating in learning activities. Finally, this study only focused on teaching divisions of fractions, so it is expected in the future that other researchers can develop this research not only for teaching division of fractions, but also for other materials.

ACKNOWLEDGMENT

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The Development of Teaching Media Based on PREZI Zooming Presentation on Heat and Temperature Subjects

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***Abstract*—Both teachers and students have become numb to conventional classroom presentations, where they are confronted with slide after slide containing too much information in quick, disjointed succession. Prezi's zooming presentation opens up the classroom to active learning and interactivity, making lessons understandable, memorable, and fun. It causes the researchers to be interested to develop teaching media based on Prezi zooming presentation. This study aimed to describe the validity, the practicality, and the effectiveness of the teaching media. This study was a research and development which refers to the 4-D model. The subjects of the tryout were students of a class X of SMAN 9 Banjarmasin. The results showed that (1) the validity of the teaching media was at valid category, (2) the practicality of the teaching media was at very good category, and (3) the effectiveness of the teaching media was at high category. It can be concluded that Prezi media is eligible to use in the learning process.**

Keywords— Teaching Media, Prezi, Zooming Presentation, Heat and Temperature

I. INTRODUCTION

One key to the success of Indonesian development is education. Based on the Law of the Republic of Indonesia No. 20 Year 2003 on National Education System Article 1 Verse 20, Government Regulation on National Education Standards. Through education should be established. Everybody is expected to improve the quality of his/her presence in participating to support the development. Learning is one of the aspects of education which is involved in improving the quality of the individual. Besides teachers, teaching materials, and methods, the learning success is also influenced by the employed media. Appropriate choice of instructional media is a major factor in optimizing learning outcomes. The use of inappropriate media to students' conditions would lead to non-functioning of media optimally. Teachers should be able to create an atmosphere in the teaching and learning interactions so that it motivates them to learn well and seriously.

Media in the learning process can be used to clarify the abstract material that can be visualized by the appearance of the presentation. The media is used in order to make the teaching materials become more attractive and easily understood by students [1]. The use of media is indispensable in teaching and learning physics for many phenomena and natural phenomena that cannot be presented and understood by students without the media, such as the movement of objects. In general, the study of physics still uses conventional media (for instance blackboard and Over Head Projector/OHP). Along with the development of media and computers, conventional learning media are less attracted to students.

Based on the observations at SMA Negeri 9 Banjarmasin, the obtained results at that school were that it has complete facilities such as available and quite good internet networks, computer, and projector. These facilities are able of support the learning becomes easier and more efficient, yet the utilization is not optimal. This condition demands teachers as one element of education to improve and develop in accordance with the current development of science and technologies.

One of the ways to overcome the problem is to use Prezi media as a tool in the learning process. Using the interesting media is needed to make students more easily understand physics that requires motivation and innovation in teaching and learning process. This will make them not easily get bored while studying.

Prezi media presentation is a software to present, which is similar to PowerPoint. Prezi has other advantages such as Zooming User Interface (ZUI), which allows Prezi users be able to zoom in and out to see their presentation media with collaborative and attractive colors through the provided slides. Prezi is made of a canvas that is not limited by a frame that can be joined with a wide range of text, video, audio, and images that can be modified by pull, move, or turn left or right in order to look more attractive and unique without replacing the slide [2].

Prezi gives greater possibility to improve the learning process more effective and efficient, so that students' learning outcomes can be improved. Some of the benefits are that the use of Prezi media can make students more active [3] and can improve critical thinking skills [4]. The research conducted by [5] states that Prezi is a very attractive media used in the learning process. Also, Prezi can raise the students' motivation [6]. It also makes students' achievement improved [1].

Based on the description, the development of learning media named Zooming Presentation (Prezi) aimed to produce a decent media in the learning process. The specific objective of this study was to decribe validity, practicality, and effectiveness of Prezi as learning media.

II. METHOD

This study was a research and developmental research. This study used 4-D (Define, Design, Develop and Disseminate) development model. In this study, the media was developed using Zooming Presentation in tenth grade of senior high school on second semester about Temperature and Heat.

The subjects were tenth grade students at SMA Negeri 9 Banjarmasin in the academic year 2015/2016. The study was conducted in January to July 2016. The study was located at SMAN 9 Banjarmasin.

This instructional media was tested in the early stages using pre-test and post-test group [7]. It was tested using the following steps:

$$O_1 \times O_2 \qquad (1)$$

Where : O_1 = pretest, $\times$ = learning process using Prezi based, O_2 = posttest.

The instruments used in the study were in the form of validation sheet of Prezi instructional media, observation sheet for teacher activity and achievement test. The data analysis techniques in research and development were as follows: an instrument has validity if the results meet certain criteria (correlates between the measurement results with these criteria). The way to know the correlation is by correlating measurement results with the specified criteria. Some criteria were used as a benchmark to judge the validity of an instrument. Correlation technique used to determine the alignment is by the standard deviation of the correlation product moment technique. Then, it was adjusted to the criteria validation aspects of media.

$$r_{xy} = \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}} \qquad (2)$$

Where r_{xy} = the correlation coefficient between X variable and Y variable, two variables that is correlated; $\sum xy$ = the number of multiplications x and y; x^2 = squares of x; y^2 = squares of y.

The interpretation of correlation coefficient r_{xy} was done by comparing the results of the calculation of $r_{xy\ w}$ with the value of r_{xy} in the table of the critical value r_{xy} product moment. If the value of r_{xy} is more than or equal to r_{xy} table ($r_h \geq r_t$), it means the correlation is significant, which means that the test instrument can be said to be valid. While, if the value r_{xy} is less than r_{xy} table ($r_h \geq r_t$), it means the correlation is not significant, which means that test instrument is invalid. The value of r_{xy} table can be seen on the table of values r product moment [8].

The practicality of media can be measured through the teacher activities observation sheet which contains the steps that the teachers have done. The teacher activities observation sheet was observed to assess the average score $\bar{X}$ each time in a meeting by using the equation 4.

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n} \qquad (4)$$

Where $\bar{X}$ = average score, X_i = the i informed score, and n = the total of questions

Then, the average score was converted into qualitative data. The criteria of scoring of teacher activities observation sheet can be seen on Table 1 [8].

TABLE 1 THE CATEGORY of TEACHER ACTIVITIES

Formula	Average Score	Classification
$X > \bar{X}_i + 1,8 \times sb_i$	$\bar{X} > 3.4$	Very good
$\bar{X}_i + 0,6 \times sb_i < X \leq \bar{X}_i + 1,8 \times sb_i$	$2.8 < \bar{X} \leq 3.4$	Good
$\bar{X}_i - 0.6 \times sb_i < X \leq \bar{X}_i + 0.6 \times sb_i$	$2.2 < \bar{X} \leq 2.8$	Good enough
$\bar{X}_i - 1.8 \times sb_i < X \leq \bar{X}_i - 0.6 \times sb_i$	$1.6 < \bar{X} \leq 2.2$	Less good
$X \leq \bar{X}_i - 1.8 \times sb_i$	$\bar{X} \leq 1.6$	Very less good

Where: $\bar{X}_i$ = ½ (ideal maximum score + ideal minimum score), sb_i = ⅙ (ideal maximum score-ideal minimum score), and X = empirical score.

The observation was done by two observers so that the reliability of teacher activities observation could be calculated with this following equation 5.

$$KK = \frac{2S}{N_1 + N_2} \qquad (5)$$

where: KK = coefficient of agreement, S = agreement, the number of same codes to the same object, N_1 = the total codes from first observer, and N_2 = the total codes from second observer.

The coefficient of agreement (KK) was used to determine the tolerance of observations with observation reliability testing techniques. After calculating the reliability using the coefficient of agreement, we could determine the category of a media through interpretation of the value of correlation coefficient (r). Value interpretation of the correlation coefficient (r) can be seen in Table 2 [7].

TABLE II THE INTERPRETATION OF VALUE OF R

The amount of r	Interpretation
0.800 s/d 1.00	High
0.600 s/d 0.800	Moderate
0.400 s/d 0.600	Rather low
0.200 s/d 0.400	Low
0.000 s/d 0.200	Very low

Effectiveness of learning was measured through achievement test by doing pretest and posttest. Equation 6 is a normalization gain test used to calculate the value of students' cognitive learning outcome [9].

$$<g>=\frac{\%<G>}{\%<G>\max}=\frac{(\%<Sf>-\%<Si>)}{(100-\%<Si>)} \quad (6)$$

Categories of effectiveness of learning process can be seen on Table 3 [9].

TABLE III. CATEGORIES OF EFFECTIVENESS OF LEARNING PROCESS

No	Score	Criteria
1	$<g> \geq 0.7$	High
2	$0.7 > <g> \geq 0.3$	Moderate
3	$<g> < 0.3$	Low

III. RESULT AND DISCUSSION

The validation of the instructional media was done by the expert validators from an academician and a practitioner.

TABLE IV THE RESULT OF VALIDITY ON TEACHING MEDIA

Aspect	Validation Score	
	X	*Y*
Variations of Presentation	3	3
	3	3
Observation Enforceability	3	3
	3	3
	4	3
Completeness of Media	3	3
	3	3
Design of Media	4	4
	4	4
Completeness of Display	3	3
Total	33	32
Average	3.3	3.2
The Value of r_{xy}	0.76	
Category	Valid	

Table 4 shows that the results of the validation analysis of instructional media that covers aspects of assessment of variations in the presentation, enforceability, completeness of media, media design, and overall appearance were at very well category. Based on the validation results, the developed instructional media was categorized valid.

Prezi is a presentation of visual design that is very fun and makes the presentation is interesting. Audiences are interested and focused to the presentation. Prezi is one tool that is used to keep classes interesting and interactive [10]. Based on the results of the validation, all aspects of instructional media have been fulfilled. This suggests that learning media can be used in learning. A valid product means the product can be used to measure what should be measured [11].

The practicality of the instructional media was measured from the observation sheet of teacher activities observation. The observation sheet of teacher activities was developed based on standards and basic competencies which become indicators and learning objectives which were based on education level in the 2006 curriculum.

TABLE V. THE ANALYSIS RESULTS OF THE AVERAGE OF TEACHER ACTIVITIES FROM OBSERVATION IN EACH MEETING

Meeting	Average in each meeting	Reliability
I	3.65	0.80
II	3.73	0.85
III	3.70	0.90
Total	11.08	2.55
Average	3.69	0.85
Category	Very good	High

The observations of teacher's activities were conducted in three meetings. The first meeting was about heat material, the second meeting was about Black principles, and the third meeting was about heat transfer. The observation results of the teacher activities were 3.69 each meeting which was included in very good category. The first meeting was 3.65 and categorized as very good, the second meeting was 3.73 and categorized very good, and the third meeting was 3.70 and categorized as very good. The reliability value was 0.85 that was categorized as high reliability. Teachers' activities that were observed had consistency and stability in measuring the practicality of the developed instructional media. A product is said to be practical if the product can be used and the product is said to be effective if the results are in accordance with the objectives set in the development [12]. If practically and theoretically learning media can be applied in the class, it means that the media is categorized as good [13].

Learning with Prezi as instructional media Prezi really helps teachers in the learning process. Prezi learning media can help learning activities run smoothly, students become more active and inovatif. The use of media as a tool in the learning process makes teachers explain more easily, especially in presenting concrete examples in everyday life. It is appropriate with the function of media to overcome the limitations of space and time and energy and passion. Also, it can increase students' motivation in learning, as well as more direct interaction between students with the resources that are used in the learning process [14].

The effectiveness of instructional media was measured through achievement test. Student learning outcomes in this study were taken through pre-test and post-test. Table 6 shows the value of learning outcomes calculated using normality gain test.

TABLE VI. GAIN CALCULATION TEST

Total of Students	Average of Gain	Category
36	0.73	High

The effectiveness of teaching media based on test results was categorized high. It was also because the implementation of teacher activity observation sheet which was done properly and systematically. If the teacher activity is implemented properly and systematically, it means that all learning objectives in the lesson plan are also conveyed properly. If the learning objectives have been performed well, the value of learning effectiveness that was measured through achievement test would also be good. This is because the used achievement test was set based on learning objectives in the lesson plan. The effectiveness is based on different levels of experience and the results of interventions are consistent with the purposes[13]. The effectiveness refers to the achievement of a goal. A product will be effective if the product can facilitate the achievement of students' learning outcomes in accordance with the standard score minimum decided by school [15].

Based on the validity, practicality, effectiveness results in this study, Prezi is worth using. This is the same as the general purpose of media, such as to make clear a message that is not too verbalistis, provide stimulus as well as the same motivation so it can stimulate attention, interest, thought, and students feeling in learning to achieve the objectives [14]. Therefore, using Prezi in the process of learning can enhance students' creativity [16]. The learning process can motivate students to be active and creative, can improve the imagination of students, can clarify the complex materials, and can reveal the material or object that cannot be displayed directly so that learning becomes innovative and fun. The application of Prezi, the zooming media presentations, on physics subject can give a significant impact on improving student learning outcomes [17]. An increase in levels of cognitive students who use the zooming presentation media in the learning process [2]. There is a huge increasing is students learning outcomes after using Prezi learning media [18].

IV. Conclusion

Based on the results of this research and development, it was acquired that: (1) the validity of Prezi media based in teaching is categorized as valid; (2) the practicality of Prezi is categorized as very good; (3) the effectiveness of Prezi media based in teaching is high. Based on the results of validity, practicality, and effectiveness, we can conclude that Prezi media based in teaching on the subject of temperature and heat is worth using.

Acknowledgment

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The Effectiveness of Using i-Spring Learning Medium to Improve the Activity and Students' Learning Outcomes

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***Abstract*—This study aimed to determine the increased activity of learning and learning outcomes in digestive system materials by the means of I-Spring learning medium. This research is a Classroom Action Research. The subjects were 31 students of class XI SMA Negeri 1 Enrekang South Sulawesi Province onthe second semester of academic year 2015/2016. The implementation of the action research consisted of two cycles, each cycle consisting of three meetings. The data wereobtained using observation sheet for learning activities and achievement test for learning outcomes. The data were analyzed using descriptive analysis. The results of the first cycle to the second cycle showed an increase in activity and learning outcomes. The average activity of students in the first cycle was 51.3% and the second cycle was 76.8%. The percentage of completeness student learning outcomes in the first cyclewas 70.6% and the second cycle increased to 78.5%. Based on the results of this study, it can beconcluded that the application of learning using "ISpring" medium increased the activity and students' learning outcomes for class XI SMA Negeri 1 Enrekang on thematerialofDigestive System.**

Keywords*—Digestive System, Ispring Medium, Learning Activity, Learning Outcomes

I. INTRODUCTION

Education is a form of human who is responsible for the welfare of society and the country. As with any other countries, Indonesia is constantly doing a variety of efforts in improving the quality of education. These efforts include curriculum changes, repair facilities, enhancement of human resources [1].

At the beginning ofthe history of education, the teacher is the sole source for acquiringlessons. In a further development, learning resource that increases with the presence of the book. The writing of the book was based on a basic concept that there is something in the root of the human mind, without first through sensing. Where educators are starting to realize the need for a learning toolthat can provide stimulation and learning experience thoroughly to students through all the senses by using media [2].

The medium can be defined as the provid error occurrence of introductory communication from sender towards the receiver. The media is one of the components of acommunication, i.e. as a bearer of a message from the Communicator heading communication. Based on this definition, it can be said that the process of learning is the process of communication [3].

In recent years, the utilization of information and communication technology in education have already begun spread, ranging from the level of basic education, secondary, got to College, though variations and focus its utilization varies at each institution. Some schools already equip themselves with information and communication technology to support teaching and learning.

Advances in information communication technologies have also allows make use of various types of media at the same time in the form of multimedia learning. The use of interactive multimedia that includes audio-visual components for the delivery of the learning material can attract the attention of the students to learn. Interactive multimedia can also provide an opportunity to the students to do experiments and explorations so as to give all a learning experience rather than merely hear explanations of the teacher. The goal is to provide convenience and broader opportunities to students in the learning process.

Attendance and progress of information and communication technology in an era of global communications today has provided opportunities and expanding the interaction between teachers and students, between students and fellow learners, between the learners and the learning resources can happen anytime and anywhere without being limited by time and space. In addition, with the help of information and communication technology the process of delivery and presentation of learning material or idea can be more interesting and fun. On the other hand, the presence of information and communication technologies as new technologies provide challenges to teachers to be able to master it so you can select and utilize information and communication technologies effectively and efficiently in the teaching and learning process.

According [4], Various efforts have been undertaken by the world of education to improve the quality of education especially quality of learning through the utilization of *information communication technologies*. In addition to its function as a tool of human problem solving, information communication technology can also be utilized to support the learning process that is believed tobe: (1) improve the quality of learning, (2) expand access to education and learning, (3) reduce education costs, (4) answermust participate ininformation communication technologies and (5) develop skills in information communication technologies skills required when students work and in his life later.

The strategy of the utilization of information communication technologies in learning include: (1) information communication technologies as a tool or medium of learning, (2) information communication technologies as a means for learning, (3) information communication technologies as a source of learning, and (4) information communication technologies as a means of increased professionalism.

Multimedia interactive learning media developmentis learning that is simultaneously capable of displaying text, images, graphics, sound, video oranimation. Multimedia interactive learningis also one of the tools to create a more varied learning. Skills developed the media is one of the basic skills of teachers. Development of multimedia interactive learning can use computer programs. The difficulties commonly found in school is the lack of teacher skills in using software applications or programming in the making of the multimedia interactive learning, but it can be overcome by using a program that creates an ease in the manufacturing process without the need for computer skills and one of them is the power point program. Power point programs is one of the programs of Microsoft office software that has a lot of advantages making it suitable to be developed in to a multimedia interactive learning.

I-Spring Presenter is one of the tools that change the presentation file into flash and SCORM/AICC forms, i.e. Forms commonly used in learning with e-learning Learning management System. iSpring softwareis available in a free version and paid. I-Spring Presenter can easily be integrated in Microsoft power point so that its use does not require complicated skills. Some features of iSpring Presenter is:

1. iSpring Presenter work as add ins for Power Point, Power Point files more engaging and interactive Flash based and can be opened in virtually any computer or platform.
2. Developed to support e-learning. iSpring Presenter can insert various forms of media, so that the resulting learning media will be more attractive, which are able to record and synchronize the video presenter, adding Flash and YouTube videos, import or record audio, add information presentation maker and the company's logo, as well as making the navigation and unique design.
3. Easily distributed in flash format, which can be used anywhere and is optimized for the web.

Until then it's still a lot of teachers who are less interested in learning when teaching against the media before learners. Teachers rely solely on the method of speaking engagements, the assumption that there is that when the topic of learning or basic competencies was submitted orally, learner means already understand. In fact, it is precisely with oral course learners will be quickly forgotten so the information cannot be in here ntin its memory. Another case study with the media will facilitate more learners in capturing the concept so that the information obtained can be easily attached to the memory of the student.

II. METHODS

The research is Classroom Action Research that aims to find out the results of the study of biology students through the use of media of instruction iSpring. This study was conducted in a recurring cycle in which each cycle consists of four activities, namely, planning action, implementation measures, observation and reflection.

Factors of concern to researched is (1) learning activities where students are the result of biological observation and the observation sheets obtained from the students of Class XI MIA1 SMA Negeri 1 Enrekang, (2) the results of the study of biology students which is the value obtained by students of Class XI MIA1 SMA Negeri 1 Enrekang. On the material the digestive system through a written test that shows the level of understanding and mastery of the material.

The subject in this study are students of Class XI MIA1SMA Negeri 1 Enrekang listed on the 2015/2016 school year amounted to 31 students. This research was carried out on the even semester corresponds to the concept of the digestive system.

Technique of data analysis in this research are: 1) Student Learning Activities. The data were analyzed using student learning activities a descriptive qualitative analysis that is described with words or phrases to derive the conclusion made by seeing the results of observation on the observation sheet has been filled by the observer during the process of teaching and learning of each cycle, the way to measure student learning activities per item or per activity indicators then used the following formula. For the purposes of data analysis end of learning activities of students, then the frequencies of the first and second meetings on the first cycle of the average percentage wanted every student learning activities of students, later generalized in order to facilitate researchers in discussing how students with learning activities.

2) The Learning outcome. Data obtained from the results of the study of biology students of Class XI MIA SMAN 1 Enrekang analyzed quantitatively by using descriptive statistics.

Indicators of the success of this research are: 1) Learning activities. Indicators of the success of this research in terms of activity is in 60% of Biology learning activities students become ingredients of observation entered into the active category. 2) Learning outcome. This research is said to be successful if the results of the study of biology mean reaches 60% of students overall have reached Minimum Completeness Criterion (KKM) i.e. 75.

III. RESULTS AND DISCUSSION

The results obtained from this study are analyzed qualitatively. Qualitative analysis is used to analyze the activity ofthe students and the learning outcomes of students in the learning process in the form of a percentage.

1) Analysis of the activity of the students during the learning process:

The results of research on student learning activities starting with the cycle I. Each cycle in this study consists of three meetings. Student learning activities that relate to the use of the iSpring medium was observed by using the observation sheet for each meeting and is composed of two observer, thateach observer watched the 16 students and 15 students. Observation sheet there are 7 components of the learning activities.

The table shows that the activity on the cycle I are at intervals of 35%- 54% who belong to the category of less active, while based on the indicators of success, the standard category active students are at a minimum percentage of 60% so that the research should proceed to the next cycle.

TABLE I. FREQUENCY DISTRIBUTION OF ACTIVITY STUDENTS DURING THE LEARNING PROCESS THROUGH THE APPLICATION OF THE ISPRING MEDIUM ON CYCLE I

No.	The observed components	Cycle I				
		I	*II*	*III*	*∑ Stud ents*	*%*
1	Listen teacher's explanation (wh en the students are seen watching what the teacher explained through the media *ISpring* Suite 6.2)	27	29	31	29	93.5
2	Reading literature related learnin g materials provided	16	18	20	18	58
3	Ask a question (including hand-picked with the intention of wanting to ask)	10	15	17	14	45.1
4	The given study materials noted.	15	18	16	16	52.6
5	Responding to a question (give the answers to the questions asked)	5	5	7	5	18.2
6	Ask for guidance teachers (when student don't understand answering the tasks)	10	12	14	12	38.6
7	Keep order in the process of teaching and learning (not playing, not interfere with your friends, not noisy, not out of the incoming class, etc.)	17	15	18	16	53.7
Average					15	51.3

At Cycle II, a meeting was carried out three times. Cycle II shows an increase in the learning activities of students of Class XI MIA1 SMA Negeri 1 Enrekang. The percentage increase in the activity of learning from previous stages in the show in the Table II.

Table II shows an increase in the learning activities of the cycle I just of 51.3% to 78.8% in cycle II. The increase in the number of percentage of activity from cycle I to cycle II of 31.3%. The increase has been entered into the active category. This shows the percentage of students reach the learning activities indicator of success that is a minimum of 60%. So for category learning activities of students ended in cycle II.

TABLE II. FREQUENCY DISTRIBUTION OF ACTIVITY STUDENTS DURING THE LEARNING PROCESS THROUGH THE APPLICATION OF THE I-SPRING MEDIUM ON CYCLE II

No.	The observed components	Cycle I				
		I	*II*	*III*	*∑ Stud ents*	*%*
1	Listening to the teacher‘s expalnation(when the students are seen watching what the teacher explained through the media ISpring Suite 6.2)	29	31	31	30	97.8
2	Reading literature related learnin g materials provide	25	27	25	25	82.7
3	Asking a question (including hand-picked with the intention of wanting to ask)	20	23	27	23	75.2
4	The given study materials noted.	27	27	29	27	89.1
5	Responding to a question (give the answers to the questions asked)	10	16	20	15	49.4
6	Asking for guidance teachers (when student don't understand it in answering the tasks)	15	13	18	15	49.4
7	Keeping order in the process of teaching and learning (not playing, not interfere with your friends, not noisy, not out of the incoming class, etc.)	28	29	31	29	94.6
Average					15	51.3

TABLE III. PERCENTAGE OF LEARNING ACTIVITIES OF STUDENTS DURING THE LEARNING PROCESS THROUGH THE APPLICATION OF THE I-SPRING MEDIUM

Interval Value	Category	Frequency		Percentage (%)	
		Cycle I	*Cycle II*	*Cycle I*	*Cycle II*
85% - 100%	very Active	7	16	22.6	51.6
65% - 84%	Active	8	4	25.8	12.9
55% - 64%	Fairly Active	1	5	3.2	16.1
35% - 54%	Less Active	0	4	0	12.9
0% - 34%	Not Active	15	2	48.4	6.5
Total		31	31	100	100

The results of observation learning activities of students during the learning process by using the media learning iSpring shows an increase from cycle I to cycle II. It is also supported by the opinions expressed by Hamalik (1986) [5] suggests that the use of the learning media in the process of teaching and learning can evoke desire and interest in the new, demotivating and evoking stimuli and learning activities, and even psychological influences brought against students. The use of media of instruction in the learning orientation will greatly help the effectiveness of the learning process and the delivery of the message and the content at that time. In addition to arousing the interest and motivation of students, learning media can also help students improve understanding, presenting interesting and reliable data, eases data interpretation, and condense information.

2) Analysis of the learning outcomes on the learning process:

The data results of the study of biology students of Class XI MIA1 SMA Negeri 1 Enrekang obtained through evaluation tests at the end of each cycle Administering the tests serve to measure the level of mastery of the students against the material that has been given. The results of each student's study analyzed quantitatively fed to the designation Criteria Minimum Completeness specified by the SMA Negeri 1 Enrekang

TABLE IV. PERCENTAGE LEARNING OUTCOME BIOLOGY STUDENTS OF CLASSXIIPA1SMAN1ENREKANGONCYCLE I AND CYCLE II

Category	**Score**	**Cycle I**		**Cycle II**	
		Number of students	***Percentage (%)***	***Number of students***	***Percentage (%)***
Not Complete	0 – 74	15	48.4	12	38.7
Complete	75 – 100	16	51.6	19	61.3
Total		31	100	31	100

Based on the above table indicates that completeness students can study in cycle I of 31 students in class XI MIA1 SMA Negeri 1 Enrekang, there are 15 students who do not complete with the percentage of 48.3% and 16 students with percentages of 51.6% who achieve mastery category. While in cycle II, 31 of those students who do not complete decline amount i.e. from 15 students into 12 students with percentages of 38,7%, so the percentage decrease occurred as much of 9.7% of 48.4% to 38.7%. While students are thoroughly experienced an increased number of previously only 16 people, on cycle II increase the amount to 19 people. The number of percentages also increased by 51.6% to 61.3% previously only amounted to 51.6%.

The percentage of the average value of the learning outcomes of students, on a cycle I 70.64% and cycle II experienced an increase of 7.9% to 78.54%. The increase in student learning results obtained prove that the process of teaching and learning by using learning iSpring medium positively impact in improving student learning outcomes.

IV. CONCLUSION

Based on research results, data analysis, and discussion, it can be summed up as follows:

1) Implementation of the medium learning, I-Spring enhances the activity of learning in students of Class XI MIA1 SMA Negeri 1 Enrekang, i.e. of the 7 components of the observed activity are all experiencing an increase with the average percentage of 78.8%.

2) Learning media use iSpring improve student learning outcomes at Class XI MIA1 SMA Negeri 1 Enrekang. This is evidenced by an increase in the category of complete learning students of 51.6% in cycle I became 61.3% in cycle II. The average value of the percentage of the results of the learning cycle I namely 70.6% while on cycle II percentage average of 78.5%

Summary of research results in relation to the above, a suggestion that can be expressed by researchers is:

1) Before doing research using the media learning I-Spring, should provide the first description of the model will be applied in the classroom, so that students are not confused when learning process begins.

2) Expected teacher can increase the confidence of students in each group so that learning can be run properly and in accordance with the target of research.

3) Expected to further research in order to develop and streng then the results of this research with advanced research on different materials or even on other subjects.

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The Implementation of Inquiry Based Learning toward Students' Learning Outcomes and Critical Thinking Skills

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***Abstract*—This research aimed to (1) test the effect of inquiry based learning toward learning outcome of cognitive product and cognitive process, (2) test the effect of inquiry-based learning toward critical thinking skills. Implementation this model using the quasi-experimental. The independent variable was inquiry-based learning while the dependent variables were learning outcome of cognitive product, cognitive process, and critical thinking skills. This research population was grade 11th students from SMA Negeri 1 Sungai Tabuk i.e. XI IPA-1, XI IPA-2, and XI IPA-3. This research samples for implementation of inquiry-based learning toward learning outcomes for the first treatment classes were XI IPA-2 and XI IPA-3, while the control class was XI IPA-1. The second treatment classes were XI IPA-1 and XI IPA-2, while the control class was XI IPA-3. The treatment classes were determined by using purposive sampling technique. This research samples for implementation of inquiry based learning toward critical thinking skills were XI IPA-2 and XI IPA-3, while the control class was XI IPA-1. This research was held for 3 months. The instrument to measure the cognitive product and cognitive process consisted of multiple-choice test and the critical thinking skills consisted of essay test. The data were analyzed by using anacova SAS release 9.1.3. The results are (1) inquiry base learning has effect to learning outcome of cognitive product and cognitive process, (2) inquiry base learning has no effect to the ability to apply, but has effect to the ability to analyze and the ability to evaluate.**

Keywords*—*Critical Thinking Skills, Inquiry Model, Learning Outcome

I. INTRODUCTION

One of the problems in facing educational world in Indonesia is that there is weakness of learning process. In the learning process, students are less encouraged to develop the ability to think. Learning in the classroom is only directed to memorize information without being required to understand what they have memorized [1][2]. The survey results of Trends in International Mathematics and Science Study (TIMSS) in 2011 reported that the percentage of Indonesian students ranked in 40th out of 42 countries. Indonesian students placed in 31st rank of the mid-level reasoning, in 41st rank of low-level reasoning and in 38th rank of the mid-level of ability to know [3]. These results are consistent to the report of Program for International Student Assessment (PISA) in 2012 in which the ranking of students' critical thinking skills is 64th from 65 countries [4].

Ref [5] released a report of PISA from 2000-2009 and showed that overall Indonesian students' science literacy is in the range of 30-40%. Based on the results of this study, the learning process and assessment need to be designed to stimulate the increase of scientific literacy. Designing inquiry-based learning and innovation is an alternative to deal with this issue.

Inquiry-based learning has been often implemented. The use of this model has improved students' learning outcomes [6][7][8][9][10][11][12][13][14]. The use of this model has also increased the ability to think [9]. It is effective in demanding students to develop and evaluate their own hypotheses and obtain their own conclusions [15]. Critical thinking skills are obtained through inquiry and observation.

Learning is a relatively permanent change in behavior through experience and training [16]. Learning is successful if there are distinct behavior changes in students. The science learning through inquiry involves science process and skills used by scientists to study and assist students in applying the skills [17].

The learning outcomes are widely interpreted in a model to include not only the cognitive and grade point, but also a wide range of behaviors and attitudes [18]. The learning process inside and outside school produces three capabilities known as a bloom taxonomy consisting of cognitive abilities, affective and psychomotor [19].

Critical thinking is represented by the skills of critical thinking: (1) inference, (2) the introduction of assumptions, (3) deduction skills to determine conclusions, (4) interpretation, and (5) evaluation [20]. Interpretation is the ability to understand and express the meaning of the various experiences, circumstances, data, events, consideration, conventions, beliefs, rules, procedures or criteria [21]. Inference is like concluding an image of some of the presented supporting data. Explaining/describing is the ability to express and justify the reasoning in relation to the conceptual, methodological, criteria and considerations based on the underlying context.

The increase of critical thinking skills through; (1) reading, (2) listening, (3) observing, and (4) analyzing [22]. Based on the aforementioned proposals, the research question was formulated as follow: Does the inquiry-based learning in biology learning affect the learning outcomes and high school students' critical thinking skills?.

II. METHOD

The design of this study was distinguished into two types. Types 1 was the implementation of inquiry-based learning model on learning outcomes using a quasi-experimental with counter balance design, as shown in Figure 1.

O1	Oo
Oo	O2

Fig 1. The Model Design of Counter Balance Study

Where are O1: Treatment Class I (The Concept of Circulatory System); Oo: Class Control; and O2: Treatment Class II (The Concept of Motion Systems)

Types 2 was the implementation of inquiry-based learning model in the ability to think also uses quasi-experimental with the design of the nonequivalent control group design, as shown in Figure 2.

O1	X	O2
O1		O2

Fig 2. The Model Design of the Nonequivalent Control Group Design

Where are O1: Pretest; O2: Posttest; and X: Treatment

The independent variable was inquiry-based learning. The dependent variable was the learning outcomes of cognitive product, the learning outcomes of cognitive process, and critical thinking skills. Control variable was the number of lesson hours, syllabus, educational background of teachers and teaching materials.

The research population of XI class students of SMAN 1 Sungai Tabuk Banjar consisted of three classes, namely XI-1 XI-2 and XI-3 class. The following is the division of the research sample: (1). To examine the significance of the implementation of inquiry-based learning model on learning outcomes, the treatment classes I were XI-2 and XI-3 classes, while the control class was XI-1 class. The treatment classes II were XI-1 and XI-2 classes, while the control class was XI IPA-3 class. The treatment classes were determined by using purposive sampling technique; (2) To examine the significance of the implementation of inquiry-based learning model on critical thinking skills, the treatment classes were XI-2 and XI-3 classes, while the control class was XI-1 class.

The research was conducted in three months (October-December 2016) in SMA Negeri 1 Sungai Tabuk Jl. Gerilya Sungai Tabuk Kramat, District Banjar.

The research instruments used in this research were (1) an instrument to measure cognitive product which consisted of a multiple choice test; (2) an instrument to measure cognitive process which consisted of a multiple choice test, and; (3) an instrument to measure critical thinking skills which consisted of an essay test.

A multiple-choice test and an essay test were validated using Rasch models [23]. The data collection and analysis techniques were distinguished into: (1) the learning outcomes of cognitive product were obtained through a multiple choice test, which was given a score of 1 if it is correct and 0 if it is wrong; (2) The learning outcomes of cognitive process is obtained through a multiple-choice test, given a score of 1 if it is correct and 0 if it is wrong; (3) the results of learning critical thinking skills is obtained through an essay test, scored using a rubric essay test. Each data group was compared with the control group, using the anacova program of SAS 9.1.3. version.

III. RESULTS

A. *Learning Outcomes*

The results of the cognitive learning products and cognitive processes processed using anacova are presented in Table 1. Table I shows the average difference of the learning outcomes of cognitive product between treatment class and control.

TABLE I. SUMMARY OF THE LEARNING OUTCOMES OF COGNITIVE PRODUCTS AND COGNITIVE PROCESSES

Biology Concept	**Learning Outcomes**	**Control Class**		**Treatment Class**	
		Pretest	**Postest**	**Pretest**	**Postest**
Curculatory System	Cognitive Product	41.94	60.54	50.61	70.18
	Cognitive Process	40.54	56.88	49.09	63.15
Movement System	Cognitive Product	35.00	60.00	36.00	65.00
	Cognitive Process	41.00	44.00	42.00	73.00

Table II. shows the average difference of the learning outcomes of cognitive product between treatment class and control class. The same thing applies to the learning outcomes of cognitive process. The significance test of the average difference using anacova is summarized in Table 2.

TABLE II. SUMMARY OF COVARIANCE ANALYSIS OF STUDENT OUTCOMES

Biology Concept	Learning Outcomes	N	F-ratio	Pr > F	R^2	c.v.	Description
Circulatory System	Cognitive Product	85	42.95	<.0.001	0.50	9.64	Significant
	Cognitive Process	85	94.84	<.0.001	0.69	7.83	Significant
Movement System	Cognitive Product	85	37.84	<0.001	0.47	3.29	Significant
	Cognitive Process	85	54.56	<0.001	0.56	8.92	Significant

Table 2. shows that there is an effect of inquiry-based learning in biology learning to the cognitive products learning outcomes (F-ratio = 42.95; *P* = 0.001 and F-ratio is 37.84, *P* = 0.001). There is an effect of inquiry-based learning in biology learning to the cognitive processes learning outcomes (F-ratio = 94.84; *P* = 0.001 and F-ratio is 54.56, *P* = 0.001).

B. Critical Thinking Skill

Learning outcomes of the effect of inquiry-based biology learning to high school students' critical thinking skills is summarized in Table III.

TABLE III. SUMMARY OF COVARIANCE ANALYSIS ON VARIOUS PARAMETER OF STUDENTS' CRITICAL THINKING SKILLS

Indicator	Parameter	N	F-ratio	Pr > F	R^2	c.v.	Description
Application	Determine	60	1.03	0.360	0.03	5.29	No Significant
Analysis	Giving Attribute	62	39.75	0.001	0.57	35.13	Significant
Analysis	Integration	61	2.83	0.050	0.08	29.24	Significant
Analysis	Analysis	61	11.89	0.001	0.29	13.10	Significant
Evaluation	Improving	61	2.70	0.050	0.08	46.00	Significant

Table 3 shows that there is no significant effect of inquiry-based learning biology to the ability to apply (F-ratio = 1.03; *P* = 0.36). There are significant differences in ability to analyze (F-ratio = 39.75; *P* = 0.001; F-ratio 2,83,56; *P* = 0.05; F-ratio is 11.89, *P* = 0.001). There are significant differences in the ability to evaluate (F-ratio = 2.70; *P* = 0.05).

IV. DISCUSSION

A. The Effect of Inquiry Based Learning on the Learning Outcomes of Cognitive Products

Inquiry-based learning can improve the learning outcomes of cognitive product and has significant effect. This finding is consistent with the research that has been reported previously by [24] although a lot of research explains that inquiry-based learning affects the learning outcomes [7][8][11][12][13][14]. The researchers above did not distinguish between the learning outcomes of cognitive product and cognitive process, as set out in the Ministerial Regulation number 41 of 2007 [25].

Separating the learning outcomes between cognitive product and cognitive process is not without reason because learning is a process. It is an activity and not a result or goal [26]. Learning is a process of change in behavior, from not knowing into knowing [27].

Ironically, the learning outcomes are not measurable because the words used to formulate the learning outcome are not operational, as reported in other studies [28], [9]. They use the term "understanding" as the embodiment of learning outcomes.

B. The Effect of Inquiry Based Learning on the Learning Outcomes of Cognitive Process

Inquiry-based learning can improve learning outcomes of cognitive processes and has significant effect. These findings are supported by previous studies [24], [29]. Other studies have generally explained that the inquiry-based learning affects the learning outcomes. For example it only affects the learning outcomes [12], or using the word construct such as the "understanding" of learning outcomes [7], [8], [9], [11], [14], [28].

The use of construct word in formulating research objectives has obscured the research objectives to be achieved. In fact, it should to be measured because it reflects the process of change in behavior [27]. In general, the results of the research do not distinguish between cognitive products and cognitive process [6], [8], [9].

Inquiry-based learning is significant to the learning outcomes of cognitive process because there are tasks to be accomplished together, so there should be a division of work. The effective communication will facilitate cooperation within the group. Thus, the opportunity to understand the learning material will be better. More importantly, the education is directed to the process of finding a concept, not just memorizing concept.

C. The Effect of Inquiry-Based Learning on the Critical Thinking Skills

Inquiry-based learning does not affect the ability to apply, but it affects to the ability to analyze and evaluate. This research divides the indicator of the ability to think critically, in contrast to some studies that have been reported previously, without outlining the indicator of critical thinking skills [9], [11][30].

One of the studies has found the indicator of critical thinking skills which is the ability to explain [14]. Nevertheless, the ability to explain according to Bloom's Taxonomy does not include the critical thinking skills [31].

Many studies have only measured the critical thinking skills [24][29][32][33][34] although there are undifferentiated indicators to be achieved [24][34]. However, the research which carried out in groups does not reflect individual skills.

Inquiry-based learning in biology learning does not affect the ability to apply. This can be understood because the ability to apply (C3) does not require a high ability to achieve it. As a comparison of skills to formulate the problem and formulate hypotheses through descriptive research can be equated with the ability to apply which is also obtained by a good category [35]. Therefore, it uses the benchmark for critical thinking skills which is a prerequisite to acquire critical thinking skills.

Inquiry based-learning has effect toward the ability to analyze and ability to evaluate. This is contrasted with the previous research by [35] in which the ability to analyze and ability to make conclusions show any improvements. Otherwise, Ref [24] found that ability to formulate the problems, formulate hypotheses, collect and analyze the data, and make conclusions are classified as good.

V. CONCLUSION

Based on the research and discussion, it is concluded that inquiry-based learning on biology learning has effect to learning outcome of cognitive product. Inquiry-based learning on biology learning has effect to learning outcome of cognitive. Morever, inquiry-based learning on biology learning has no effect to the ability to apply, but has effect to the ability to analyze and the ability to evaluate.

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Multiplication of Fraction With Natural Number by Using Hurdles

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***Abstract*— Students often have a wrong understanding on multiplication of fractions in which they consider multiplication of numbers, the value definitely will always be higher. It underlies the researchers to design the learning of fractional multiplication operations with natural numbers using hurdles context with real problems. The purpose of this study is to find out the role of hurdles in helping the students' understanding on basic concepts of fractional multiplication operations with natural numbers by the approach of Indonesian Realistic Mathematics Education (PMRI). The method used is research design. This study described how this hurdles made a real contribution to the students of the fifth grade, SDN 179 Palembang, Indonesia to understand the concept of multiplication of fractions with natural numbers. The results showed that the context of hurdles can help students to understand their knowledge about the concept of multiplication of fractions with natural numbers. Strategy in answering, the model found by the students, and discussion in front of the classroom have built constructive ideas and contributions to the students so that it can be used as an initial knowledge of understanding their concept, namely the concept of multiplying fractions with natural numbers. Students' learning process is essential in understanding the multiplication of fractions with natural numbers from informal stage to the formal stage.**

Keywords—Design research, Fraction, Hurdles, PMRI

I. INTRODUCTION

One of the basic topics of mathematics is a fraction. Reference [1], the fraction is a difficult topic for students. Reference [2] students get wrong about understanding of multiplication of fractions, they consider if the multiplication of numbers, it definitely will always be higher. Reference [3] state that the difficulties of learning the multiplication of fractions, because they do it in accordance with the rules without understanding.

Students do not understand about conceptual and calculation of fractions becoming a rule without any logic. Therefore, this study uses the approach PMRI (Pendidikan Matematika Realistik Indonesia) or RME (Realistic Mathematics Education). Referencce [4] the basic concept PMRI taken out of context that have been identified using a model student and daily life close to the students.

Based on [5] PMRI is an approach in teaching mathematics that is adapted from of Realistic Mathematics Education (RME) approach. Multiplication of fractions with natural numbers is the first indicator on learning plan in fractional multiplication arithmetic operation. Students should understand the concept well in the initial indicators in order to be a bridge to understanding the next level indicator. In finding the concept, it can be implemented in a context. In Reference [1], fraction can be presented by measurements.

This study uses the contextual situation of activities to support students' learning. Using a number line is a long measurement model can be more appropriate than the other tool from [6]. This activity according to Bay-Williams, Martinie (2003) it is a fun way to use a real-world context to engage students in thinking about fractions through the linear model [7]. Context of athletics hurdles which is an Asian Games sport is used as the starting point used as a helpful media to solve the problems associated with fractional multiplication operations with natural numbers.

Asian Games is a multi sports activity participated by Asian countries which will be held in Palembang and Jakarta in 2018 as the host and this would be an interesting thing in order that students are interested in learning mathematics and it becomes a general knowledge of students, which is one of the characteristics of PMRI. Reference [8] describes three principles of PMRI in accordance to the principles of RME, namely guided reinvention and didactical phenomenology, progressive mathematization, self-developed models. This principle can be formed by the interaction of a good student. Reference [9] there are three aspects that are important in the learning process according to the social constructivist perspective, namely, social norms, norms of social mathematics. It is important to establish a good interaction, interaction is one of the principles of PMRI. In this paper, we present three activities that are conducted in a second cycle of an explanatory teaching experiment in learning multiplication of fraction with natural number using hurdles. In this activity, students work on multiplication of fraction with natural number using hurdles. The purpose of this paper is to explore how the hurdles activity helps and gives contribution to learning multiplication of fraction with natural number.

II. METHOD

This study uses a design research which is an appropriate way to answer questions of researchers and achieve the objectives of the study. Reference [10] design research is the systematic study in designing and evaluating educational intervention as a solution to solve complex problems in educational practice and to enhance knowledge of the characteristics of intervention, design and development. This study consists of three phases which are done repeatedly until it discovers a new theory as a revision result of the learning theory which is tested

This research uses PMRI (Pendidikan Matemtatika Realistik Indonesia) approach. PMRI is a learning which starts from the 'real' things or students' experience, emphasizing the skills process of 'doing mathematics', discussing and collaborating, arguing with classmates so that they can find an invention as opposed to teacher's explanation and ultimately use mathematics to solve the problems either individually or in groups [11].

Reference [12] states that research design is given in anticipation of a thought experiment to imagine learning activities designed in the classroom, and what students can get from learning, because they participate in it.

Reference [13] states that a research design consists of preparing for the experiment / prelimanary design. This phase is meant to review literatures, that is to discuss the whole materials. The materials cover the multiplication of fractions with natural numbers, analysis of curriculum in materials, and approaches of PMRI, Then the researchers design the Hypothetical Learning Trajectory (HLT) as a sequence of materials of learning multiplication of fractions by natural numbers using context hurdles with PMRI approach. At this stage HLT researchers examine the first small groups of the fifth graders of SD N 179 Palembang consistting of 6 students with different abilities. There are two students with high ability; two students with middle ability and two students with low ability.

During the lesson, the students are divided into 2 groups, each of which consists of 3 students with different abilities. The observation along with the analysis of anything happened during the Preliminary Teaching Experiment has been conducted. The evaluation on the learning activities is conjectured based on the research findings to improve HLT.

Reference [9] state that the context is a main point for students in developing mathematics and the context it self should be meaningful for them and real for their' mind. Hurdles is chosen because it represents a fraction, in which one track consists of 10 jumps with the same size. So that the students can estimate the fraction later and present to the form of multiplication by leaps and distance traveled by the running participants. In addition, a running hurdle is one sport that will be included in the 2018 Asian Games in Palembang; it can attract the students' attention to do any activity designed.

Furthermore, the role of context to face the hurdles will be more visible when the students are given a problem about the number of jumps in running that have been taken from the overall distance by the runners. So the use of hurdles in the context of this study is to help the students to multiply fractions by natural numbers.

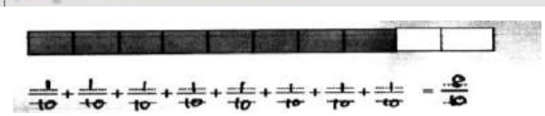
According to Freudenthal in [14], students are given the opportunity to build and develop their ideas and thoughts when constructing mathematics. Teachers can select appropriate learning activities as a basis to stimulate students to think and act when constructing mathematics.

The second phase in the research design is the experimental design, conducting teaching experiments, where the HLT that has been designed and tested in pilot experiments and then revised, retested to the class as the subject of research, namely: class V SDN 179 Palembang consisting of 22 pupils.

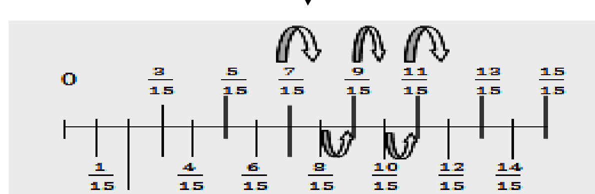
The teacher of the class, as the model teacher and researcher, observe the learning activities. The third phase is a retrospective analysis. The aim of the retrospective analysis generally is to develop the Local Instructional Theory (LIT). At this phase, HLT is compared to the actual student learning, the results are used to answer the problem formulation. All data obtained in the second phase are analyzed to design and develop the activities in the future learning. Here is HLT that has been designed by the researchers.

Data are collected in three meetings of 210 minutes of lesson. According to Van Nes, Van Eerde before conducting the learning activity, researcher discusses the activity with teacher in preparing the lesson. The role of researcher in the learning activity is to stand in the classroom, to ask the students some additional questions, to observe the learning activities, to coordinate the activities, and to make last-minute change to the necessary activity for providing relevant information.

The learning activity is recorded by two video recorders. One video recorder captures the whole classroom activity, and the other focuses on the target group. The video is segmented into clips based on sequences of observed interactions, negotiations and activities relating to each didactical episode in the activity [15].



Student can understand the concept multiplication fraction through problem hurdles activity



Multiplication fraction with natural number by using jumping on the Number line of fractions

↓

$$\frac{1}{9} \times 5 = \frac{5}{9}$$

$$\frac{3}{10} \times 3 = \frac{9}{10}$$

Student solve the problems by the multiplication of fraction with the natural number

Fig. 1. Hypotetical Learning Trajectory

During the learning activities, we also make some notes based on some important moments. All the students' works are cross-interpreted to avoid subjectivity in interpretation. Together with the teacher, we discuss on the reason of the students' visualization. To gain more insight on the students' visualization and interpretation, researcher conducts unstructured interview with some students. Reference [16], the interview is also aimed to clarify students' thinking and interpretation.

III. RESULT AND DISCUSSION

Based on the research result, the students are able to understand the concept of multiplication of fraction with natural number from several activities. They can understand the concept multiplication of fraction through problem of hurdles activity, Through Introducing repeated addition by using jumping on the number line of fractions, they solve the problems by the multiplication of fraction with the natural number. Furthermore, the result and discussion can be described as follows.

From activity 1, it can be seen that the students can understand the concept of fraction multiplication through the problem of hurdles activity. It has been done on the teaching experiment stage for solving the existing problems based on the context. In this activity, the students patch an origami paper on the terraced paper. Then, they write down the value of fractions and sum up bracket value one by one. The results of the students' answers can be seen in the picture below.

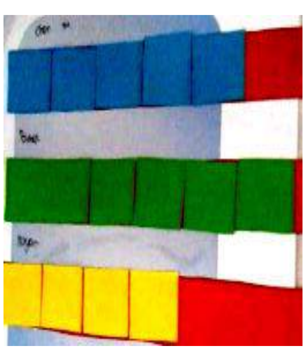


Fig. 2. One of the Students' Answers on the Activity Make a Track from Story of Hurdles Race

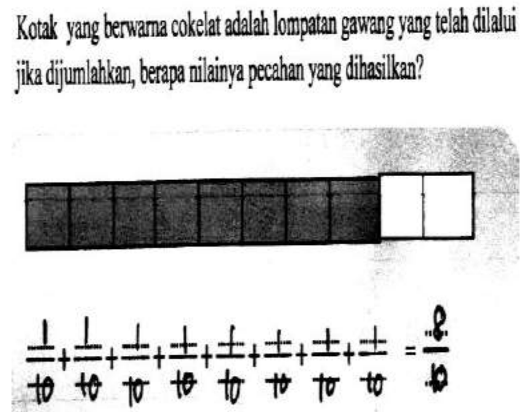


Fig. 3. One of the Students' Answer

From Fig.2, the students create a track using the terraced paper and patch origami paper there on by story of hurdles race. Furthermore, the students link with fractional value. In Fig.3, to determine the concept of multiplication, the students can add up the value of the fractions. Then, the activity 1 is to write conclusions about the relationship between multiplications with addition. The results of the students' answers can be seen in the picture below.

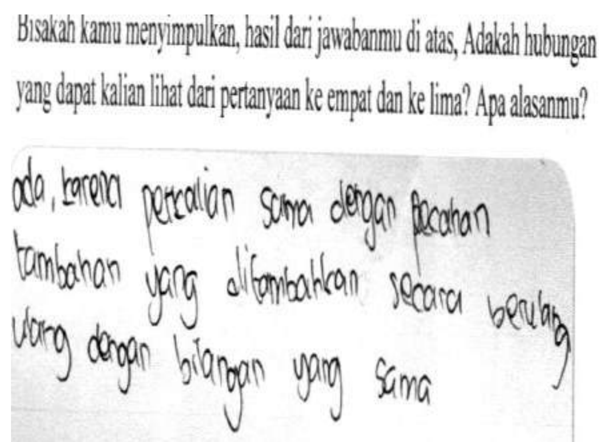


Fig. 4. The students' answer of the concept multiplication

From the above figure, the students can write the conclusion between multiplications with addition of simple fractions. At the time of conducting the activities, the students are not told about the concept of multiplication. One of the new students realize it after they completed this activity.

After understanding the relationship between multiplication and addition, the next activity is designed to Introduce multiplication of fraction with natural number by using jumping on the number line of fractions,

On the second activity, students were given the story of hurdles by using the number line. Then, they were asked to describe the leap that has been passed by runners on the number line. The idea of researcher is: students were directed to create a model of the fractional multiplication with their own. After that, the students completed the multiplication of fractions by natural numbers.

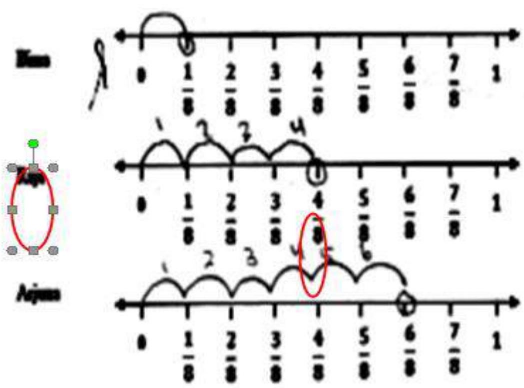


Fig. 5. The students' answers on the activity making the leap of the run on the number line

Dialog in answering the first question on the second activity

Observer : *then what does the story talk about?*

Students : *Raja stopped on the* $\frac{1}{2}$ *leap's track because of thirst*

Observer : *which one is the number line that indicates* $\frac{1}{2}$*? That half is equal to?*

Students : $\frac{2}{4}$

Observer : *then, what is here?*

Students : $\frac{4}{8}$

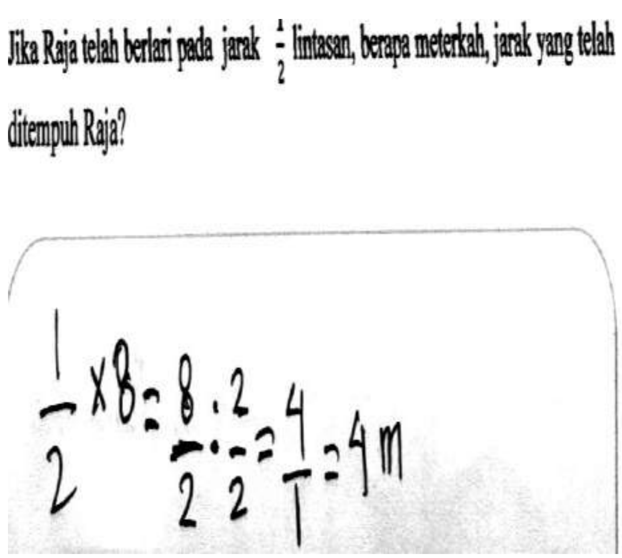


Fig. 6. The students' answers getting by multiplication of fraction with natural number

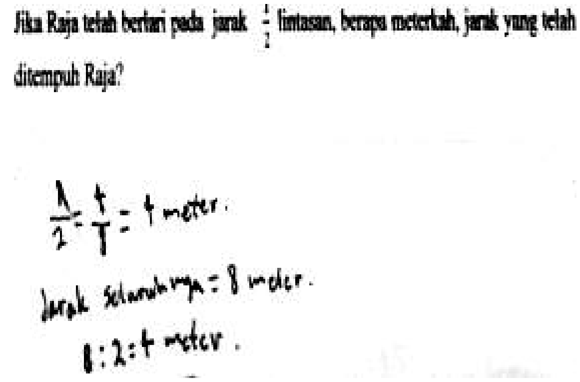


Fig. 7. The students' answers getting by equalizing fractional value and comparing

In Fig.5, students were asked to draw a jump runner position on the number line. It can be seen that students were able to describe the position of the runner. Furthermore, students were asked to solve the problem about measuring the distance which has been through by the runners on the halftrack, the researcher found several students to answer questions with the idea that is made by the students themselves and the students answered correctly.

In Fig.6, the way students in getting answer that is by multiplying directly the halftrack with the natural number that is the value of the overall trajectory is 8 m, producing 4 m, while in the fig.7, the way of the students in getting answer by equalizing fractional value and comparing it with the number line, and then the students could compare the overall distance to halftrack, students got an idea in dividing into from the overall distance so that it got 4 m.

The next students' activity is completing multiplication of fractions by natural numbers, on this activity the students solved existing problems in the student worksheet using multiplication fractions by natural numbers, students were asked to calculate the time that has been taken by runners per wicket and calculate distance that has been through by each runner, this is students' answers.

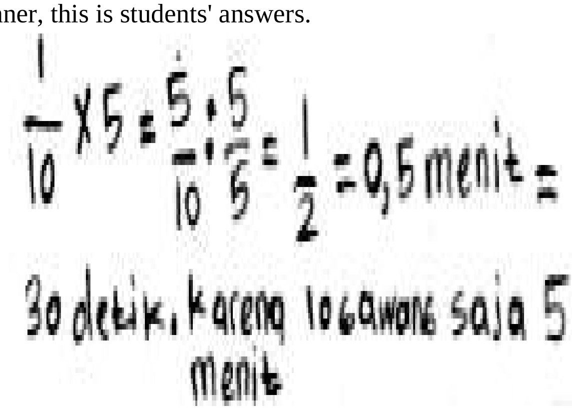


Fig. 8. The Students' Answers on Activity Calculate The Time of Hurdles Runner

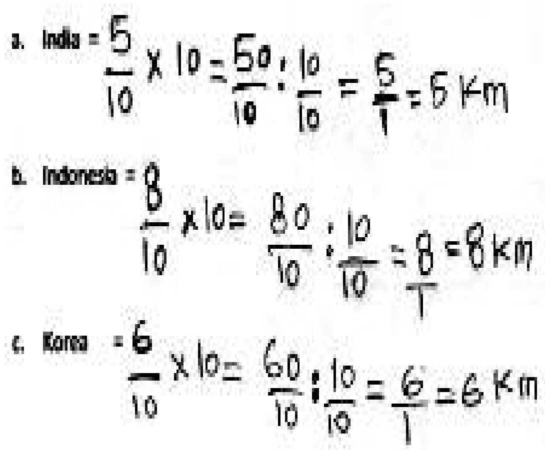


Fig. 9. The Students' Answers on Activity to Calculate The Distance of Hurdles Runner

From Fig.8, students get answers to 30 seconds for each one leap wicket by multiplying the fractional value of the leap with the overall time, in Fig.9, students get the answer by multiplying the fractional value leaps that have been passed runner by multiplying the overall distance. Hurdles can help students on multiplication fractions material by natural numbers. Student difficult to solve the multiplication fraction due to the low understand about the materials. Multiplication of fraction can be solved using the part-whole relation concept [17], [3] such as using the hurdles.

IV. Conclusion

Based on the results and discussion that has been described previously, it can be concluded that the role of hurdles can help students on multiplication of fractions material by natural numbers. Here are the things that helped the students are as follows, the first, experience in meaningful and fun learning given, that is the activity of linking sport with math problems and patching an origami paper on the terraced paper to make the run’s tracks can help students to link by finding the concept of addition and multiplication of fractions and the second, the process illustrating the number line and runner’s leap can help students to equate the value of a fraction.

Thus, this study is one of a positive contribution to the learning multiplication of fractions material by natural numbers in the context of hurdles.

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Blended Learning with Smartchoice iTools

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***Abstract*—Lembaga Bahasa dan Pendidikan Profesional (LBPP) LIA has made use of a blended learning type. It is a face-to-face training combined with self-paced e-learning from Smart Choice Series equipped with iTools. These materials are already in use for almost four years and are approaching the ending or evaluation time for the materials' usage. This research investigated the utilizations of itools' features by the teachers in terms of the knowledge and the frequency. The respondents were 14 teachers of LBPP LIA Banjarmasin and Banjarbaru and they have ever taught the level of Elementary (El) and Intermediate (In) using the Smart Choice iTools. Quantitative data were collected through questionnaire in April on Term II of 2017. This study serves as an early and partial evaluation on the implementation of blended learning by utilizing the Smart Choice iTools. The results showed that some features are elaborated to the fullest meanwhile at the same time, some others are not frequently in use. These conditions might be due to the teachers' knowledge of the features or the activities carried out during the sessions.**

Keywords—Blended Learning, Features, Smart Choice itools

I. Introduction

The emergence of sophisticated and virtual media has led a change to traditional classroom that relies mostly on the white/blackboard and chalk as the teaching and learning media. The use of laptop and LCD has replaced the task of Overhead Projector (OHP) that made use transparent plastics as the spreadsheet. The growing utilization of e-book has altered the physics of thick and heavy books. Moreover, the printed Encyclopedia has already been replaced by the online dictionary or internet based Encyclopedia. All in all, there have been many more development or improvement in the classroom due to the positive use of 21st century media.

Related to the increasing utilization of teaching and learning media, being technology savvy is mostly required. According to Tate [1], media literacy is more than the capacity to access, analyze, evaluate, and communicate messages, media literacy gives students and teachers the opportunity to examine the sociopolitical context of literacies that impact their everyday lives. In fact, the recent teachers are not sufficiently equipped with media literacy as they are not born digitally native. It takes quite some efforts to have these Generation X or Y to catch up with their students who are born digital native or the Generation Z.

Lembaga Bahasa dan Pendidikan Profesional (LBPP) LIA has the passion of always keeping update with the latest approach and methodology in the English teaching and learning. As one of the efforts, the institution utilizes materials that combine traditional classroom and technology based media. It is Smart Choice Series written by Ken Wilson from Oxford University Press. These series of books adopted the Common European Framework of Reference (CEFR). The book was firstly officially used in Term IV of 2013 by all branches of LBPP LIA all over Indonesia. The materials are completed with audio, video and online practice for students. During the teaching and learning process, a laptop and the screen, speakers, and WIFI or LAN network are necessary. These materials have been used all over Indonesia for almost four years by all LBPP LIA. The evaluation time or the usage is one step ahead because the contract ending is nearing. Therefore, this research tries to investigate the utilizations of iTools' features by the teachers in terms of their knowledge and the utilization frequency.

II. Literature Review

A. Blended Learning

Blended learning in Eduviews AK-12 Leadership Series [2] is defined as the teaching practice that combines teaching methods from both face-to-face and online learning, is an established, rapidly growing instructional model that is proving highly effective in helping schools and districts address the challenges of students achievement, limited resources, and the expectations of 21st century learners. Blended learning is implemented in a variety of ways, ranging from models in which curriculum is fully online with face-to-face interaction to models in which face-to-face classroom instruction is integrated with online components that extend learning beyond the classroom or school day. The variety is shown in Fig. 1.

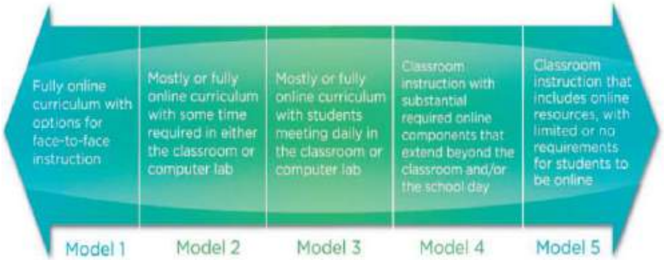

Fig. 1. The Continuum of Blended Learning Models

Some types and examples of Blended Learning are outlined in the Table I as presented by Suprihatin [3].

TABLE I. TYPES AND EXAMPLES OF BLENDED LEARNING

Live face-to-face (formal) • Instructor-led classroom • Workshops • Coaching/mentoring • On-the-job (OTJ) training	Live face-to-face (informal) • Collegial connections • Work teams • Role modeling
Virtual collaboration/synchronous • Live e-learning classes • E-mentoring	Virtual collaboration/asynchronous • Email • Online bulletin boards • List servs • Online communities
Self-paced learning • Web learning modules • Online resource links • Simulations • Scenarios • Video and audio CD/DVD • Online self-assessments • Workbooks	Performance support • Help system • Print job aids • Knowledge databases • Documentation • Performance/decision support tools

B. *Smart Choice iTools*

Smart Choice Second Edition used by LBPP LIA is a four-skill course for adult and young adult learners. The series stresses on improving the ability to communicate in English. Each level contains 60-90 hours of classroom material and in LBPP LIA, the coverage of the materials is in 18-20 sessions and each meeting is timed 120 minutes.

According to Wilson [4], Smart Choice iTools from Oxford University Press is a CD-ROM-based software program that transforms each Student Book into a media-rich classroom presentation tool. The design of iTools helps teachers navigate easily from page to page. iTools is compatible with all interactive whiteboard hardware and can also be used with a computer and data projector. In general, the iTools includes classroom video segments, embedded answer key and audio scripts, easy-to-use tool bar, Resources tab, and variety of audio, video, and PowerPoint media.

C. *iTools' Features*

- Resources is a library of photos, worksheets, and PowerPoint presentations inviting teachers to customize dozens of resources for classroom presentation and student practice. On the left side of the page, the Resources tab is located.

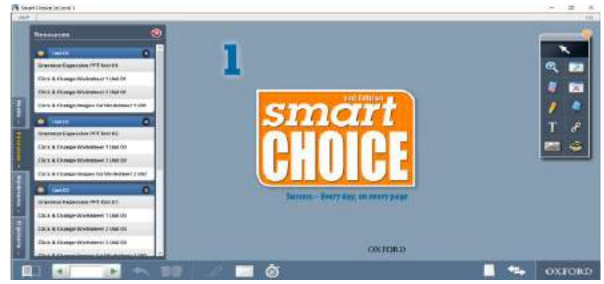

Fig. 2. On the left side of the page

- Bookmark is a feature which can be used by the teacher to keep a page from the Smart Choice iTools
- Flipcharts is pad of blank sheet and is used to write something as it functions like a whiteboard
- Back Arrow is used when one needs to go back to the previous page
- Drawings allows the user to write or to draw on the screen without exiting the Smart Choice iTools.
- Timer is stopwatch available to use for counting upwards from zero and measuring elapsed time without exiting the page as below:

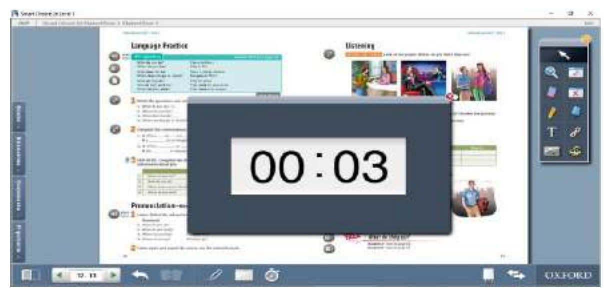

Fig. 3. Timer is stopwatch available

- Flip Control is a button to help modifying the position of some features whether it is right-or-left-oriented.
- Navigate Tool is a feature to move the page upward and downward or to the left and to the right. The Navigate Tool is the arrow sign on the upper right part.

Fig. 4. Navigate Tool

- Zoom Tool and Reset Zoom Tool are similarly used to enlarge the page or a part of the page.
- Eraser Tool is used for removing writing from the screen.
- Clear Screen is a feature to have the screen blank after being used.
- Pen Tool is the pen which can be used to write or draw either on the blank screen (flipcharts) or the page screen.
- Highlight Tool is used to give marks or color to a certain part of the screen
- Add Note is a feature that can be used to insert note or reminder on the page
- Add Web Link serves as inserted note that can be linked directly to browser supported by internet connection. The chain on the picture below shows the Web Link.

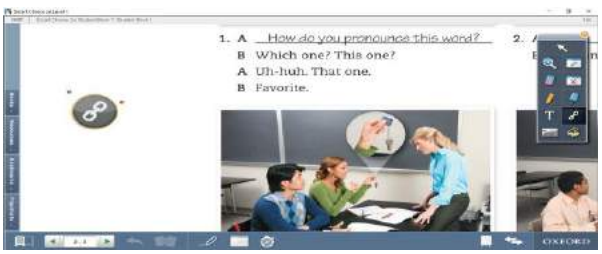

Fig. 5. The chain on the picture below shows the Web Link

- Screenshade Tool is needed when one has to cover a whole page or a part of the page only.

Fig. 6. Screenshade Tool

- Spotlight Tool is utilized or spotlighting certain part only without presenting other parts as below:

Fig. 7. Spotlight Too

- Online Practice is designed for students to use outside class, includes interactive vocabulary, grammar, conversation, and video activities, and provides automatic scoring and feedback.

The Bookmark, Flipcharts, Back Arrow, Drawings and other features can be seen from this screenshot:

Fig. 8. The Bookmark, Flipcharts, Back Arrow, Drawings and other features

D. Smart Choice Online Practice

It is a student's password-protected access to online practice activities that covers grammar, vocabulary, video-based listening comprehension, and record-and-playback speaking activities. The audio for Student Book and Workbook is also provided and downloadable from this access. To make it more complete, instant feedback is provided when the student requests feedback on his/her work at any time to assess and track his/her own progress. As for the classroom teacher, s/he can anytime monitor and track student, class and institutional progress.

III. METHOD

This is a quantitative research by taking small scaled survey as the technique of data collection. The population is all teachers of LBPP LIA Banjarmasin and Banjarbaru. There are 26 of them. The questionnaire as the research instrument was given to 14 respondents which means it takes a bit more than 50% of the total population. The sampling technique was the random one depending on the teachers' willingness and availability to participate in the study. The teachers who filled out the questionnaire were those who have been teaching in LBPP LIA for 20 years, 10 years, 5 years, and 1 year. Seven out of fourteen are teachers from the latest recruitment in 2016.

IV. RESULT

The investigation on the teachers' knowledge of Smart Choice's iTools is focusing on whether the teachers knows how to utilize the features of Smart Choice iTools. It is discovered that Resources tab, Navigate Tool, Zoom Tool, Reset Zoom Tool, Eraser Tool and Pen Tool are the features mostly utilized by the teachers. The second to the highest frequency used features are Back Arrow, Highlight Tool and Add Note. Clear screen, Drawings, Timer and Spotlight Tools are the next features which are understood by the teachers in term of usage. Some other features which are not quite utilized by half of the teachers are Bookmark, Flipcharts, Flip Control, Add Web Link, Screenshade Tool, and Online Practice. The detail findings can be seen in Table II.

TABLE II. THE TEACHERS' KNOWLEDGE OF ITOOLS' FEATURES FROM SMART CHOICE SERIES

Feature	Yes	No
Resources	14	0
Bookmark	6	8
Flipcharts	6	8
Back Arrow	13	1
Drawings	11	3
Timer	11	3
Flip Control	9	5
Navigate Tool	14	0
Zoom Tool	14	0
Reset Zoom Tool	14	0
Eraser Tool	14	0
Clear Screen	12	3
Pen Tool	14	0
Highlight Tool	13	1
Add Note	13	1
Add Web Link	8	6
Screenshade Tool	6	8
Spotlight Tool	11	3
Online Practice	9	4

The most familiar features of Smart Choice iTools to the teachers are due to the high usage frequency. They serve highly as navigation tools that are merely on click every time the screen page is changed. Those less utilized features such as Bookmark, Flipcharts, Flip Control, Add Web Link, Screenshade Tool are not in favor due to the possibility of using the features in every teaching. Bookmark isn't considered primarily necessary because every page needed can easily and directly be clicked without having to find the bookmarks first. Bookmark and Add Web Link tab can actually be utilized together when a web link is added and a bookmark is needed. Flipcharts, Flip Control, and Screenshade Tool can maximally be used when the teachers manipulate an activity that requires the students or the teachers themselves to write something or when a part is needed to specially be displayed.

The Online Practice is also rarely taken as advantages in enriching the students' material or as follow up activity outside the classroom because the students mostly admit that they don't have time and/or sufficient internet connection to access the self-online practice. There must be an alternative that instead of being assigned as homework, the online practice could be done in the classroom if the institution's internet facility supports. However, this might bring another new problem which is related to the materials' coverage of the term or semester.

In exploiting the Smart Choice iTools, the teachers vary their utilization depending on the need. Navigate Tool, Zoom Tool and Reset Zoom Tool are tabs which are always used by 7 to 8 teachers. None of the samples stated that they never used these features as it can be seen in Table III. Other features which are utilized by most teachers are Back Arrow, Zoom Tool, Reset Zoom Tool, Eraser Tool and Clear Screen. None of the teachers mentioned that they never utilized these features.

TABLE III. THE UTILIZATION OF SMART CHOICE ITOOLS

Feature	Frequency Of Utilization					
	always	***often/ frequently***	***sometimes***	***occasionally***	***seldom***	***never***
Resources	4	1	4	2	2	1
Bookmark			1	1	2	2
Flipcharts	1		4			
Back Arrow	2	9	1	1		
Drawings			3	1	4	3
Timer		2	2	2	3	2
Flip Control		2	2	1	2	2
Navigate Tool	8	4	1	1		
Zoom Tool	7	5	1			
Reset Zoom Tool	7	4	2	1		
Eraser Tool	2	2	2	4	4	
Clear Screen	2	2	2	1	5	
Pen Tool	1	1	5	1	2	4
Highlight Tool	1	1	4		1	4
Add Note			2	4	1	6
Add Web Link				2	2	4
Screenshade Tool				2	1	3
Spotlight Tool		1	4	2	2	1
Online Practice	1	1	3	2	2	3

The features which are not frequently used by the teachers are Bookmark, Flipcharts, Drawings, Add Note, Add Web Link, Screenshade Tool and Spotlight Tool. This might due to several reasons. First, the teachers do not find the necessity for using the features such as Bookmark and Flipcharts. Second, it is probably because the teachers are lack of knowledge in maximally making use of the features. As for Online Practice, it could mostly be due to the internet facility and time allocation.

V. CONCLUSION

The innovation in EFL teaching and learning which is so called blended learning might encounter various challenges in term of knowledge and the management of utilization. As for Smart Choice iTools, teachers' lack of knowledge might hamper the utilization of the iTools. The exploitation must also be supported by the facility especially internet connection. Moreover, teachers' creativity is mostly needed in blending the non-technology based procedures with the technology based one.

ACKNOWLEDGMENT

This research is dedicated to LBPP LIA which have always innovated its' English as a Foreign Language (EFL) teaching and learning. The highest gratitude goes to the samples of the study for their help in taking the survey.

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The Development of Students Worksheets for Constructing Knowledge of the Fundamental Laws of Chemistry

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***Abstract*—It is a crucial issue that the result of TIMSS in 2011 placed Indonesia in the 38th rank of the 42 countries for mathematics and in 40th rank of the 42 countries for science. These facts indicate that the students' skills in reasoning is still poor since the understanding of math and science is a reflection of the ability to reasoning. The new paradigm of learning requires students to be able to construct their own knowledge by inductive or deductive reasoning. In this case, the students need some guidance so that they are able to acquire the knowledge they need to understand. This research aims to develop learning guidance for constructing the knowledge of the fundamental laws of chemistry by inductive reasoning based on the presented data. The development of worksheets of this study was conducted using 4-D model of Thiagarajan. The results showed that the developed worksheet in this study is categorized as excellent which had 0.84 of Aiken's average validity coefficient. Therefore, the worksheets were easy to understand, easy to implement, and were able to guide the students in constructing the knowledge of chemistry. The result of try-out displayed that the effectiveness of the worksheets developed was excellent of 84.37%.**

***Keywords*—student worksheets; inductive reasoning; chemistry**

I. Introduction

The results of the previous studies showed that the majority of chemistry concepts in Central Kalimantan are understood by the students through the teacher's explanation. In fact, there are only few students acquire the knowledge by their own thinking or reasoning process. This situation has an impact on the poor ability of students in reasoning. The study of Trends in International Mathematics and Science Study (TIMSS) in 2011 placed Indonesia in the 38th rank of the 42 countries for mathematics skill and in 40th rank of the 42 countries for science skill. These facts indicate that the students' skills in reasoning is still poor since the understanding of math and science is a reflection of the ability to reasoning. This condition can also be interpreted that the learning which has been done has not been able to optimally develop students' reasoning skill.

Learning in the perspective of constructivist theory is a process in which the students are mentally active to construct new knowledge based on the cognitive structure already mastered. Reference [3] stated that constructivist learning approach is the process of developing new knowledge in the students' cognitive structure based on their own experiences. Constructivist learning approach puts an emphasis on students' active role in gaining understanding and interpretation of the information and events they experienced. This approach includes creating the awareness of students related to the current concepts, creating a broad mental space including multiple conceptual parts, and providing the adaptation of the new information to the previous knowledge through constant contextual communication and harmonization. This model is a promoting model for the students to take into account the importance of the concepts as mental elements, to develop not only positive attitudes towards science and learning, but also towards scientific process skills in order to increase the their achievements [5]. Based on the perspective of constructivist, the task of a teacher is to create a learning environment that is often referred to *"scenario of problem"* that reflects their authentic or real learning experience that can be applied in a real situation.

One method that is very relevant to the constructivist view of learning is a method of discovery learning developed by Jerome Bruner. In the process of learning, the ability of students to construct new knowledge can be optimally developed through discovery learning. According to Bruner [15], in the learning process students should actively use the concepts or principles they have mastered and conduct investigations or experiments to discover the concepts and principles of a new one. Methods of the invention provide a positive impact on learning outcomes for the students to participate actively to gain experience and learn to find the concept of interacting with the environment [4].

The process of constructing new knowledge in learning follows the framework of the invention (inductive and deductive reasoning) that meets the characteristics of the substances being studied. However, inductive reasoning is generally preferred in scientific work. Inductive reasoning, according to [11], is the process of thinking in our sense of knowledge dealing with the events or things that are concrete and specific to infer more general knowledge. Reference [7] mentioned that the development of conceptual knowledge can be acquired through the relations among information. The process of relating occurs among the information stored in the memory or between the existing knowledge and new information.

Taba [10] introduced a learning strategy that is based on inductive thinking. The inductive learning strategies is also developed on the basis of the concept of students' mental processes by giving attention to how the students handle information and get it done. Inductive learning strategy is a strategy designed to help students develop higher level thinking skills and creative through observation, comparing, finding patterns, and generalizing [8]. Reference [9] stated that the inductive learning model relies on information processing through the process of thinking inductively.

The model of inductive thinking is developed on the basis of some postulates as follows: (1) the ability to think can be taught; (2) thinking is an active transaction between the individual and the data; (3) the thinking process is a sequence of steps that is regular (lawful). In the process of learning and teaching activities, materials are a means for students to develop certain cognitive operations. In these activities, students learn to organize facts into a system of concepts such as: (a) relating the data obtained mutually to each other and make conclusions based on those relations; (b) drawing conclusions based on the facts that have been learned in order to state a hypothesis; and (c) predicting and explaining a particular phenomenon.

Inductive learning strategy is oriented to learning information processing. The steps of inductive strategy includes: (1) the establishment of the concept (recording, classifying, and naming) of the works to be appreciated; (2) analysis of concepts (interpreting, comparing, and generalizing); (3) application of the principles (analyzing a new problem, making hypotheses, answering the hypothesis, and checking the hypothesis) can be terminated through the creation of new works. Some studies showed that an inductive strategy, model, or approach provides better learning outcomes at various levels of education. The research result [12] showed that the average scores obtained by science students who learned using integrative-based inductive learning model were higher than the average scores obtained by science students who learned using conventional learning. Reference [13], based on the research results, suggest that there are significant differences due to the effects of the application of inductive learning models using animation macro media flash on seventh grade students' learning outcomes of the seventh grade at SMP Negeri 1 Pagaran on the materials of the heat. Inductive approach referring to constructivism in learning is able to optimally develop the power of reason, the ability of students to think logically, critically, and creatively [14].

Chemistry is a science that is developed from empirical facts through scientific processes. Scientific processes in the development of chemistry largely involve inductive thinking process; therefore, inductive strategy is the right choice in studying chemistry. In this perspective, chemistry should be used as a vehicle to train the students' ability to think.

In inductive learning activities, the students are required and trained to make reason or think to be able to find the knowledge they have mastered. Of course, this is not easy for students who have been accustomed to receive knowledge from the teacher's explanation. In this case, the students need help in the form of guidance, counseling, or referrals to think that they are able to assemble the facts, concepts or principles into new knowledge that must be mastered. Therefore, the real success is highly dependent on the model of inductive strategies given to the students. The model includes guidance, counseling, or direction of thinking that can be packaged in the form of students' worksheets. The worksheets contain tasks that must be done by the students.

This research has developed a learning guidance (in the form of worksheets) with inductive line of reasoning that "enables" the students to create reasoning in order to find their own knowledge of chemistry to be mastered. In this study, the substance of fundamental laws of Chemistry" was chosen as a vehicle to develop inductive reasoning and thinking skills: (a) knowledge of the fundamental laws of chemistry in the form of concepts and principles developed from empirical facts; (b) the basic knowledge which is a prerequisite for all quantitative chemical knowledge.

This research is a research and development study having a common goal to develop worksheets based on inductive reasoning (inductive worksheets) based on the data presented in the fundamental laws of chemistry in high school which includes: (1) Law of Conservation of Mass; (2) Law of Definite Proportions; (3) Law of Multiple Proportions; (4) Law of Volume Proportions; and (5) Avogadro's Law.

Specific goals to be achieved are: (1) to test the feasibility of the product (inductive worksheets) on aspects of readability, the potential of enforceability and expediency; (2) to determine the ability of students in constructing knowledge about the fundamental laws of chemistry.

The practical utility of these results is that the worksheets developed inductively are expected to be used as a learning guidance that enables students to construct their own knowledge of chemistry to be mastered. The results of this study are also expected to provide theoretical benefits to enrich the theoretical and empirical studies on learning strategies oriented to the development of student abilities in constructing knowledge independently.

II. METHOD

This is a research and development. The subject of this research is the development of products in the form of inductive worksheets. The worksheets were designed by implementing inductive reasoning to gain new knowledge. The assessment of feasibility on the worksheets developed involved experts and teachers as potential users.

This research was conducted in two stages. The first stage of the research was to develop a model of the invention learning in the form of student worksheet for being used in the teaching of chemistry in high schools. The procedure of the development adapted the 4-D development model of Thiagarajan. The development of the model consisted of four stages namely defining or restricting, designing, developing, and disseminating [15].

The stage of defining began with an analysis of the curriculum, analysis of learners and learning problems, and analysis of learning materials. At the design stage, the draft of the worksheets was created. It was called draft-1. The worksheet drafting refers to the common used format, while the substance of the coverage refers to the results of the analysis of curriculum and learning materials. At the stage of developing, assessment on worksheets feasibility was carried out using expert judgment through expert validation and try-out. The initial step of assessing was the validation and revision of the earlier draft (draft-1) by the experts. The assessment of experts was carried out to test the feasibility of draft-1 in terms of (1) the legibility, (2) the applicability, and (3) the utility. The results of the assessment and corrections of experts were then used to revise the draft-1. The revised draft-1 was herein after referred to draft-2 and it was ready for pilot-tested on the try-out. The try-out was conducted on the teaching and learning process of chemistry at SMAN 4 Palangkaraya.

The data of the worksheets feasibility including readability, applicability, and utility were collected using questionnaires distributed to the experts and potential users (teachers) of chemistry in high schools. The ability of students to acquire the knowledge of chemistry through inductive reasoning was revealed from the try-out document of students' worksheets. The scores of the experts on the assessment of worksheet feasibility using five-scale parameter were tabulated and calculated to get the average scores. Determining the content validity coefficient was using Aiken's formula as in [1]. Aiken's statistics can be written as follows:

$$V = \Sigma s / \{n (c - 1) \quad (1)$$

note: V = coefficient content validity
s = r - Io
Io = lowest judging scores
C = the highest assessment score
r = scores given by assessors
n = number of experts

To determine the ability of the students in constructing the knowledge, the documents of the students worksheets were scored using the scoring guidelines already prepared. The scores were transformed into a value range of 0 to 100 and were then calculated on the average and subsequently were converted to a qualitative five-scale catagory i.e. from "very poor" to "very good".

III. RESULTS AND DISCUSSION

A. Developing the Worksheets

The worksheets developed in this study were intended to guide the students' activities in finding the knowledge of the fundamental laws of chemistry that they have to understand through inductive reasoning. The worksheets are designed so that the students are able to reason inductively to find knowledge about the fundamental laws of chemistry. The fundamental laws of chemistry learned on the tenth grade of high school including (1) the laws of mass eternity; (2) the laws of definite proportions; (3) the laws of multiple proportions; (4) the laws of volume comparison; and (5) Avogadro's law.

Learning activities through inductive reasoning require data or information (which is specific) that must be processed to draw general conclusions. In the developed worksheets, the data or information required has been presented on the worksheets. The students needed to process the data through inductive reasoning to acquire knowledge about the fundamental laws of chemistry. It is based on the consideration that most of the empirical data needed by the students can not be obtained through observation due to the lack of facilities in the schools.

B. Assessing the Worksheets

The worksheets developed in this study were assessed using expert judgment to obtain the information of legibility, applicability, and utility. Those aspects were assessed based on the expert judgment. The data of legibility, applicability, and utility were presented as follows. The assessment was carried out by eight experts including teachers as potential users.

1) The Worksheets legibility

The data of worksheet legibility were collected using questionnaires with five aspects of assessment: (1) the level of legibility based on the size of the letters (fonts) used, (2) the level of the legibility of words used, (3) the legibility of the content/message, (4) The level of legibility of pictures or illustrations; and (5) the hierarchy and systematic writing. The average scores of expert assessment on the worksheets legibility is presented in Table I.

TABLE I. THE AVERAGE SCORE OF COEFFICIENT VALIDITY AND READABILITY ON THE WORKSHEETS

Statements Regarding the Assessed Aspect	Average Score	Aiken's Validity Coefficients
The font can be read well.	4.80	0.91
The words or terms used can be easily understood.	4:20	0.85
The content/message of every sentence is understandable.	4.80	0.80
The pictures or illustrations can be easily understood.	4:00	0.85
The step of learning activities is arranged and understandable.	4:20	0.79
The average score of the worksheets legibility.	4:40	0.8 4

It appears from Table I that the Aiken's validity coefficient for worksheet legibility was 0.84 in "very good" category. Thus, it can be stated that the worksheets are readible, understandable, and sistematic-arranged.

2) The Worksheet Applicability

The level of applicability of learning activities contained in the worksheets was assessed in four aspects are (1) the ease of carrying out instructions; (2) the adequacy of the data presented to the inference; (3) the applicability of strategy to their invention; (4) the ability of the students to construct knowledge; and (5) the adequacy of the time allocation. The data of the expert assessment are presented in Table II.

TABLE II. VALIDITY COEFFICIENT AND AVERAGE SCORE OF WORKSHEET APPLICABILITY

The Assessed Aspects	Average Score	Aiken's Validity Coefficients
Instructions on the worksheet were easily implemented by students.	4.8 0	0.90
The information presented on the worksheets is sufficient to perform the inference.	4.2 0	0.88
The worksheets make teachers feel ease to implement the strategies of discovery learning.	4.2 0	0.87
The activities on the worksheet motivate the students to obtain knowledge about the fundamental laws of chemistry.	3.8 0	0.82
The time allocation provided is sufficient to perform the learning activities.	4, 00	0.80
Average Score	4.2 0	0.86

The worksheets developed from the aspects of applicability have the Aiken's validity coefficient of 0.86 which is "very good" category. This means that these worksheets can be used successfully in teaching chemistry in schools.

3) Worksheet Utility

The utility of the worksheet was assessed by five aspects namely (1) the benefits of worksheets for teachers in implementing the concept of discovery learning; (2) the effectiveness of the worksheet in guiding students to discover concepts/principles of chemistry; (3) the opportunity for the students to find the concept/principles of chemistry; (4) the potential of internalizing the concepts/principles of chemistry that the students obtained through inductive reasoning using the worksheets; and (5) the potential in developing thinking skills. The average score of respondents' assessment on the aspects is presented in Table III.

TABLE III. VALIDITY COEFFICIENT AND AVERAGE SCORE OF WORKSHEET UTILITY

The Assessed Aspects	Average Score	Aiken's validity coefficients
The instructions on the worksheets are easily implemented by students.	4.8 0	0.90
The data information presented on the worksheet is sufficient to perform the inferences.	4.2 0	0.88
The teachers can implement discovery learning using the worksheets.	4.2 0	0.87
The students can do the learning activities the knowledge of the fundamental laws of chemistry.	3.8 0	0.82
The time allocation is sufficient to perform the learning activities using the worksheets.	4, 00	0.80
Average Score	4.2 0	0.86

Table III shows that the worksheets developed have Aiken's validity coefficient of 0.83 which is on "very good" category. Thus, it can be said that the worksheets can guide students to construct the knowledge of the fundamental laws of chemistry. Aiken's validity coefficient of readability, applicability, and utility show that students' worksheets are very feasible to implement in the learning process.

C. *Ability of Students to Construct the Knowledge*

The worksheets developed have been tested by the try-out conducted at SMAN 4 Palangkaraya. The try-out was intended to determine the effectiveness of the worksheets in terms of the ability of students to construct the knowledge of the fundamental laws of chemistry. In this case, the effectiveness was assessed from the average percentage of knowledge that can be constructed by students. The greater the percentage of the knowledge constructed by the students, the greater the effectiveness of the worksheets are. The ability of the students to construct the knowledge of chemistry was based on the success of students in acquiring the right conclusions in each topic of learning. The data is presented in Table IV.

TABLE IV. ABILITY OF STUDENTS TO CONSTRUCT THE KNOWLEDGE OF THE FUNDAMENTAL LAWS OF CHEMISTRY USING THE WORKSHEETS

The Knowledge of Chemistry	Average Students Ability (%)	Category
1. Law of Conservation of Mass	90.62	Very good
2. Law of Definite Proportions	90.62	Very good
3. Law of Multiple Proportions	71.85	Good
4. Law of Volume Proportions	87.50	Very good
5. Avogadro's law	81.25	Very good
Average	84.37	Very good

The results of try-out show that the success of the students in constructing the knowledge of the fundamental laws of chemistry using the worksheets is in excellent level with the score of 84.37%. This means that by using the worksheets the students are able to construct 83.47% of their own knowledge about the fundamental laws of chemistry. This result is in line with [2] which was stated that the constructive approach was more successful than traditional teaching method. The successful of interactive direct teaching based on constructivist learning attributed to the students' positive attitude associated with the conceptualization and the creation of three-dimensional mental space of the knowledge [6].

IV. CONCLUSION

The experts judgment scored that the worksheets developed in this research are suitable to be used because (a) it is easy to read, easy to understand, and systematically compiled; (b) it is easily implemented in learning; (c) it can guide the students to construct the knowledge of the fundamental laws of chemistry that must be mastered. The results of the try-out showed that the effectiveness of the worksheets in guiding students to construct the knowledge of the fundamental laws of chemistry is excellent of 84.37%. Since the worksheets are able to guide the students to construct knowledge of chemistry that they have to master**,** the teachers are suggested to develop effective worksheets to guide students to construct their own knowledge of chemistry and to develop students' ability to reasoning. The worksheets can be used in learning activities as the guide for the students to construct knowledge, particularly the knowledge of a concept or principle which is developed on facts.

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Developing Student Worksheet for Learning Matrix

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***Abstract*—One of the teaching materials that can improve students' competence in analyzing and solving any problems independently is student worksheet. The use of student worksheet can also help students to comprehend the mathematical concept. This study aimed to develop student worksheet about the properties of determinant of a matrix. This study was a development research with formative evaluation type. The data in the research were the result of expert review, one-to-one evaluation, small group evaluation, and field test. The research subjects were students who programmed Matrix in Mathematics Education Study Program, Universitas Lambung Mangkurat. From the analysis, it can be concluded that the research has resulted in the student worksheet for learning Matrix. At the expert review stage, two experts evaluated the content and instructional design. The worksheet was tried out toward students with different mathematical abilities at one-to-one and small group evaluation. At the field test stage, 32 students used the worksheet in groups to learn the properties of determinant of a matrix.**

***Keywords*—Development, Matrix, Worksheet**

I. INTRODUCTION

Science and technology develop faster so that human resources that are able to compete globally are necessary. In the era of globalization, Indonesian students should have competence to compete with other students from various countries. The improvement of Indonesian competence and competitiveness can be done by using student-centered instruction in mathematics that helps students develop critical thinking through exploring structured problems.

Students are expected to understand the materials of the mathematics learning comprehensively and holistically that can increase students' independence and creativity in mathematics [5]. One of the teaching materials that can be used in student-centered instruction and improve students' competence in analyzing and solving any problems independently is student worksheet [2].

The use of student worksheet can help students to comprehend the mathematical concept [5]. In addition, student worksheet also can help students to be active in learning process, develop student confidence, increase learning motivation and eagerness, and teach student to use time in effective way. These benefits show that the student worksheet gives considerable influence in teaching learning process.

The development of student worksheet should meet some requirements i.e. validity, practicality, and effectiveness [4]. Validity refers to the extent that the design of the worksheet should include "state of the art knowledge" (content validity). Practicality refers to the extent that users (students) and other experts consider the worksheet as appealing and usable in normal conditions. Effectiveness refers to the extent that the experiences and outcomes from the worksheet are consistent with the learning objectives.

This study aimed to develop student worksheet about the determinant properties of a matrix. Student worksheet is used to teach Matrix course with a series of questions as an introduction to reinvent the properties of determinant of a square matrix. Students were also asked to give a proof for their answer.

II. METHOD

The study was conducted in even semester of the academic year 2016/2017 in Mathematics Education Study Program, Universitas Lambung Mangkurat. Development research with formative evaluation type was used in the study as a method [1] which includes expert review, one-to-one evaluation, small group evaluation, and field test. The sequence of formative evaluation is as follows (Fig. 1).

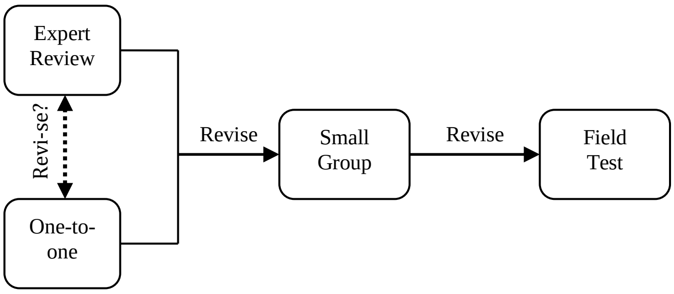


Fig. 1. General sequence of formative evaluation types

Data collection techniques used in this study are interview to find out the qualitative validity of the content and construct, determine students' suggestions and comments; documentations to determine the practicality of worksheet; and test. The research subjects were students who programmed Matrix in Mathematics Education Study Program, Universitas Lambung Mangkurat.

III. RESULTS AND DISCUSSION

Student worksheet which has been developed refers to the following learning outcomes: (1) differentiating the characteristic of matrix that has determinant, (2) determining the determinant of matrix order 2*x*2, (3) determining the determinant of matrix order 3*x*3, (4) using properties of determinant to solve the problem, and (5) creating matrix which has determinant equal to 0. The properties of determinant of matrix that have to be reinvented by students are ($|A|$ and $|B|$ are determinant of matrix A and matrix B respectively) as follows: (1) if every element of a row (column) of a square matrix A is zero then $|A| = 0$, (2) $|A| = |A'|$, (3) if every element of a row (column) of a determinant $|A|$ is multiplied by scalar k, the determinant is multiplied by k, (4) if B is obtained from A by interchanging any two adjacent rows (columns) then $|B| = -|A|$, (5) if B is obtained from A by interchanging any two of its rows (columns) then $|B| = -|A|$, (6) if B is obtained from A by carrying its ith row (column) over p rows (columns) then $|B| = (-1)^p |A|$, (7) if two rows (columns) of A are identical then $|A| = 0$, (8) if every element of the ith row (column) of A is the sum of p terms the $|A|$ can be expressed as the sum of p determinants, (9) if B is obtained from A by adding to the elements of its ith row (column), a scalar multiple of the corresponding elements of another row (column), then $|B| = |A|$ [Ayres].

A. *Expert Review*

At this stage, two experts reviewed the draft of the worksheet which focused on the content and construct validity. The investigation of the content and construct validity was focused on the following issues:

- Does the content include the topic taught in Matrix?
- Does the content reflect the student-center instruction?
- Is the content sequenced properly?
- Are the learning outcomes stated clearly?
- Is the content well chosen to meet the learning outcomes?
- Is the duration (50 minutes) mentioned in the worksheet enough?

The improvements were made on the worksheet based on the results of the interviews and discussions with the experts. The experts suggested fixing the font style, improving the mathematical term which was mistyped, and reconsidering the duration for students to work using the worksheet (Fig. 2).

B. *One-to-one Evaluation*

At one-to-one evaluation, the worksheet which developed was tested to three students with different mathematical abilities, i.e. high, medium, and low. The procedure was same for each student although it was performed at different times. The researchers met each student and involved them in an informal conversation. One-to-one evaluation focused on clarity and ease of use of the questions that were developed, as well as the interest of students to such questions. Generally, the students gave positive comments for the worksheet and they could understand the questions except for question 3 because there is a mistyping. One of the students' suggestions is shown in Fig. 2. After the expert review and one-to-one evaluation, the worksheet was revised to be used in small group.

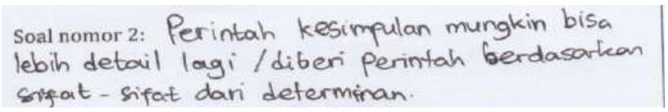
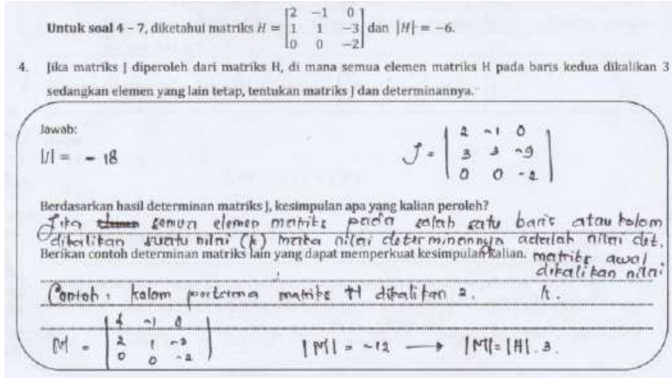

Soal nomor 2: Perintah kesimpulan mungkin bisa lebih detail lagi / diberi perintah berdasarkan sifat - sifat dari determinan.

Fig. 2. One of the student's comment

C. *Small Group Evaluation*

At this stage, the researchers acted as observers in the learning in which the worksheet was used by three students working in group. The students were required to solve nine problems and provide suggestions/comments on worksheet that has been done. One of the problem solved is shown in Fig. 3.


Untuk soal 4 – 7, diketahui matriks $H = \begin{bmatrix} 2 & -1 & 0 \\ 1 & 1 & -3 \\ 0 & 0 & -2 \end{bmatrix}$ dan $|H| = -6$.

4. Jika matriks J diperoleh dari matriks H, di mana semua elemen matriks H pada baris kedua dikalikan 3 sedangkan elemen yang lain tetap, tentukan matriks J dan determinannya.

Jawab:

$|J| = -18$ $\quad J = \begin{vmatrix} 2 & -1 & 0 \\ 3 & 3 & -9 \\ 0 & 0 & -2 \end{vmatrix}$

Berdasarkan hasil determinan matriks J, kesimpulan apa yang kalian peroleh?

Jika ~~elemen~~ semua elemen matriks pada salah satu baris atau kolom dikalikan suatu nilai (k) maka nilai determinannya adalah nilai det. matriks awal dikalikan nilai k.

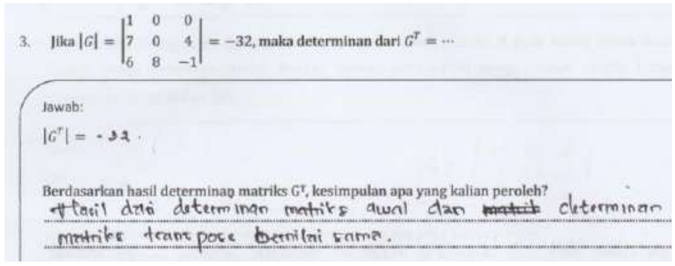
Berikan contoh determinan matriks lain yang dapat memperkuat kesimpulan kalian.

Contoh : kolom pertama matriks H dikalikan 2.

$M = \begin{vmatrix} 4 & -1 & 0 \\ 2 & 1 & -3 \\ 0 & 0 & -2 \end{vmatrix}$ $\quad |M| = -12 \longrightarrow |M| = |H| \cdot 2$.

Fig. 3. Group works for the fourth question

From 9 questions, the group of students just could solve seven questions in 50 minutes. Based on the result, the researchers tried to make questions simpler by deleting the question 'Proof your answer by using other matrices' (Fig. 4.).


3. Jika $|G| = \begin{vmatrix} 1 & 0 & 0 \\ 7 & 0 & 4 \\ 6 & 8 & -1 \end{vmatrix} = -32$, maka determinan dari $G^T = \cdots$

Jawab:

$|G^T| = -32$.

Berdasarkan hasil determinan matriks G^T, kesimpulan apa yang kalian peroleh?

Hasil dari determinan matriks awal dan ~~matriks~~ determinan matriks transpose bernilai sama.

Fig. 4. Group works for the fourth question

The practicality of the worksheet was that the students can appeal and use it in normal conditions. This was investigated by carrying out the observation while a group of students was solving the 9 problems in the worksheet in 50 minutes. Eventhough the group could not solve all the problems in 50 minutes, it can be said that in general the worksheet can be used in normal condition with some small revisions.

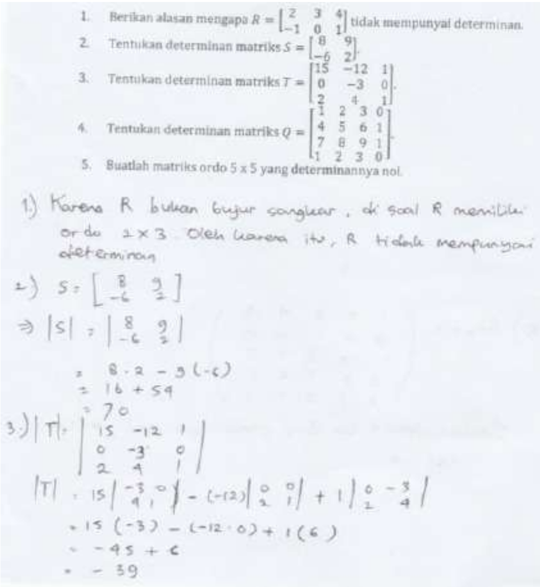
D. *Field Test*

Field tests conducted in Matrix class that consisted of 32 students and the students were divided into 8 groups. The groups were given 50 minutes to work on nine questions in 100 minutes learning. After the students finished the worksheet, three groups presented their work and the teacher gave additional comment to conclude the properties of determinant of matrix together with students. At the end of the learning session, the students did the test individually about the determinant of matrix.

The aspects of effectiveness that were investigated in this stage involved: (1) Did the students like learning using worksheet? (2) Was their time spent well? (3) Did the worksheet affect students' understanding, activity, creativity, and, motivation?

The issues were evaluated by interviewing 7 students. They were asked to mention their opinion about the worksheet, the problems they had solved, and the way the teaching and learning process had been conducted. All students said that they like the use of worksheet in the learning and like learning in group.

The students' understanding on the properties of determinant matrix was evaluated by giving a test consisting of five questions. The result of the test was satisfying enough in which the average of students' achievement was 78.75 in scale 1-100. The following example shows the answer of the student on the test for questions number 1 to 3 (Fig. 5).


1. Berikan alasan mengapa $R = \begin{bmatrix} 2 & 3 & 4 \\ -1 & 0 & 1 \end{bmatrix}$ tidak mempunyai determinan.
2. Tentukan determinan matriks $S = \begin{bmatrix} 8 & 9 \\ -6 & 2 \end{bmatrix}$.
3. Tentukan determinan matriks $T = \begin{bmatrix} 15 & -12 & 1 \\ 0 & -3 & 0 \\ 2 & 4 & 1 \end{bmatrix}$.
4. Tentukan determinan matriks $Q = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 4 & 5 & 6 & 1 \\ 7 & 8 & 9 & 1 \\ 1 & 2 & 3 & 0 \end{bmatrix}$.
5. Buatlah matriks ordo 5 x 5 yang determinannya nol.

1.) Karena R bukan bujur sangkar, di soal R memiliki ordo 2 x 3. Oleh karena itu, R tidak mempunyai determinan

2.) $S = \begin{bmatrix} 8 & 9 \\ -6 & 2 \end{bmatrix}$

$\Rightarrow |S| = \begin{vmatrix} 8 & 9 \\ -6 & 2 \end{vmatrix}$

$= 8 \cdot 2 - 9(-6)$

$= 16 + 54$

$= 70$

3.) $|T| = \begin{vmatrix} 15 & -12 & 1 \\ 0 & -3 & 0 \\ 2 & 4 & 1 \end{vmatrix}$

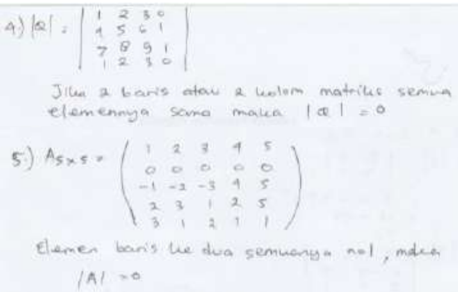
$|T| = 15 \begin{vmatrix} -3 & 0 \\ 4 & 1 \end{vmatrix} - (-12) \begin{vmatrix} 0 & 0 \\ 2 & 1 \end{vmatrix} + 1 \begin{vmatrix} 0 & -3 \\ 2 & 4 \end{vmatrix}$

$= 15(-3) - (-12 \cdot 0) + 1(6)$

$= -45 + 6$

$= -39$

Fig. 5. Students' answer on the individual test for question 1 to 3


4.) $|Q| = \begin{vmatrix} 1 & 2 & 3 & 0 \\ 4 & 5 & 6 & 1 \\ 7 & 8 & 9 & 1 \\ 1 & 2 & 3 & 0 \end{vmatrix}$

Jika 2 baris atau 2 kolom matriks semua elemennya sama maka $|Q| = 0$

5.) $A_{5 \times 5} = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 0 & 0 & 0 & 0 & 0 \\ -1 & -2 & -3 & 4 & 5 \\ 2 & 3 & 1 & 2 & 5 \\ 3 & 1 & 2 & 1 & 1 \end{pmatrix}$

Elemen baris ke dua semuanya nol, maka $|A| = 0$

Fig. 6. Students' answer on the individual test for question 4 and 5

The evaluation of the effectiveness of the student worksheet was conducted in a rather informal way.

IV. CONCLUSIONS

From the study, it can be concluded that the research has resulted in student worksheet for learning Matrix. At the expert review stage, two experts evaluated the content and construct validity. The worksheet was tried out toward students with different mathematical abilities at one-to-one and small group evaluation. At the field test stage, 32 students used the worksheet in groups to learn the properties of determinant of a matrix.

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Learning Fractions through Swimming Context for Elementary School Students

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***Abstract*—This research aimed to produce learning trajectory by using the swimming context in helping students to understand the concept of fractions and addition of fractions. The approach used was Realistic Mathematics Education, Indonesian version (PMRI). The study involved 6 fourth grade students with heterogeneous capabilities in Elementary School IBA, South Sumatra, Indonesia. The method used was a design research with three phases of the preliminary design, the design experiment, and retrospective analysis. However, this study only shows the results at the phase of the design experiment, in particular on a pilot experiment. Data collection techniques used were video recordings, photograph, the student's work, the results of pretest and posttest, and student interview during learning. The results showed that the swimming context could stimulate students' informal knowledge of the meaning of fractions in which it can eventually be used in addition of fractions material.**

Keywords*—Addition of Fractions, Design Research, PMRI, the swimming context

I. INTRODUCTION

Learning fractions in Indonesia tend to focus on procedures only. The problem is a variety of fractions meaning as one of the difficulty causes in the learning fractions [1]. The students should be given the widest possible opportunity to explore the meaning of fractions before students study the relationship between fractions and operations on fractions [2]. Another problem is the students' difficulties in adding fractions, especially with different denominators. The difficulty in conventional teaching causes hazy understanding of fractions itself. Thus, when teacher explains how to solve addition of fractions by equating the denominator, students follow mechanistically (without understanding).

Learning should be more meaningful so that students are more active and understanding of the subjects taught. Student-centered learning system can be achieved if teachers can use a variety of flexible teaching strategies [3][4][5]. Therefore, it is necessary that a promising approach to be applied, that is Realistic Mathematic Education, in Indonesia (PMRI). PMRI is selected because it is in line with the 2013 Curriculum in which the objectives of the 2013 Curriculum is to provide knowledge to the students completely and not fragmented [6]. The 2013 Curriculum emphasizes the involvement of students to find the lesson concepts through teachers' role as a facilitator. However, even though the learning activities have been followed, the level of variety in the creativity of teachers remains low [5]. Therefore, teachers should be more creative in designing the learning in the classroom. PMRI provides opportunities for teachers and students to communicate well to create social interaction in the classroom. One of the advantages of PMRI is able to add the communication between teachers-students and students-students. Social interactions in the classroom occur when students work together in solving mathematical problems given and are able to explain the problems based on the socio-mathematics norms [6]. Social-mathematics norms, for instance, are shown by the students' agreement about the correct answer, and they contain not only a correct mathematical calculation, but also a correct understanding and interpretation of the teacher's questions [7], [8].

In PMRI, the teaching is built on informal knowledge of students, and it is important to give students the opportunity to explore some of the situations of daily lives where the fractions play a role [9]. PMRI is an approach that starts from the real things for students and emphasizes the skills of discussing process with classmates so that at last their discovery can be used to solve problems either individually or in groups [10]. The situation of students' lives is not only about the real extent of the students' views, but also all imagination of students, affordable by their imagination [9][11].

PMRI requires a context which is close to the students to help students in understanding the lesson [10]. There are four contexts in learning math, namely student personal aspect, academics, public society and scientific aspect [12][13][6].

The swimming context is chosen because it can represent fractions using measurements. The shape of the pool is one model that allows to represent parts of the whole. The measurement concerns the identification of a length which uses the length as a part in determining the length of an object [14].

Several previous studies have shown good results in learning fractions by using the PMRI approach, namely the research by [15] which showed that a series of activities have been done to help students in learning fractions. A study conducted by [16] showed that the results of the use of learning media of the fraction bar can support students' understanding in comprehending fractions from informal phase to formal phase. The teaching materials about addition of fraction using PMRI developed by [1] also revealed the good results in which the materials can extremely guide students to develop ideas and foster the creativity in solving problems.

To implement the study, the authors used design research method. It consists of three stages: preliminary design, experiment (a pilot experiment and teaching experiment), and retrospective analyze. But this current research was limited to the pilot phase of the experiment.

From the above discussion, the researchers conduct a research conduct with the aim of developing a theory of learning to assist students to understand the concept of the adding fractions using the swimming context.

II. METHOD

This research used design research as the method which was designing learning fractions material for the fourth grade students. Research design is a method of the research which aims to develop the Local Instructional Theory (LIT) to improve the quality [17]. In this research, the developed design was Hypothetical Learning Trajectory (HLT) which contained a series of students' learning activities. The research design consists of three phases, which are:

(1) Preliminary design. HLT have been designed which contained the anticipation of things that might happen. Before designing, the researchers determined the learning objectives or the objectives which would be achieved and the starting point of learning. HLT consists of three parts: learning objectives, learning activities, and hypotheses of learning process that will occur [18]. In the perspective of design research, the objective of the preliminary design was to formulate the local instructional theory (LIT) which can be elaborated and perfected while performing experiments [19],[20].

(2) The design of experiment (Pilot and teaching experiment). This pilot experiment is referred as a bridge between the preliminary phase and the teaching experiment phase. The purpose of this pilot experiment was to test the initial HLT. The main target of this phase was to collect the data to support the suitability with the initial HLT. This research was limited until this phase.

The purpose of experiment is to test and improve LIT which is developed at an early stage and to develop an understanding of how it works [19]. The experiment also aims to gather data to answer the research questions [20].

(3) Retrospective analysis. All of the data obtained in the experimental phase were analyzed. The data obtained from the learning activities in the classroom were analyzed and the analysis results were used to plan the activities or to develop the design on the next learning activities. The aim was to develop local instrument theory.

Pictures of the research design phase are shown in Fig. 1.

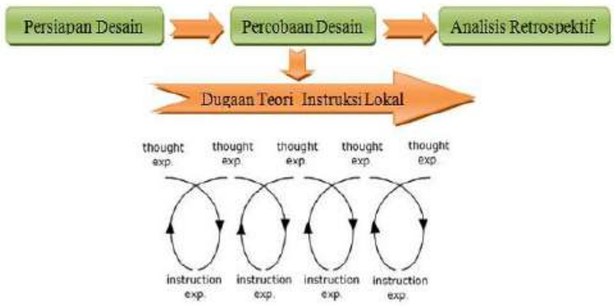


Fig. 1. Research desaign phase

This research involved 6 of 4th grade students from Elementary School IBA Palembang whose ages ranging from 10-11 years. The techniques of data collection to answer the research problems, which were observation, interview and documentation.

The objective of the observation was to get an idea dealing with social norms of mathematics which prevails in the class, the teaching methods used, class organization, the rules in the classroom, the students' work and the time allocation during the learning process.

Interview was conducted on mathematics education experts, teachers and students. Interview to the experts aimed to determine the suitability between content and relevance, the application context, interoperability, and the ease of material, language which is easy to understand and the adequacy of time. The objective was to get in-depth information about the difficulties of teacher in teaching the material, the level of students' understanding, teacher's experience toward PMRI approach, and students' experience toward PMRI approach. The role of the researchers in this learning activities was to ask the students some addition questions, observe the learning activities, coordinate activities, and to make changes to activities which are required to provide relevant information on the research [21].

Documentation was done together with observations to see how the learning process occurs, the students' strategies and the students' thinking process from the informal stage to the formal stage in mathematics. Documentation data were collected through video recordings and photos.

The technique of data analysis was conducted qualitatively. The data which have been collected at the preliminary, pilot experiment, and teaching experiment phases were analyzed on the retrospective analysis phase. The results of the analysis of observation sheets, interview results and pre-test results of pilot experiment phase were used as guidelines for designing the initial HLT. Besides analyzing the results of the students' written test, data analysis on the research design method was performed by comparing the observation results during the learning process with the designed HLT.

III. RESULTS AND DISCUSSION

In the preliminary design phase, the researchers examined the literature of the instruments to be used in the research series. Obtained from the discussion were the design of hypothetical learning trajectory, student activity sheet, test questions, lesson plans, teacher's guides, and scoring guides. Once the researchers had designed the initial learning, the learning equipment that would be used were obtained. The learning activities are described as follows.

A. Student activity 1. The meaning of fractions

The problems given in activity 1 were associated with elements of fractions. At the beginning of the lesson, teacher gave apperception by asking "Did you ever swim?", "Tell us your story!", "How do you think swimmer can win the race?" Such activities made the students answer in enthusiasm.

Fig. 2. Students' activity 1

The teacher then instructed the students to sit in groups and gave the activity sheet 1. The students started working in groups. The students discussed and performed the activity, and the teacher as a facilitator observed student activities. After they were done with the discussion and the activity sheet 1, the students presented their respective answers. Problems presented in the activity 1 form the part that has been pursued athletes when swimming. The first question asked the length of swimming pool. The second question asked the distance of the athletes. After that, the students determined which parts reached athlete. From the answers, students' understanding of the fraction meaning began to be built. Students can know that the part that has been taken by athletes is one of the meanings of fractions. At the end, the students concluded that the distance covered by the athletes is the numerator, while the length of the pool is the denominator of the fraction. A picture of student activity in discussion groups as well as drawing on the answers of students can be seen in Fig. 3.

In Figure 3, students made fractions of a given problem. The length of the pool is the denominator, and the distance reached by the athlete is the numerator. In an interview with the student, at the final conclusion the students were able to determine where the numerator and denominator were. So the purpose of this activity can be achieved.

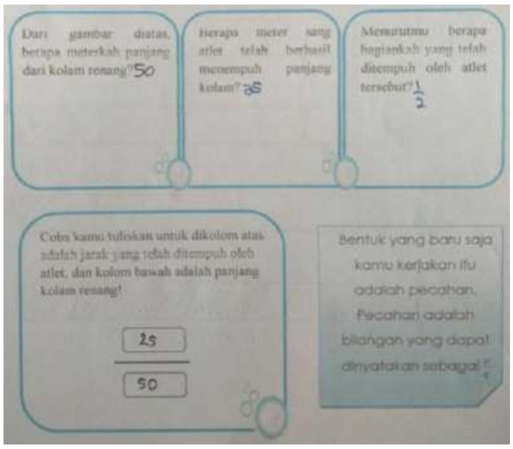
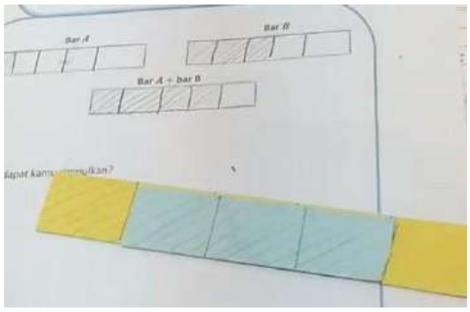
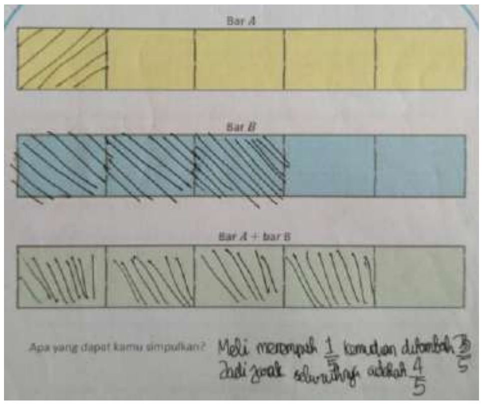


Fig. 3. Students' answers on the activity 1

B. Student activity 2. Addition of fractions with same denominators



(a)



(b)

Fig. 4. Students' activity and students' answers on the activity 2a using fraction bar

The students were required to solve a problem where an athlete reached certain distances in certain seconds, and then the two distances were added up. In this activity, the students were asked to use the fraction bar in the process of finding the sum of the fractions. Student activity started from shading fraction bar according to the distance covered for 20 seconds, and then students shaded again another fraction bar according to the distance in 30 seconds. Furthermore, the students cut one bar in accordance with the shaded fraction, after the students pasted the shaded part which has been cut to the piece of top bar. From the bar, the students can determine the sum of the parts that have been taken by athletes. Students' answer can be seen in Fig. 4.

In Fig. 4, the students can accurately shade the regions determined in the question. Then with the help of fraction bars, the students summed these regions and put their answers in the answer section.

In the next problem, students were asked to calculate the fractions using the number line. Number line had been drawn in the answer section; the students would only need to determine the right point of the distance reached by the athlete. The distance set by the students would eventually still be summed using the number line.

In this problem, the students had to add up the distances of two athletes who were swimming. The students determined the distance of the first athlete on the number line, and then summed with the second athlete's distance. Thus, the students could draw the conclusion that the sum of both athletes can be seen from the number line drawn by the students. The students' answers are shown in Fig. 5.

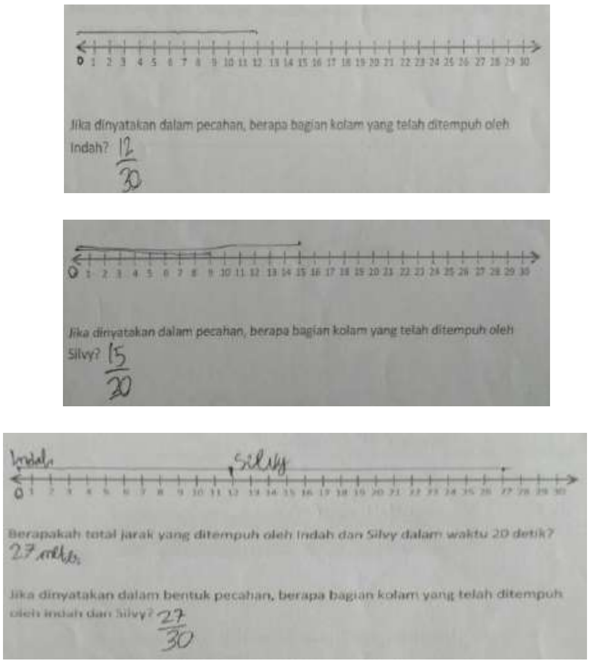
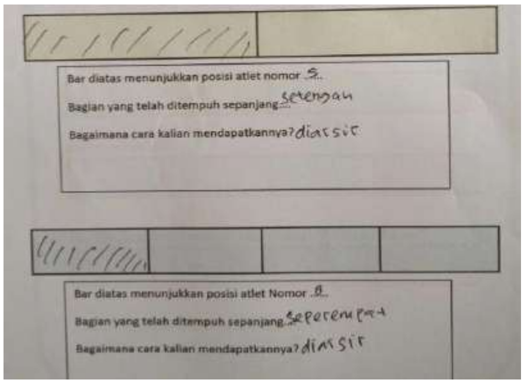


Fig. 5. Students' answer on the activity 2b using number line

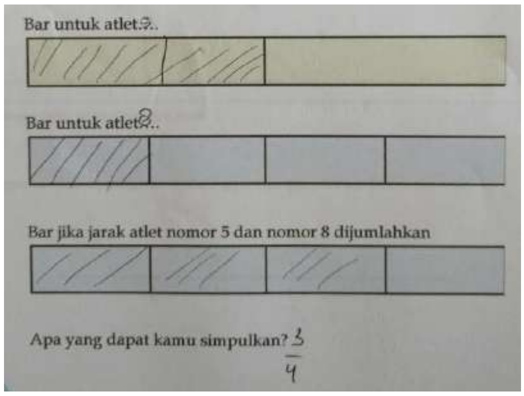
The students could correctly determine the point that represented the distance of the athlete. The students' answers illustrated that the students have understood how to add up fractions with common denominators using the number line.

C. Activity 3. Addition of fractions with different denominators

The students were instructed to solve a problem where swimmers from Japan and Korea reached certain distances in certain seconds, and the two distances were summed. In this activity, the students were asked to use the fraction bar in the process of finding the sum of fractions. The use of fraction bar on the activity was equivalent to the fraction bar on activity 2. The students were given fraction bar with different sections, and each student shaded fraction bar in accordance with a predetermined section. The students cut one fraction bar, pasted it to a fraction bar intact, and calculated the number of the existing sections in the fraction bar. Student activity can be seen in Figure 6.



(a)



(b)

Fig. 6. Students' answer on the activity 3a using fraction bar

In Figure 6, the students were correct in adding fractions with different denominators. The students added the two fractions with the given bar. They put their solutions onto the provided activity sheet. This is in line with the hypothetical learning trajectory designed by the researcher.

In the next activity, the students solved different problems but still in similar context, namely swimming pool. The students were asked to add the distances of both athletes. The distances of the two athletes were determined by the part of the reached swimming pools. However, in this case, the length of the pools used different denominators. Afterward, the students were asked to solve the question using the number line. The results of the students' answers are shown in Fig. 7.

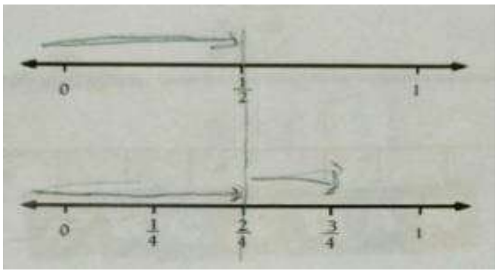


Fig. 7. The students' answer on activity 3b using number line

Fig. 7 shows the students adding fractions using number line accurately. They have to know that the sum of fractions with different denominators cannot be done directly, but they must equalize the denominator first.

From the results of the research conducts on the fractions material using PMRI approach, PMRI approach is considered very good to be applied in either the fractions material or other materials. By the support of context and learning media, students learn more enthusiastically. In addition, PMRI approach can make the students more active in learning process. Moreover, the students do not simply do calculation, but they also understand the answer from the problems.

IV. CONCLUSSION

Learning trajectory obtained is in the form of the trajectories of the learning process which is through by students start from the activities of knowing and understanding the meaning of fractions, shading the fractions bar, completing the fractions addition using fraction bar and the number line, Activities in the students' worksheets which have been designed to help students understand and resolve problems of the fractions addition from its intuitive informally to the problem-solving formally.

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Identification of Emotional Intelligences Level through Brainstorming Method and Its Impact on Students' Academic Achievement

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***Abstract*—This study aimed to identify the level of emotional intelligences through brainstorming method and its impact on students' academic achievement. This study used quantitative descriptive research. The samples were determined by using purposive sampling technique from the students of Chemistry Education, Faculty of Teacher Training and Education, Lambung Mangkurat University. Data collection techniques used emotional intelligences instrument, cognitive test, and student motivation questionnaire. Data analysis techniques used multiple linear regression and partial regression coefficient test (t test, sig 0.05). The finding showed that the average levels of students' emotional intelligences were EA 23.46 EM 27.16, SEA 28.02, RM 27.32 and academic achievement (AA) 74.43. Then, EA 0.392, EM 0.015, SEA 0.264, RM 0.478. It can be concluded that emotional intelligence has given an impact on students' academic achievement.**

Keywords*— Academic Achievement, Brainstorming, Emotional Intelligences

I. Introduction

Emotional intelligence is how individuals understand their own feelings, empathize with the feelings of people around them and regulate emotions in different ways. Emotional intelligence may be more important and needed to get a success than IQ (Intelligence Quotient). If IQ is not achieved then emotional intelligence will accommodate it. The statement concluded that every individual has the potential of generating an idea through their emotional intelligence and to develop their potential in various fields. Salovey emotional intelligence has been classified into five regions [1].

Emotional intelligence distributes much of the students' academic achievement. This is due to student's ability to control emotions while learning, by not suppressing their feelings. However, to make the given problem as a process find a solution, the solution process is an activity that is considered positive in order to create stable conditions and without pressure. Motivation in emotional intelligence is seen as the basis to improve the success rate in various fields, particularly the achievement. Achievement is supported through a set of feelings such as enthusiasm, passion in learning, and self-confidence. Some people are able to achieve at a high level, it is because the individual has a level of toughness and great diligence and was based on the nature of enthusiasm, conviction, and courage to face the challenges [1].

Emotional intelligence was first used as a term of a dissertation of Wayn Payne (1985), followed by Salovey and Meyer (1990) and Goleman (1995). The term was later developed into an essential examined and discussed in the 2000s. Emotional intelligence relates to what person should do and not do in the learning environment [2][3][4][5]. This is closely related to how the students take a decision with positive thinking, brave, motivated, and completely true [3][5]. Decision making is a specific cognitive concepts in moral terms [2].

Linda Bryant argues that "emotional intelligence in the education field is considered very important [6][7][8] as a concept/approach that can contribute to the process of teaching and learning", other concepts such as Gadner in multiple intelligences [9], Mihalyi Csikzent-Mihalyi's flow concept [6]. Related to this, educators should be a major actor in the classroom, where teachers have the ability to combine learning theories through multi-learning. The implementation of learning theory and multi-learning will lead students to understand their personal learning, so that the learning process will be easy. Then, students can understand that emotional well distributed while learning in the classroom is intelligence [10][5]. Indirectly, the scenario has been planned by the educator will have an impact on the emotional intelligence level of students and make it easier to analyze the level of knowledge, attitude, personality, and cognitive during the process of teaching in the classroom [6][11].

Research results by Walter Mischel from Stanford Psychology University [6] showed that individuals with high emotional intelligence through measurement [12][13] is a person who has the potential to succeed in the future because he understands his ability to make decisions and solve problems [5] emotionally. It deals with the provision of treatment to students who will be analyzed through an assessment of emotional intelligence. These results have the basic assessment consists of several measurement indicators such as self-awareness, self-regulation, motivation, empathy, and social skill [14].

Treatment in learning is the most important thing that must be considered by the teacher. Application of models, methods, strategies, and even learning atmosphere affect cognition, attitudes, motivations and moral development of students [15]. Through the application, teachers will be easier to form the character and moral as well as an analysis of learning styles and emotional intelligence of students [16]. Individual moral development is closely related to their development emotionally and then brings students into the real meaning of emotional intelligence [5][15]. In the process of learning, emotional intelligence is rated as abilities [17] to identify, assess and control emotions like attitude [18], cognitive, motivational [5][10][17]. Good teaching is a study condition that could lead to creative ideas and the stability of their learning process [18]. That process will not only generate a smart idea but could shape the behavior of the students were polite, controlled and oriented on their emotional intelligence [18].

Learning by brainstorming is a good treatment to achieve an effective learning process but not only have an impact on students' cognitive [19]. The learning process with a systematic brainstorming technique will improve student learning outcomes significantly and implementation is high cognitive performance [20]. In this connection, other factors (attitude, morale, creativity, and motivation) in addition to academic achievement (cognitive) took effect on the emotional state of students, so it was concluded that the integration of brainstorming in the study will accommodate the emotional intelligence of students [21][22][20]. Brainstorming oriented emotional intelligence will also have an impact on communication and enhance the activity of students in learning, then learning will be centered to students [23]. Through the formation of small groups in the classroom and SCL approach, then brainstorming will motivate students during the learning process takes place. Processes that occur during learning is a process where students entrust themselves to active and can contribute something [23].

Ref. [23] says that learning through brainstorming will improve and increase the linguistic students in learning. [24] The use of brainstorming strategies in learning will develop students' creativity in solving problems and establish communication skills, so that not only the creativity of students growing, but also the knowledge and way of thinking. Brain brainstorming will make students think creatively, critical and develop their knowledge in resolving problems [25]. In line with [17] that emotional intelligence is when people can understand, listen, feel, and express what they want with the procedure and the correct concept. The linkage is definitely related to the achievement of emotional intelligence (self-awareness skills, self-control, self-motivation, empathy, and social-skills) [17].

II. Method

This research method of this study was descriptive quantitative [26]. The purpose of this study is to identify the level of student emotional intelligence and academic achievement through brainstorming learning method. In addition, students' motivation in the learning process is also a measure in this study.

Research conducted at Chemistry Education Program of Lambung Mangkurat University. Research sample was the students of Chemistry Education of academic with the number of 42 students who were determined by purposive sampling technique. The sampling technique was based on several considerations related to samples, variables and courses selected. The data were analyzed by using multiple linear regression analysis and partial regression coefficient test using SPSS 22.0 program [27].

III. Findings

Chart below is an illustration of the value of the average level of emotional intelligence and students achievement successively Emotional Awareness (EA) 23:46 Emotional Management (EM) 27.16, Social Emotional Awareness (SEA) 28.02, Relationship Management (RM) 27.32 and Academic Achievement (AA) 74.43. Based on the data that have been mentioned, it can be seen that the Social Emotional Awareness is the most dominant emotional intelligence or emotional intelligence which is high among other analyzed criteria. The AA point showed that students' academic achievement is in a good category.

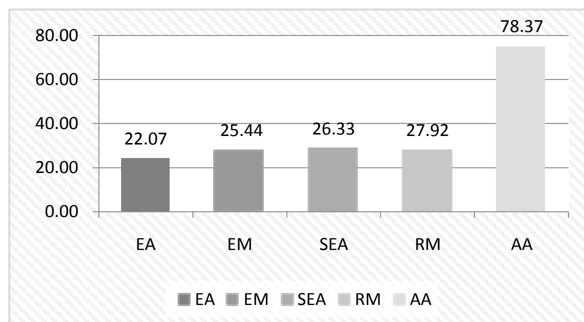

Fig. 1 The average of emotional intelligences level

Based on the results of the data analysis, the concept of emotional intelligence gives impact on student achievement. The same thing is also shown on the statistical data that is processed. Descriptive data showed statistical description of the beginning of the data as the mean of each dimension Learning Outcomes (academic achievement), Emotional Awareness (EA), Emotional Management (EM), Social Emotional Awareness (SEA), and Relationship Management (RM): 78.37, 22.07, 25.44, 26.33, and 27.93. Then, the data regression showed that there is a relationship of emotional intelligence on learning achievement. The score of the academic achievement is considered good with the category of emotional intelligence that is in either category. Therefore, it shows that through these methods, it can affect the emotional intelligence and academic achievement so that both have a relationship.

TABLE I. VARIABLES ENTERED/REMOVED[A]

Model	Variables Entered	Variables Removed	Method
1	RM, EA, EM, SEA[b]	.	Enter

a. Dependent Variable: AA

b. All requested variables entered

TABLE II. ANOVA[A]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.34	4	3.59	.18	.95[b]
	Residual	749.33	38	19.72		
	Total	763,67	42			

a. Dependent Variable: AA

b. Predictors: (Constant), RM, EA, EM, SEA

TABLE III. COEFFICIENTS[A]

Model		Unstandardized Coefficients		Standardized Coefficients	*T*	*Sig.*
		B	*Std. error*	*Beta*		
1	(Constant)	72.03	4.70		15.32	.00
	EA	-.07	.18	-.08	-.39	.70
	EM	.00	.20	.00	.015	.99
	SEA	.06	.24	.07	.26	.79
	RM	.08	.17	.10	.48	.64

a. Sample of a Table footnote. (*Table footnote*)

Coefficient data table above indicating that there is a relationship or emotional intelligence influencing students chemistry achievement. With regard to the statistics shown by the table, the value of the constant 72.03 with the t test results for 15.32, df 4 and significance 0.000. Thus, the hypothesis Ho was rejected; no connection or influence on students' emotional intelligence chemistry and H1 was accepted: no relationship or emotional intelligence influencing on students chemistry achievement. This conclusion is derived from the results of the t test through multiple linear regression analysis that Ho is rejected if th < t table, significance < 0.005. EA 0.39, EM 0.02, SEA 0.26, RM 0.48 showed that t ht < t tb (2.024) which meant that emotional intelligence has given an impact on students' academic achievement and Sig. 0.00 < 0.005. This value is clearly concluded that Ho was rejected and H1 was accepted that there is a relationship or emotional intelligence influence on student achievement chemistry. This hypothesis is strengthened beyond theory, also based on the results of statistical data analysis carried out which clarifies the relationship or significant influence.

Multifactorial phenomenon of a student's academic success has been studied extensively over the past few decades, although many studies focused only on cognitive factors. In a fatherly attempt to explore the importance of other factors in student achievement, study related to emotional intelligence (EI) and academic achievement appears [28, 29, 30, 31, 32]. The above data are similar to that described studies that the role of emotional intelligence is very influential on the achievement of students' academic achievement.

The literature review has also shown that emotional intelligence is very supportive of student's social and cognitive development [33], which is an advantage in some contexts, especially in educational settings. In fact, emotional knowledge related to the adjustment of students in academic and achievement, positive social behavior, achievement test, and evaluation [34]. In addition, students with emotional competence the higher setting goals greater academic and reflect a better level of self-discipline, motivation, regulation of stress, work organization, curiosity and has a higher value [35][36].

In addition, the emotional ability can be a key in social interaction: the expression of emotion positive students where they are likely to receive feedback and comments from others, whereas the expression of emotional disposition will have the opposite effect [37]. Thus, the power level of emotional intelligence has to predict students' academic value through the ability to interact, collaborate across study groups, and assessment [38]. Based on the statement are discussed, that the method of brainstorming undertaken is able to accommodate students' identification of emotional intelligence and emotional intelligence influence on student achievement. Thus, emotional intelligence has relevance to student achievement, and certainly with regard learning design chosen as the basis for identifying these things.

IV. CONCLUSION

Based on the research that has been done, the emotional intelligence has a relationship or influence on student academic achievement to which can be seen through the data analysis done and presented on this study. Then, brainstorming method used is also described according to the theory that this method is able to accommodate the learning so that students are able to develop creativity and potential either cognitive or emotional intelligence to become future generations that have potential, science, talent and value.

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The Development of Interactive Computer-Based Media for Learning Probability Subject in Mathematics Class

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***Abstract*—The probability subject is found as an interesting topic for the students but the limitation of the learning media becomes an obstacle in understanding this subject. This research aimed to develop computer-based media for learning probability subject in mathematics class at grade XI of senior high schools. This interactive learning media was developed by using an ADDIE development model. The topics were probability, combination and permutation. The development was conducted through the following steps: (1) analysis; (2) design; (3) development; (4) implementation and evaluation. At the stage of analysis, the researcher conducted a needs analysis for Core Competence (CC) - Basic Competence (BC) analysis, analysis of students' problems, and material analysis. The researchers collected materials from related books used by students and teacher in the class to design the learning media. The learning media that had been developed was validated by five validators and revised based on the input from the validators. The validation of the media involved aspects of curriculum, learning, display, and program. The valid learning media was tested in two stages. The first one used the small group test with subjects of five students and the second used large group test with subjects of 30 students. Based on the data analysis, it can be concluded that the computer-based media for learning mathematics on probability subject is valid with average score for each aspects of more than 3.71, and gains a good responses from students.**

Keywords—Computer-Based Learning Media, Probability, Research and Development

I. Introduction

The development of technology has always been progressing very quickly, especially in the field of computers. Computers are used in various sectors, including the public sector, the economy, and education. The computers used in teaching can accelerate the learning process. Learning materials delivered through the computer are easily understand by students. Learning using computer media can encourage students to do exercises and to perform simulations because the availability of animations, color and music [1]. Computer media has the potential to cause a direct interaction between students and the topic, provide immediate feedback and increase interest in learning [2]

The use of technology in learning is also one of the demands of the 2013 curriculum. This curriculum focuses on student learning, which means learning is no longer focused at the activity of teachers so that the teachers do not always explain learning materials to the class. Students should actively build knowledge, as mentioned in the 2013 curriculum. Moreover, the teacher should facilitate the students to build their knowledge independently. A form of effort to have student center learning is by using learning media, such as computer-based learning media.

The problems in statistical learning in secondary education are the stages of motivation, digging experience, the formation of knowledge and automation of knowledge [3]. This phase can be facilitated by the use of computers in learning. In mathematics, the subject of probability uses various learning activities, such as determining the chance of throwing the dice toss. The learning activity is done frequently and if done by each student, it will take a long time. Nevertheless, it is very important that the learning activity is carried out by the students as it will help in understanding the probability. Throwing dice or coins in large quantities can be effectively done using a computer. Based on the results of the survey interviews with some high school mathematics teachers, the researchers found that in teaching probability especially in conducting activities of throwing dice or coins, the teachers do not give direct experience for students to perform those activities. When students build knowledge with direct activity they will get the good effect to learn and more motivated. Solving the real problem is also the key to success in statistical learning [4].

Based on the aforementioned problems, there must be a way that the activities in the learning probabilities, especially in the events of roll dice or coins, can be performed by each of the students effectively. According to the researchers, computers become a solution in which computers are able to visualize the activities of learning probabilities accurately and attractively. Thus, the researchers wanted to develop a computer-based instructional media with interactive tutorial models for class XI on topics of probabilities. The study produced computer-based instructional media that is valid and conforms to the standards of practicalities to be used by students of class XI for learning probabilities.

II. Method

This study was a research and development (R & D), which aimed to produce a computer-based media with interactive tutorial models for learning probability subject in mathematics class for grade XI of senior high school. This development research used ADDIE development model using the following steps: (1) analysis; (2) design; (3) development; (4) implementation; (5) evaluation [5].

The subjects of this study in the small group test were five students with the heterogeneous academic ability and gender from class XI of Senior High School Babussalam Pekanbaru. The subjects of large group test were students of class XI of Senior High School Babussalam Pekanbaru with total of 30 students with heterogeneous academic skills. The instruments for collecting data in this study were validation sheet and student response sheet. Validation sheet consisted of a media validation sheet (to assess aspects of the display and the program) and material validation sheets (aspects of the curriculum and learning assessment). Each validation sheet consisted of four alternative answers, namely 1, 2, 3, and 4, which were categorized as very low, low, good and excellent, respectively. Student responses to the questionnaire included statements that were divided into three aspects: media, the subject, and display. Student responses to the questionnaire consisted of five alternative answers, i.e. strongly agree, agree, a bit agree, disagree, and strongly disagree.

In the validation phase, the learning media is assessed by validator using validation sheet. The validation Sheets from each validator were analyzed, and comment and suggestions from validators were used as the basis for improving the media prior to the trial. In the small group trial, the media was run by each of the students in the computer lab under the researchers' guidance. The qquestionnaire was completed by the students. The analysis of the cycle process was used as the basis for the evaluation and improvement of the media for the large group trial. After conducting the large group trial, the media was revised based on the replies to the questionnaire in large group trial. Data analysis techniques in this study consisted of validation sheet analysis and analysis of student responses in the questionnaire. The analysis of the validation sheet was done by using the following formula.

Mean of each indicator from 5 validators was calculated using the following formula:

$$K_i = \frac{\sum_{h=1}^{N} V_{hi}}{N} \tag{1}$$

Mean of each aspect of validation was calculated using the following formula:

$$A_i = \frac{\sum_{i=1}^{n} K_{ij}}{n} \tag{2}$$

Overall mean of validation was calculated using the following formula:

$$RTV = \frac{\sum_{i=1}^{N} A_i}{N} \tag{3}$$

After an average total validation is obtained, the total average was matched with the validity criteria 3≤RTV≤4 considered valid 2≤RTV <3 categorized quite valid, 1≤RTV <2 considered invalid.

The calculation of the percentage of students' response was done by giving a score for each item statement in the student questionnaire responses based on the chosen alternative options. The options were strongly agree, completely agree, agree, disagree and strongly disagree indicated by 5, 4, 3, 2 and 1 respectively. The next step was to calculate the percentage of responses for each aspect by the following formula:

$$R_i = \frac{\sum_{j=1}^{m} P_j}{\text{Skor maksimal aspek ke - i}} \times 100\% \tag{4}$$

After calculating the percentage of responses for each aspect, the average percentage of the total was calculated by using the formula:

$$RT = \frac{\sum_{i=1}^{m} R_i}{m} \tag{5}$$

Furthermore, after calculating the total percentage, categories of responses were determined by using the following categorizations: 85% ≤RT excellent category, 70% ≤RT <85% good category, 50% ≤RT <70% unfavorable category, RT <50% is not good category.

III. Results and discussion

A. Analysis

Activities in this phase involved the problem definition, analysis of basic competencies and the analysis of probability topics.

1) Problem Defined: Based on observations and the researchers' interviews with teacher about the learning activity, the researchers found a number of claims in statements of problems and solutions.

- Problem 1

Probability is one topic in mathematics with simple numerical calculation level, but it takes a strong analysis and the right mindset. For example, determining the composition of a some digits of given numbers was getting difficult if students get condition as this one: how many three-digit odd numbers of more than 300 can be made of the numbers 1,4,6,8, 9?

- Solution:
  In the media, the definitions and concepts are provided using an easily understood language and the right thought process that was understood by overcoming students
- Problem 2
  Probability topic needs many simple experiments like throwing dice and coins. The experiment using a small dice or coin, however, is difficult to demonstrate in front of the big class.
- Solution:
  In the media, experiments of rolls the dice and coins are provided and easily performed repeatedly for students as their learning needs.
- Problem 3
  On probability topic, students are required to write the sample space to understand and work on the problems. The sample space of the roll of two dice has 36 sampling points, and the students need to spend a long time in learning the topics.
- Solution:
  A presentation in easily understood form gives steps in determining the sample space and streamline of the time.
- Problem 4
  The probability topic has plenty contextual examples. Yet many students had problem in understand the relation in the topic. The inability of the students in understanding the probability in real-life examples will make this material difficult to understand.
- Solution:
  An example is given in the form of images that can help students' understanding.

2) Analysis of Basic Competencies and Probability Topic: Analysis of basic competencies and topics probability was done to define basic competencies (KD) used in developing learning media. The basic competencies for the development of instructional media are as follows:

3.13) Describe and apply various rules of counting slot through some real examples and algorithm of counting slot (multiplication, permutations and combinations) through diagrams or other means.

3.15) Describe the concept of sample space and determine the probability of an event in an experiment.

3.17) Describing the concept of probability of an event and use it in problem solving.

Under the Basic Competences, the probability topic presented on the development of instructional media are as follows: understanding counting slots, filling slots, definition of factorial notation, permutations, combinations, probability of single event, probability of multiple event, independent event and conditional events. These materials were divided into six class meetings with the following description:

Class Meeting 1

1. Definition of Counting Slot

Counting Slot is a rule used to determine or calculate how many ways the case of an event. Counting slot consists of the filling of slots, permutations and combinations.

a. Filling slots

When a first event can be solved by k1 different ways, the second event can be performed in k2 various ways, and so on up to the events of n, then the number of different ways all of these events is K, in which:

K = k1. k2 . k3 ... kn

To determine the number of available places, we use the product operation as well as other means such as a tree structure, cross-table, and sequences of numbers

Example:

Suppose there are two black and blue pants and four shirts of yellow, red, white and purple. How many pairs of pants and shirt colors can be formed?

Answer:

By the rules of multiplication, there are two possibilities pants and four possibilities for shirt which means that the number of different pair combination can be used is 2 x 4 = 8 pairs of different pants and shirt.

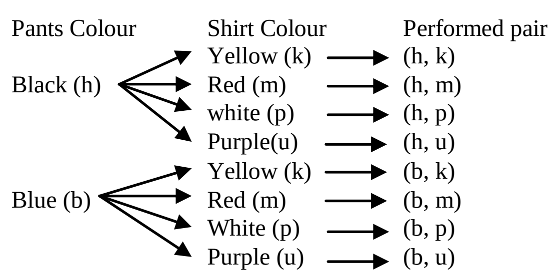
By using the crosstabs.

TABLE I. THE CROSSTABS

	Yellow (k)	Red (m)	White (p)	Purple (u)
Black (h)	(h, k)	(h, m)	(h, p)	(h, u)
Blue (b)	(b, k)	(b, m)	(b, p)	(b, u)

By using Tree Diagram.

Fig. 1. Tree Diagram



Using the ordered pair.

Suppose the set of pants color is expressed by A = {h, b} and set the color of clothes is B = {k, m, p, u}. The set of ordered pairs of set A and set B can be written {(h, k), (h, m), (p, p), (h, u), (b, k), (b, m), (b , p), (b, u)}. Many elements are in the set of ordered pairs with 8 kinds of color pairs.

Class Meeting 2

1. Definition of Factorial Notation

n factorial is the product of the positive integers from 1 to n. The notation of n factorial is denoted by n! (Pronounced "n factorial"), for example 4! = 1 × 2 × 3 × 4

2. Permutation

a. Permutation of different elements

K arrangement of different objects from n objects is provided where k ≤ n is often popularized by the term k permutation of different objects from n objects available. Many permutations of k objects from n objects in writing P (n, k) or P_k^n can be formulated:

$$P_k^n = \frac{n!}{(n-k)!} \tag{6}$$

b. Permutation which contains the same element.

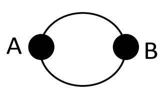
The number of permutations P (n, n) with similar object, b the same object, and so on written P, were formulated as follows:

$$P = \frac{n!}{a!b!...} \tag{7}$$

c. Cyclic permutations

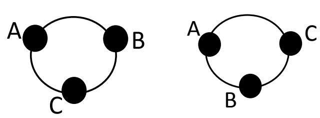
If there are two objects sitting in a circle, then a lot of composition no 1 = (2-1) !, namely:

Fig. 2. Two objects sit in a circle



If there are three objects sitting in a circle, then a lot of composition no 2 = (3 – 1)!, namely

Fig. 3. tree objects sit in a cilcle



If there are n objects sitting in a circle, then a lot of the arrangement taking place there (n - 1)! Thus, the definition is obtained: If there are n distinct objects and arranged in the form of cyclic (circular), then the number of arrangements that occur (permutation P cyclic or cyclic) is: $P_{siklis} = (n-1)!$

3. Combination

The composition of the object with the order k of n objects are not considered available where k ≤ n often popularized by the term combination of k objects from n objects available. The number of combinations of k objects from n objects in writing C (n, k) or C_k^n formulated:

$$C_k^n = \frac{n!}{(n-k)!\,k!} \tag{8}$$

Class Meeting 3

1. Definition of Sample Space and Events

At trial of throwing a coin metal, the emerging results can be written using the set notation. Suppose the "G" is meant the emergence of the image and the "A" appearance of the figure. The set of all the above results that may arise at trial written S = {G, A}, S is called the sample chamber or sample chamber. Thus, the sample space is the set S of all event or events that may arise from an experiment. The sample space is usually denoted by the letter "S" referring to as the set of rules. Members of the sample space are called sample points. For example, sample space S = {G, A} has a 2 point example, the G and A are referred to as members of the set universe. The number of members of the sample chamber generally denoted by n (S).

Each time the experiment will result in event or occurrence. For example, a coin throwing activities will appear side of the picture (G) or the appearance of the figure (A). Activity throwing a six-sided dice will obtain the results of events that may appear one of the six sides of the dice 1, 2, 3, 4, 5, or 6.

Thus, the results of the incident is a subset of the sample space. An event A is a set of sample points or a subset of the sample space S. The set is empty or {} and S itself is a subset of S, so it is an event. φ called the incident is unlikely (impossible), while the S referred to events that are certain.

2. Definition of Event Probability

Before knowing the definition of probability of occurrence, students should know first relative frequency. The relative frequency is the ratio between the numbers of results that appear with the number of tests conducted. For instance trial throws a coin 12 times. If a "G" 7 times and the rest appear "A" then the relative frequency of the emerging picture of Fr (G) = 7 / 12 and relative frequency appears Score Fr (A) = 5 / 12dengan thus relative frequency appears G or A approaches 1/2, written P (A) = P (G) = 1/2. So a trial which has some of the results, each has an equal chance formulated:

$$P(A) = \frac{n(A)}{n(S)} \tag{9}$$

Class Meeting 4

1. Frequency of Expected Event

An event expected frequency Fh of a trial is the product of probability P (A) to the number of trials n: $Fh = P(A) \times n$

Example:

Three two-sided coin image (G) and numbers (A) are thrown together as many as 80 times, specifying the advent expectations. What are all three figures?

Answer:

S = {GGG, GGA, GAG, AGG, AAG, AGA, GAA, AAA}, so n(S) = 8

A={(AAA)} ; Fh(all are number) = P(A) x n = $\frac{1}{8} \times 80 = 10$ times

2. Complements Probability of Event

Suppose the number of sample space is n (S), the number of an event A is n (A). The number of events that is not A or complement of A denoted Ac is: n (Ac) = n (S) - n (A), if the left and right sections divided by n (S), it will obtain the equation:

$$\frac{n(A^c)}{n(S)} = \frac{n(S)}{n(S)} - \frac{n(A)}{n(S)} \leftrightarrow P(A^c) = 1 - P(A) \quad (10)$$

Class Meeting 5

1. Probability of Multiple Event

Multiple event is an event that is formed by combining two or more simple events. By utilizing the operation between the set, we will determine likelihood compound. Operation between the set is a combination of the two sets and slices of the two sets.

Suppose the six dices are tossed at once. Probability A appears as primes number, i.e. A = {2, 3, 5} and B events appear an even number, i.e. B = {2, 4, 6}. In a Venn diagram, the two events above can be described as follows:

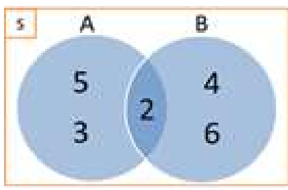


Fig. 4. Venn diagram

It show that event A and B are not independent (having subset A ∩ B = {2}) From combination operation of two set, students obtain n(A U B) = n(A) + n(B) – n(A ∩ B)

$\frac{n(A \cup B)}{n(S)} = \frac{n(A)}{n(S)} + \frac{n(B)}{n(S)} - \frac{n(A \cap B)}{n(S)}$, conclude

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Class Meeting 6

1. Conditional and independent event

Let A and B are events in a sample space S. A and B refer to two events which are independent if the occurrence of events are not affected by the occurrence of other events. Thus it can be said that: Events A and B are independent if and only if $P(A \cap B) = P(A) \times P(B)$. If $P(A \cap B) \neq P(A) \times P(B)$, then the event A and B are dependent.

Example:

Two blue and white dices are thrown together. A is the number 4 on the blue dice appearance and B is the event number 3 on the white dice appearance. Are events A and B two independent events? If so, specify the number four chances appear on the dice blue and white number 3 on the dice.

Answer:

The appearance of the number 4 on blue dice does not affect the appearance of the number 3 on the white dice, so that the two events are independent. A={(4,1), (4,2),...,(4,6)} and B={(1,3), (2,3), ..., (6,3)}. So P(A ∩ B) = P(A) x P(B) = $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$.

If one of the events influence the occurrence of other events, the two events are not mutually independent (conditional events). The incident occurred conditionally: $P(A \cap B) = P(A) \times P(A|B)$

B. Design Phase

In the design phase, the activities included were: using flowchart design, designing the program in the form of branches, collecting material, and creating a preliminary design of the program display. Flowchart was made to assist the researchers' work on the development of the computer-based learning media.

1) Flowchart Design: Flowchart in the design phase is a chart that shows the flow of developed media. In other words, it is a graphical description of the sequences in running developed learning media for probability. Flowchart made for the development of instructional media starts from opening to closing a program. It aims to assist the researchers' work on the development of the computer-based media for mathematic learning with interactive tutorial models for class XI on probability topic.

2) Program Design: To facilitate researchers in designing a link of each page in the media created, the researchers designed the program in the form of branching.

3) Finishing the flowchart design: The researchers collected all materials needed to make the program. The collected material was in the form of images, animations, training materials taken from textbooks and Internet materials. The researchers installed additional applications to help the development of this learning media.

4) Designing the Program Display: After creating the program design, the researchers began to make preliminary design of the display, the autorun, frontpage pages and teaching material.

C. Program Development

During the development phase, the media was created by combining text, animation and image in harmony to produce a good and attractive display. Images and animations were processed with Adobe Photoshop CS 3 and Macromedia Flash 8. Web pages were created using Microsoft Office FrontPage 2003, pages for topics created with Microsoft Office PowerPoint 2007. Then, they were put all together via the link in an application using the autorun program of Pro Enterprise Longition AutoRun. At this stage, the activities were divided into three groups: the realization phase autorun, realization and realization front page display materials.

D. Implementation and evaluation

At this stage, the researchers validated the initial prototype of instructional media that has been made based on the initial design on phase of the design. The validation result was analyzed and then used as material improvement and refinement of an early prototype of instructional media. Furthermore, the researchers tested the prototype of instructional media for students to see the response to media prototypes. The test was done in two stages, the small group trial conducted with 5 students of class XI High School Mathematics Babussalam and large group trial conducted on 30 students of class XI High School Mathematics Babussalam Pekanbaru.

1) The Validation Score of the Instructional Media

TABLE II. THE VALIDATION SCORE OF THE INSTRUCTIONAL MEDIA

Class Meet-ing	Mean of each aspect (A_i)				Mean (RTV)	Valida-tion catego-ry
	Curriculum	*Lear-ning Activity*	*Cosme-tics*	*Pro-gram*		
1	3.86	3.71	3.68	3.92	3.79	Valid
2	3.88	3.85	3.75	3.92	3.85	Valid
3	3.86	3.95	3.75	3.75	3.82	Valid
4	3.81	3.95	3.62	3.71	3.77	Valid
5	3.81	3.91	3.75	3.71	3.79	Valid
6	3.86	3.80	3.75	3.64	3.76	Valid

a) Suggestions / feedback by the validator: Once validated, instructional media was revised and improved based on suggestions and corrrection from validators. At the first class meeting of the validator suggestion, it was necessary to add material on the sum rule for the first class meeting. Then in the first class meeting, the researchers added a discussion of the rules of summation as in Fig. 5.

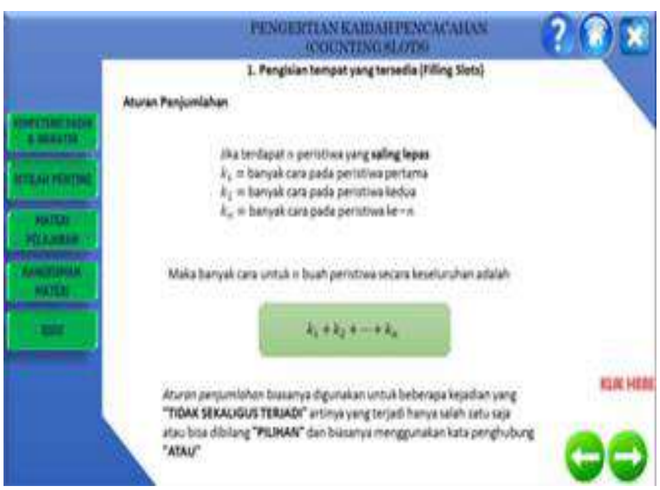


Fig. 5. Revision of Addition Rules

For class meeting 1, validators' feedback was on general improvement, such as there was a link to the power point in lesson material thas was not performed properly. By revision, overall all links ran well. In the aspect of the screen, the validator suggested to reduce and avoid using colors that were hard to see, such as the colors which were too bright or too soft. The change can be seen in Fig. 6 and Fig. 7.

Fig. 6. The colour before revision

Fig. 7. The colour after revision

In class meeting 3, the validator suggested the improvements of dice animation because it did not work when clicked. In this case, the researchers found the solution of the problem which was before running the media. The user must first install Macromedia Flash 8, then the application was included in a package with the media. As the menu system requirements, the researchers explained to the user for installing the Macromedia Flash 8 that available on learning media. For class meeting 5, the validator suggested to put more examples of problems, so students could understand better. Then, the researchers have added two additional examples of problems. At class meeting of 6, the validator suggested changes of the indicator at class meeting 6 to be adapted to the basic competence. Therefore, the researchers have been refining and adjusting to the basic competence.

2) A small group Testing: The small group trial was conducted to a group of 5 students of class XI High School

Mathematics Babussalam Pekanbaru which were selected randomly with the heterogeneous gender academic ability.

TABLE III. THE SCORE OF SMALL GROUP TRIAL

Class Meeting	**Percentage of Each Aspect**		
	Media	***Teaching Material***	***Program***
1	95.00%	94.67%	90.67%
2	94.00%	85.33%	84.00%
3	98.00%	90.00%	86.67%
4	96.00%	91.33%	86.67%
5	97.00%	91.33%	88.00%
6	93.00%	86.67%	84.00%
Total Percentage	95.5%	89.88%	86.66%
Category	Very Good	Very Good	Very Good

The results of students' responses from the small group trial demonstrated an excellent success rate, characterized by the total percentage of every aspect of ≥85% and positive comments from students. Based on the results of student responses on the small group trial, the prototype media has got a very good response.

3) Large group trial: In the large group trial, prototype revision based on suggestion of the small group trial was tested toward 30 students of class XI at High School Mathematics Babussalam. This was done to see the students' response to computer-based learning media using model of interactive tutorials, and students' responses can be seen in Table 4.

TABLE IV. THE SCORE OF LARGE GROUP TRIAL

Class Meeting	**Percentage of Each Aspect**		
	Media	***Teaching Material***	***Program***
1	88.83%	84.78%	86.22%
2	88.83%	81.78%	84.67%
3	88.67%	85.78%	85.56%
4	86.00%	85.11%	84.67%
5	87.00%	83.89%	84.22%
6	88.00%	82.78%	84.67%
Total Percentage	87.88%	84.02%	85.00%
Category	Very Good	Very Good	Very Good

The score for the whole group of class meetings on aspects of the media and aspects of the program was included in the very good category, and the aspects of the subject matter obtained good category. These showed that the model of computer-based learning media using interactive tutorial for high school grade material XI on probability topic obtained a very good response

4) Product Revised: The media that has been tested on a large group was subsequently revised in accordance with the learning need in order to obtain computer-based learning media with interactive tutorial models for class XI on Probability topics at mathematics class.

IV. DISCUSSION

The process of validating the learning media was done in four aspects: the curriculum, the learning aspect, the aspect of the display, and aspects of the program. In this study, the validators were experts of computers and learning of mathematics.

Based on the analysis of the validation results from the aspects of the curriculum, the learning aspect, the aspect of the display, overall program, it can be concluded that media computer-based learning is valid, with an average of all aspect ≥3. This result means that computer-based learning media with interactive tutorial models for class XI SMA on probability topic can be used as one of the media in carrying out the learning of mathematics in particular on the topic of probability.

The responses to computer-based learning media model of interactive tutorials for class XI SMA on probability topic were obtained from the student questionnaire. From the questionnaire, it can be concluded that the learning media obtained a very good response to the total percentage of the third aspect of the class meeting ≥85%. The students claimed that they could operate the media with easily. Display on media was very interesting and easy to understand. The students also stated that the animation in this learning media was interesting and helpful in understanding the material. From the results of student questionnaire, it can be concluded that computer-based learning media with the model of interactive tutorial for high school Grade XI on probability topic can be used as a learning media for probability topic.

V. CONCLUSION AND RECOMMENDATION

This development research produced a learning media in the form of computer-based media with model of interactive tutorials for Class XI SMA on probability topic. This Mathematics learning media has been validated and had two trials. From the results of the validation and testing, it was found that the development of computer-based learning media with interactive tutorial models for class XI SMA on probability topic was regarded valid and received a very good response from students.

The researchers give some recommendations in relation to the development of research as follows:

1. This research has produced a valid instructional media and got a very good response. This media is very good due to the attractive presentation of the material with good animation and its easiness to operate. Therefore, the media that has been developed should be used as the learning media in studying mathematics, especially probabiltiy topic.

2. In this study the researchers restricted the media research only to the validity of the results and the students' responses to learning media. These open an opportunity for other researchers to look at the effect of using instructional media on student learning outcomes or other aspects of learning.

3. This learning media needs computers as means of learning support. The schools that want to use this media should provide computer facilities in schools.

4. Teachers need to have basic computer skills to use this media. If required, this media can be modified in accordance with the needs of teachers.

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The Combination of Peer and Self-directed Feedback on Writing Achievement of Low Proficiency EFL Students

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***Abstract*—Teacher feedback is a common way of giving feedback to students. However, there are gaps found particularly whether English proficiency level influences feedback effectiveness and whether feedback gives benefits students on all writing aspects. Therefore, this study examined three-fold foci whether low proficiency EFL students who were taught using the combination of peer and self-directed feedback (PSF) had better writing achievement than students who were taught using teacher feedback, whether these students benefited on content and organization aspects, and whether they benefited on vocabulary, grammar, and mechanics aspects. Employing a quasi-experimental research, this study involved two groups of 29 students given a writing test. The students were the sixth semester students who took Writing IV course at STKIP PGRI Banjarmasin. The data were analyzed using One-way ANOVA and Mann-Whitney test. The results showed that low proficiency EFL students who were taught using the combination of PSF had better writing achievement than low proficiency EFL students who were taught using teacher feedback (p-value .018). However, these students did not benefit on content and organization aspects (p-value 0.243). They benefited more on vocabulary, grammar, and mechanics aspects (p-value 0.009). Therefore, teachers are suggested to provide their own feedback on content and organization and that the combination of PSF is used to assist them in teaching the low proficiency EFL students to reduce the burden. Further investigation involving moderate and high proficiency levels is suggested.**

Keywords—peer and self-directed feeedback; writing achievement; low proficiency

I. INTRODUCTION

Teacher feedback is a common way of giving feedback to students. It continues to take part as a central role [12]. Nevertheless, it is not a simple task even to teachers themselves. Teacher feedback is burdensome for teachers. Most teachers spend much more time to correct students' work while the students solely spend a short time to look at the corrections [17]. It is also not impossible that the students find it hard on what to revise and how to respond to the feedback [7]. As a result, experts still continue to question the effectiveness of teacher feedback [19] [12].

An alternative to teacher feedback, namely the combination of peer and self-directed feedback (PSF), is offered in this study from an underlying condition that writing and learning are social processes and that in a real life it is common to work in pair and alone. This work creates an authentic social context for interaction and learning as collaborative peer work makes the students engage in a community and lead them to finally work individually [12]. Peer feedback is believed to be able to enhance a sense of audience [25], provides instant feedback with variety of suggestions [17], and prepares the students to work with their work later on by learning from others' strengths and weaknesses [17][19]. The peer feedback in this study is followed by self-directed feedback. Self-directed feedback is the feedback that the students found after they have revised the feedback from their friends.

Previous quasi-experimental study as in [5] showed that the students who got peer feedback and those who were exposed to self correction had better writing ability than those who exposed to the conventional editing process of writing. Nevertheless, reference [15] investigated the use of peer feedback pointed out that it was insignificantly different from the students given teacher feedback. The other study as in [9] found that self-directed feedback method showed to be significantly more effective than teacher-correction method and personality type had no significant effect on learners' progress in writing. The last previous study as in [24] showed that the peer and self revision in writing is different in quality. It was found that peer revision could be implemented for the improvement on content aspect while self revision is for language form.

Reference [24] brought some insight that there are possibilities in which students benefit on all or certain writing aspects only. Reference [23], for instance, pointed out that feedback gives significant results on all writing aspects namely content, organization, vocabulary, grammar, and mechanics. On the other hand, reference [6] found out that teacher feedback helps students in content and organization while Rahimi in [1] and [30] showed that peer feedback helps students in content and organization. These results remain in some doubt. Therefore, one factor in feedback effectiveness name English proficiency level is taken into account [12], [8]. Reference [11] and [18] showed that high proficiency students prefer to revise independently and were able to provide more details in explaining identified problems and offering suggestions for revisions. To fill the abovementioned gaps, this study considers the influence of English proficiency levels particularly those who have low English proficiency level and all the writing aspects to answer the following research questions:

"Do students with low English proficiency level who are taught by using the combination of peer and self-directed feedback (PSF) have better writing achievement than those who are taught by using teacher feedback (TF)?"

"Do students with low English proficiency level who are taught by using the combination of PSF have better writing achievement on content and organization aspects than those who are taught by using TF?"

"Do students with low English proficiency level who are taught by using the combination of PSF have better writing achievement on vocabulary, grammar, and mechanics aspects than those who are taught by using TF?"

II. METHOD

A quasi-experimental design was employed in this study to investigate the effect of the combination of peer and self-directed feedback on writing achievement of low proficiency EFL students. There were two variables. The independent variable was feedback having two variances namely teacher feedback and the combination of PSF and the dependent variable was the writing achievement. 29 students of English Department STKIP PGRI Banjarmasin who took Writing IV course involved in this study. They were grouped into an experimental group and a control group. Post-test only was used in this study. To ensure that these groups were equal in terms of knowledge and skill, pre-test was given to students. It was found that the *p-value* was .06 was higher than .05. As a result, the students in these two groups were homogeneous. They were labeled as Class A and Class B. Then, these classes were randomly chosen to be the control and the experimental groups by a cluster random sampling using a lottery coin for nine times. Class A was as the control group while Class B was as the experimental group. In regard to classify the students' proficiency levels, TOEFL-like test was held. 16 students were taken from the control group which consisted of 31 students. Meanwhile, 13 students came from the experimental group that consisted of 26 students. The students from high English proficiency level were not included since the focus was only on the low proficiency EFL students.

During the experimental study, each group was taught using the same materials and the same process writing approach, but they got different types of feedback. The overall ten meetings were done in which one meeting was for the TOEFL-like test, one meeting was for pre-test, one meeting for the feedback training in the experimental group, six meetings were used for the treatment, and one meeting was for post-test. The considerations of these ten meetings were to provide sufficient length of time, building constructive feedback, and measuring the effect of feedback.

The treatment of the combination of PSF on the experimental group was arranged from the steps suggested as in [2][17][22]. Particularly, the combination of PSF given in this study was the exchange papers and compare writing peer as in [17] which was elaborated in the writing process from [10] namely planning, drafting, editing (reflecting and revising), and final draft. In the experimental group, the students got a set of feedback sheets depending on the stage of the writing process. Specifically, summary of teaching scenario of the process writing approach with the combination of combination of PSF in the experimental group as well as teacher feedback in the control group is as follows.

The students were asked to write argumentative essay 1. The first stage was planning. In this stage, they were taught the argumentative essay materials. They were also asked to analyze the model text of argumentative essay. In pairs, they found a topic to write, read references, plan the essay and brainstorm ideas, do the exchange paper peer feedback, revise, organize the content of the essay, revise and were given an assignment to discuss more, collect the plan, and finish the introductory paragraph. Then, on the drafting stage, they worked in pairs to write the first draft, did the exchange paper peer feedback, revise, and finish the draft. Third, on the editing and publishing stage, the still worked in pairs to write the second draft, did the exchange paper peer feedback, revise, did the compare writing peer feedback, finish the writing, and submit it to the teacher. As the assignment, they were asked to choose a topic to write for the next meeting and read more references. Further, on the fourth meeting, the students wrote argumentative essay 2 individually. The stages were the same, yet the written feedback was different. The assisted feedback was the self-directed feedback.

In contrast, the students in the control group were asked to write two argumentative essays as well by the assistance of teacher written feedback.

In relation to instruments, two instruments were used in this study. They were English Proficiency test in the form of TOEFL-like test to classify students to get the low and higher levels and the writing test to write an argumentative essay for collecting the data in the form of the students' writing achievement. The students were asked to write an argumentative essay consisting of at least four paragraphs with the time allotment 90 minutes. The score was given based on the Content (30 score), Organization (20), Vocabulary (20), Grammar (20), and Mechanics (10). The prompt of the writing test itself was validated by an expert of writing. The things covered by the expert in validation form were the appropriateness of the test with the students' level, the length of the essays, the objective of the tests, the test instructions, and the scoring rubrics. Then, the try-out of the prompt of the writing test and the opinionnaire of the topic preference were done before the test was administered. The try-out itself was conducted to 30 English Department students of Kanjuruhan University Malang due to their similar characteristics to the subjects of this study.

On the scoring rubric, the analytic one was used because classroom evaluation of learning was best served through an analytic one [4]. In addition, analytic scoring rubric gave high reliability and more construct validity because it was appropriate for L2 writers as there are different aspects of writing ability developed at different rates and provides useful diagnostic information [16], [28]. To see the clarity of this scoring rubric, it was tried out to three different raters. The raters were informed and trained on the use of the scoring rubric.

The data of this study were taken from the TOEFL-like test and the students' post-test scores. The first finding of this study was obtained from the TOEFL-like test. The data were scored and tabulated. These data from the TOEFL-like test were classified in the form of groups. The students in the control and the experimental groups were classified into two contrast levels namely high and low levels. Then, the second finding data were obtained from the post-test writing. In the data analysis, the first step was conducting a preliminary statistics by analyzing obtained data for fulfilling the statistical assumptions on the homogeneity and normality testing. The second step in the data analysis was testing the hypotheses by deploying One-way ANOVA and Mann-Whitney tests using SPSS 18.0 program. Finally, the last step in the data analysis was making a decision of accepting or rejecting the null hypotheses.

III. RESULTS AND DISCUSSION

The results of the TOEFL-like test, the post-test, and the discussion of this study are presented in this section.

A. The Results of the TOEFL-like Test

The classification of students based on the English proficiency levels is available on Table I.

TABLE I. THE CLASSIFICATION OF THE STUDENTS BASED ON THE ENGLISH PROFICIENCY LEVELS

	N	High Proficiency Level	Low Proficiency Level
Cont. group	31	15 students	16 students
Exp. group	26	13 students	13 students

Table I shows the number of low proficiency EFL students in the control and experimental groups were 29 students. The students were classified by considering their TOEFL-like test. The score range of the low proficiency students in control group was from 387 – 327 while in the experimental group was from 303 – 387.

B. The Results of the Hypotheses Testing

The post-test data were computed to Kolmogorov-Smirnov and Levene's tests. The obtained results were 0.318, 0.861, 0.696, 0.778, 0.786, and 0.905 indicated that all data were normally distributed. Then, the obtained results from Levene's test were 0.082, 0.056, and 0.018 indicated that two data were homogeneous and the other one was not homogeneous. Therefore, One-way ANOVA was deployed to answer research questions 1 and 2 and Mann-Whitney test was used to answer research question 3. Besides, descriptive statistics analysis was found to see the range, minimum and maximum scores, mean scores, as well as the standard deviation of the two groups as can be seen on Table II.

TABLE II. THE DESCRIPTIVE STATISTICS ANALYSIS RESULTS

	N	Mean	Std. Dev.	Min	Max
Cont. G	16	62.81	4.38	57	71
Exp. G	13	68.85	8.31	59	81
Cont. G (C, O)	16	66.13	4.87	56	74
Exp. G (C, O)	13	69.08	8.31	58	84
Cont. G (V, G, M)	16	63.13	4.79	56	70
Exp. G (V, G, M)	13	71.38	8.66	58	84

The last step was testing the research hypotheses under this study. The result of One-way ANOVA and Mann-Whitney tests to evaluate the null hypotheses are seen on Table III.

TABLE III. THE RESULTS OF ONE-WAY ANOVA TEST FOR RESEARCH QUESTIONS 1 AND 2

	Sum of Squa-res	Df	Mean Square	F	Sig.
Between Groups	261.112	1	261.112	6.305	0.018
Within Groups	1118.130	27	41.412		
Total	1379.241	28			
Between Groups	62.499	1	62.499	1.424	0.234
Within Groups	1184.673	27	43.877		
Total	1247.172	28			

TABLE IV. THE RESULTS OF MANN-WHITNEY TEST FOR RESEARCH QUESTION 3

	Writing Scores
Mann-Whitney U	45.500
Wilcoxon W	181.500
Z	-2.574
Asymp. Sig. (2-tailed)	0.009[a]

Tables III and IV show that the obtained *p*-values were 0.018, 0.234, and 0.009. On the first research question, it is clearly seen that the *p*-value was smaller than the level of significance (0.018 > 0.05). There was not enough evidence to accept the null hypothesis. It was concluded that there was significant difference on the writing achievement in the students with low English proficiency level who were taught using the combination of PSF and the students with low English proficiency level who were taught teacher feedback.

In regard to the second research question, the *p*-value was greater than the level of significance (0.234 > 0.05). There was enough evidence to accept the null hypothesis. It is noticeable that there was insignificant difference on the content and organization writing achievement in the students with low English proficiency level who were taught using the combination of PSF and the students with low English proficiency level who were taught teacher feedback.

Meanwhile, the third research question result shows that the *p*-value was smaller than the level of significance (0.009 > 0.05), meaning that there was significant difference on the vocabulary, grammar, and mechanics writing achievement in the students with low English proficiency level who were taught using the combination of PSF and the students with low English proficiency level who were taught teacher feedback.

The low proficiency EFL students in the experimental group had better writing achievement than those in the control group. The result of this study could verify the previous studies as in [29], [7], [9], and [11]. Peer and self-directed feedback successfully helped the low proficiency EFL students in the experimental group got better achievement in writing. This result was not in line with what has been discussed in [7], [24], [8], and [12] that one factor that affected this insignificant result was the English proficiency levels. This contrast result is supported by Watanabe and Swain [27] in which they found out that pattern of pair interaction plays role in the effectiveness because low proficiency students could also provide feedback to their peers.

Through the conduct of this study, further investigation to what extend the low proficiency students benefit from the combination of PSF is accomplished. The second finding of this study corroborated [3] and [13] studies that peer feedback gave limited benefits. The combination of PSF showed insignificant result on the content and organization aspects or so-called global aspects of writing. This result is in contrast to [21], [1], and [21] that peer feedback helps students to improve on the content and organization especially the feedback givers. Reference 21 focus on receiver and giver was in accordance to [27] finding that low proficiency students who acted as givers would also improved the achievement. Therefore, [6] finding is confirmed as the students with combination of PSF could not outperform those who were taught using teacher feedback in content and organization.

Subsequently, these low proficiency students were in more favor to get the teacher feedback during the writing process. Reference [14] mentioned that feedback is available when the peers are helpful in providing the input. The result that the low proficiency students had difficulties on how to respond on content and organization was because of their limited knowledge. This result implied that the low proficiency students could not work well to give feedback on content and organization for their peers as well as themselves and they were in favor to teacher feedback instead of the combination of peer and self-directed feedback. These students were then included to those who tend to choose teacher feedback [7].

Finally, the third research question result indicated that the improvement from the combination of PSF was found on vocabulary, grammar, and mechanics aspects or local aspects. It is also in contrast to [21] and [20] that vocabulary aspect result did not get positive response. More specifically [20] also showed that grammar and mechanics got improvement than content and organization. In addition, reference [26] also shows positive results on this local aspect of writing. The availability of feedback sheets as a guidance for the low proficiency EFL students is one of the factors to this significant result. The students can review their friends' writing thoroughly by the points on the peer and self-directed feedback of this study. Previously, the students in the experimental group were also given the feedback training so that they understand how to use it well. Therefore, the feedback sheets and feedback training are two pertinent components in written feedback. Regardless low proficiency EFL students' ability in content and organization aspects, vocabulary, grammar, and mechanics aspects bring good news for teachers to implement this combination of PSF in their classroom.

However, it is unavoidable that a study is free from some unintended things. As a nature of an experimental study, every single thing under the umbrella of this study has been tried to be equal but the treatment in the control and the experimental groups. However, there might appear things which are suspicious to the researcher's eyes namely subjects of the study and length of the treatment. The number of students was one of the limitations of this study as it could not ensure the mortality threat in this study. The other limitation of this study was the length of the treatment. These six meetings used for the treatment was short compared to those longitudinal study for semesters or years. However, all limitations are expected not to affect the results of this study.

IV. Conclusions and Suggestions

In a nutshell, first the low proficiency EFL students who were taught using the combination of PSF had better writing achievement than the low proficiency EFL students who were taught using teacher feedback. Second, the low proficiency EFL students who were taught using the combination of PSF did not have better writing achievement than the low proficiency EFL students who were taught using teacher feedback in the aspects of content and organization. Third, the low proficiency EFL students who were taught using the combination of PSF had better writing achievement than the low proficiency EFL students who were taught using teacher feedback in the aspects of vocabulary, grammar, and mechanics. Some noticeable findings of this study are due to the significant result of the combination of PSF it is important that teacher provides wider possible range of feedback to students in writing. While teacher provides the combination of PSF in their classroom, there are encouraged to provide feedback on content and organization particularly on the low proficiency EFL students. Even though students were only successful in the vocabulary, grammar, and mechanics aspects, the combination of PSF bridges students to master the skills in giving and incorporating peer comments.

The established conclusion above is along with the implications and suggestion for writing teachers and further researchers. This present study has established the practical and empirical evidences that peer and self-directed feedback is also beneficial for the low proficiency EFL students particularly on the vocabulary, grammar, and mechanics aspects with the availability of feedback sheets and feedback training. Therefore, it is important that writing teachers note the low proficiency EFL students content and organization aspects. In other words, writing teachers are suggested to treat certain students with appropriate feedback. Moving to the suggestions for further researchers, despite the effectiveness proof through this study, they should keep in their mind that careful consideration on the research design, timing of giving feedback which is on the process of writing instead of the product of writing, the involvement of all writing aspects, ways of giving feedback, and students differences for instance school levels need to be taken into account. Further research on moderate as well as high proficiency students and other students' differences are also interesting and fruitful cases for further researchers.

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Digital Literacy Learning Model in Digital Era

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***Abstract*—The use and abuse of digital technology in teaching and learning become a necessity in digital era. The digital era challenges future teacher to use information technology in teaching and learning at school with creative and innovative ways. PGSD (Elementary School Teacher of Education) students should also have the ability of using technology with creative and innovative ways in their teaching competences. This article aimed to investigate how to develop digital literacy skill by Digital Learning model in the classroom. The Digital Learning Model must be done by finding, managing, processing and presenting data from digital information. This study used R&D design and the subject were 20 second grade students from PGSD FKIP UMMI academic year 2015/2016. Data were gathered through observation, questionnaires, and interviews. This study revealed that this learning model made learning more meaningful and improved communication skills on how to present data visually. Based on this study results, it is recommended for lecturers to use this learning model to improve digital literacy skill.**

Keywords— Digital Literacy, Digital Skill, Learning Model

I. Introduction

The growth of media industry, both print and non-print media, increase the use and abuse of information technology. Nowadays, people are connected easily to each other and compete with a global market in digital ways. In this digital era, we have many opportunities in various fields. To deal with this era, the human resources should be prepared including through education. The survival skills for new generation are critical thinking and problem solving; collaboration across networks and leading by influence; agility and adaptability; initiative and enterpreneuralism; effective oral and written communication; accessing and analyzing information; and curiosity and imagination [1]. Thus, skills and abilities are also really needed for our future teacher. The implication is that they should be able to teach the subjects by digging information through observation, questioning, trial, processing the data or information, and presenting data or information, followed by analyzing, reasoning, concluding and creating. Based on these reasons, most of the educational process depends on the ability and awareness of literacy.

Although media literacy is used in many ways on different levels of education, the curricular approach is different due to schools mission. Lee and Tiande [2] in their research found that:

> *'media literacy is used in many ways by different stakeholders at national university and school levels. Although the media literacy program in study was initiated by the same university, the curricular approaches of the partnership schools are different due to the schools' varying missions.'*

Literacy in the digital era is defined not only as the ability to write and read, but broadly, literacy will relate to the ability to think, learn, and analyze non-print (digital) media. Therefore, PGSD students, as future teachers in the digital era, should analyze digital media to understand and appreciate digital structure and effects. Besides, they need to realize that through digital media, the view even attitudes may change. People learn about uses, strategies, and values simultaneously and haphazardly [3]. We learn literacy informally in everyday lives and we do not follow any step by step pattern as in the school. Based on this background, in this study, PGSD students learnt to experience digital media by digital literacy learning model. It means that PGSD students use their experiences with media in or outside the classroom as a common experiential basis for classroom exploration.

II. METHOD

This study used R&D (Research and Development) design by Borg & Gall [4]. Several methods were used in implementing this research design. The methods are descriptive, evaluative, and experimental methods. Descriptive method was used in the initial study to collect data on existing conditions, including (1) the condition of products that already exist as a comparison or base material for the product to be developed, (2) the condition of the user such as teacher, principal, school and students, (3) the conditions of enabling and inhibiting factors including the human element, facilities, and infrastructure, management costs, and the environment. Evaluative method was used to evaluate the development of a test product. Experimental method was used in addition to the experimental group also in the control group. Selection of the experimental group and the control was done randomly.

The study was conducted through the following three stages: (1) Preliminary study was an early stage or preparation for development. This stage consisted of three steps: (a) literature study (a study to learn concepts about the model that will be developed); (b) field survey (field survey conducted to collect data relating to the planning and implementation of learning digital literacy, especially with regard to the development of literacy skills); (c) drafting model (the models draft reviewed in a meeting, which was attended by experts in the field of curriculum and learning, language education, and elementary school teachers who are experienced. Based on input from the meeting, the research team revised a draft model and then duplicated it as needed); (2) The second step was preliminary field testing and main field testing. In this stage, the first step undertakes limited testing later trials more widely. Limited trials for testing conducted on a class of students. In this class, 20 students applied the experimental method (single one-shot case study). The researchers observed and noted all important things. Advantages and weaknesses, errors, or irregularities were committed by the lecturers at the time of application of learning models. Furthermore, the more extensive trial was conducted. At this stage, more research sample of 60 students in three classes A, B, and C were involved; (3) The last step was dissemination and implementation. The efficacy testing of the product was the testing phase of the product which was to test the digital literacy learning model as compared to the usual lesson. Testing was done by using a quasi-experiment method in the experimental group and the control group (pretest-posttest control group design). Product testing will be conducted at the research stage further in the second year.

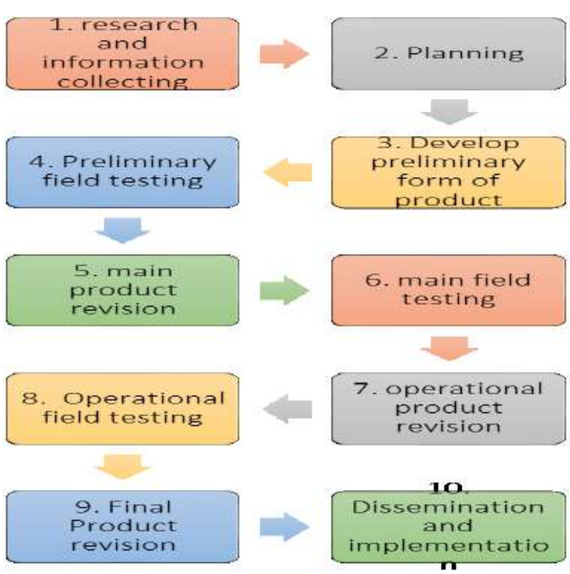

Fig 1. R&D steps

The stages weredelivered in ten steps as follows: (1) research and information/data collecting; (2) planning and scheduled the research; (3) development of preliminary draft of product (the digital literacy learning model); (4) preliminary field testing on 20 PGSD students; (5) main product revision by a focus group discussion with expert; (6) main field testing; (7) operational product revision; (8) operational field testing; (9) final product revision; (10) dissemination and implementation.

III. RESULTS AND DISCUSSION

Literacy means an ability to read and write and media means a communication tools [5]. These definitions build a meaning of media literacy. As Potter [6] said:

> '*media literacy is a set of perspectives that we actively use to expose ourselves to the media to interpret the leaning of the messages we encounter. We build our perspectives from knowledge structures. To build our knowledge structures, we need tools and raw material. These tools are our skills. The raw material is information from the media and from the real world. Active use means that we are aware of the messages and are consciously interacting with them.'*

European commission [7] defines media literacy as follows:

> *'Media literacy may be as the ability to access, analyze and evaluate the power of image, sound, message, which we are now confronted with on daily basis and are on important part of our contemporary culture, as well as to communicate competently in media available on a personal basis.'*

Based on those definitions about literacy and media literacy, we can conclude the definition of Digital Literacy as ability to access, analyze, and evaluate a digital media. In this research, to make PGSD students literate in digital media, they should be challenged to make their own digital media to deliver material in a classroom. Thus, they should: (1) understand and experience information literacy; (2) experience digital media; (3) create works in varied digital media so that they have direct knowledge of how to process and deliver information; (4) use varied digital media, in order to extend and express their understanding and feelings; (5) understand the process of creating within a given digital media through experience and practice with digital media making; (6) analyze their own transactions with media digital that they made; (7) analyze digital media their made to understand biases and values inherent in their media.

At the preliminary study, the researchers made preparations for the development of learning models. The preparation included studying the literature on digital-media learning and information Literacy, conducting a literature study regarding support skills using digital media, determining the subject of research, and conducting a field survey by interviewing digital media literacy.

From interviews, it is concluded that students know, understand, and use digital media in their daily lives. All PGSD students have not been involved in creating of print and non-print works previously. Supporting skills in the manufacture of media literacy were still not controlled. The supporting skills included the skills to operate a camera, computer software (Corel Draw, Photoshop, and WEB/Blog, etc.), writing skills with attention to the integration of scientific and skills of how to communicate through the media.

From the observation of the field testing, some findings were revealed. The subjects of the study had literacy skills in a medium stage. It meant that they were already fluent to use media, know the functions, carry out certain functions, and execute more complex operations. Digital media users can continue according to their need. The users knew how to obtain and assess information they needs, as well as using a strategy for specific information. Moreover, poor supporting skills produce digital media literacy. There were limited support tools, such as computer, smartphone, printers, and representative cameras. Poor Internet access on classroom was also the problem. Finally, the working team was not fully formed.

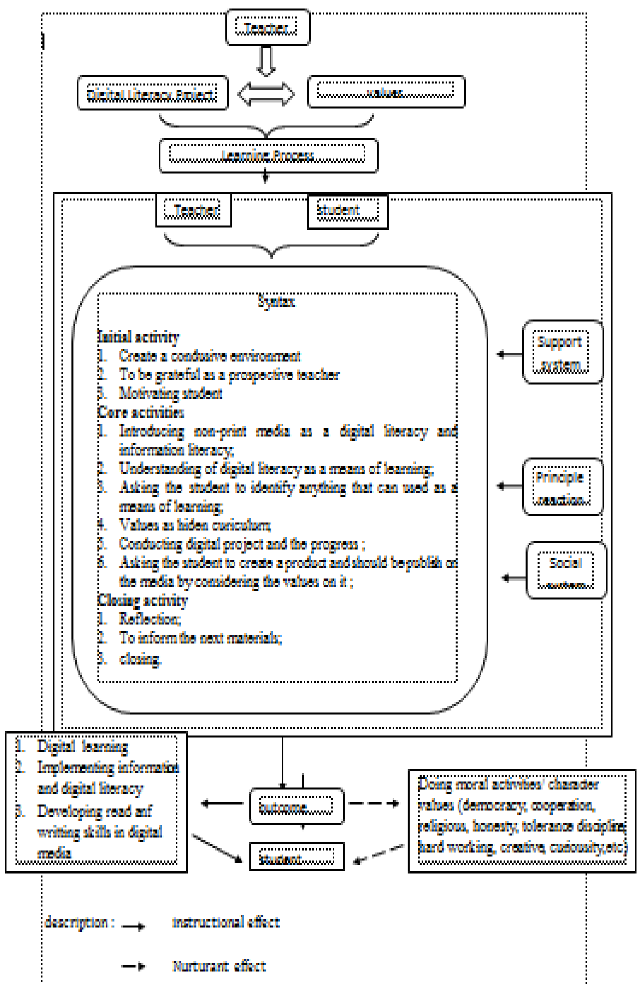

Fig 2. Digital literacy learning model

The models and its process drawn are as follows: (1). Preparation (student centered class discussion/ reflecting curiosity towards issues): (a) The students had a clear vision about the digital and information literacy; (b) The class was divided into two groups of digital literacy media (web and blogs); (c) The existing problems were explored by the students; (d) The problems were specified and considered in terms of what the values on it; (e) The information resources were estimated to collect data (interviewing, observe, book and internet); (f) The digital literacy project was planned (web and blog) and the class was divided into groups; (g) The courtesy was kept when collecting data or information; (h) A project journal was created that consisted of target activity, activity achievement, and the next activity. (2) Development (a groups discussion to formulated the project): (a) formulating problems they have to web/ blogs; (b) developing the tools of the project (ex: a draft of questionnaire); (c) recording obtained facts and data on to web/blogs; (d) checking the completeness and appropriates of the data with the goal of project; (e) processing on the result of the acquired data. (3) giving feedback (groups discussion to write down the project report): (a) writing down the report to web/blogs with the other groups as a reader target; (b) setting up the class for the reader circle (each group read the report of the other); (c) a group presentation; (d) giving tutors feedback (cross checking the aims of the project, the data completeness, the inserting values and the reader targets); (e) exchanging the draft report (to be evaluated by the other groups); (f). revising the draft 1; (g) tutors and teacher feedback; (h) revising the draft 2; (g) publishing; (4) reflection and conclusion: (a) reflecting all the observable processes by asking a question; (b) giving responses (by the student); (c) planning the next digital project.

IV. CONCLUSION

Digital literacy learning model is an excellent approach to achieve national education goals. Digital literacy learning model emphasizes the creativity of learners. Lecturer task is to manage the class as a team that works together with students to find something new to the class (learners). Lecturers should manage boredom on learners themselves and revive motivation to learn them. The digital media can also be used as a tool to make the students understand or comprehend the material presented well, increase activity, and invite participation of learners in the learning interaction. Digital literacy learning activities in the classroom are implemented for achievement of learning itself. These activities are divided into classroom activities (classical activities), working in pairs (pair work), working group (group activities).

Digital literacy helps students to connect in the learning process. Students are trained to build their own knowledge of their active involvement in the learning process. Besides, the students are challenged to activate their metacognition skill through digital literacy skill. Reference [8] explains about metacognition as 'metacognition thus involves planning, monitoring, regulating, questioning, reflecting on and reviewing our cognitive processes.' The students become active learners in learning process. Their activities include of how to search, collect, analyze, and present data from digital media to audio and visual.

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The Effect of Problem Posing and Problem Solving Model on Chemistry Learning Outcome

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***Abstract*—This study was aimed to determine differences in learning achievements and to find out the most effective learning model among the problem posing, problem solving, and problem posing-solving models in grade X SMAN 6 Banjarmasin. This research used a quasi-experimental methods with a pretest-posttest comparison group design. The samples were class X MIA 1 as an experimental class 1, X MIA 2 as an experimental class 2, and X MIA 3 as the experimental class 3. A test-technique was used to collect data and the data were analyzed using one-way Anova test, N-gain test and Duncan test to analyze the cognitive achievement of students who learn chemistry using problem posing, problem solving, and problem posing-solving learning models.The results showed that (1) there were significant differences in cognitive learning achievements among students in the experimental class 1, experimental class 2 and experimental class 3. (2) the use of the learning model problem posing-solving was more effective when applied to the learning process compared to the problem posing model and problem solving model.**

Keywords-Cognitive Achievement, Mole Concept, Problem Posing, Problem Solving, Problem Posing-solving

I. INTRODUCTION

Chemistry is one of the choices of interesting learning subjects in Mathematics and Natural Sciences which studies the chemistry substances beneficial to people's life. Many of everyday natural events can be studied in chemistry, but so far there have been many problems in the learning of chemistry. One of the reasons which gives an impression that chemistry is difficult is that the concept of chemistry is abstract, like learning a new language, chemistry has specific vocabularies.

The topic of the concept of mole in the study of chemistry in the X class of SMA is one of the subjects which comprises the learning of counting which needs the right understanding on the concept. The concept of mole introduces the basis of the chemistry counting. This material consists of concepts and counting which are considered to be difficult to be learned by students and that is why it needs a suitable learning model to introduce.

One of the efforts to increase students' success is by using active learning, most of which processes are done by the students. They should think to do their learning, introduce their ideas, and solve their problems. Also, they should able to apply the material they have learned. They should actively learn to listen, to see, to raise questions on certain topics and then discuss them with the others. Besides that, the most important thing in active learning they should solve problems, find examples, and implement the skills of doing assignments by themselves. These depend on the knowledge they have or will achieve [1]

There are learning models which can improve students' thinking skills in solving problems; these are learning models of *problem posing* and *problem solving*. The learning models of *problem posing and problem solving* are two among the many learning models which involve students' activities and their creativities in their learning process. The two learning models enable them to be active, and enhance their critical thinking and creative skills. The learning models are expected to develop students' positive attitudes in order to develop human resources to face future with more challenges.

The learning model of *problem posing* is the learning model which requires students to make their own questions or to solve a problem to make simpler questions [2]. This learning model is adapted to students' ability, develop the cognitive structure, and motivate students to think critically.

The learning model of *problem solving* is the learning process which demands students to solve problems created by the teacher himself/herself, or to solve the problems based on the facts in the surroundings through the learning process in class using many ways and techniques. This model can stimulate students to critically and creatively think, starting from looking for data up to formulating solution so that students can take meaning from the learning activity [2]

The two models are similar in focusing on problem solving; students are invited to be active so that information does not come only from the teacher but also from students. They are also expected to construct new knowledge by themselves based on the available information and their prior knowledge. The difference between the two is that the *problem posing* learning model enables the students to offer the learning problem; and that the *problem solving* learning model requires the teacher to offer the learning problem.

The result of a research conducted by [3] states that the use of *problem posing* learning model results higher learning achievement than that of *problem solving one*. [4] that the implementation of *problem posing* learning model completed with the material in *power point* can increase students' achievements. Besides that, [5] shows that there are differences in critical thinking skills, logical-mathematical intelligence and the students' mastery on the concepts on the salt hydrolysis taught by using the *problem solving* learning model from those who are taught by using the conventional one.

Based on the above explanation, the two models were integrated together in this research to get better result. The integration of the two models becomes a new learning innovation known as the *problem posing-solving* learning model. By using the *problem posing* learning model, the students can be more active and are able to construct knowledge through thinking process and by using the *problem solving* learning model, the students are able to think to solve problems. The integration of the two learning models were conducted as a way to increase students' learning achievement, especially in the concept of mole in chemistry.

II. METHODS

This research was conducted through the *quasi eksperiment* method with the design of *pretest-posttest comparison group design*. A pretest was given to the sample to find out the students' initial understanding on the concept of mole before the treatment. After the implementation of the *problem posing*, *problem solving*, and *problem posing-solving* models, the *postest* was given to find out the students' cognitive learning achievement

The population in this research were students of Class XMIA SMA Negeri 6 Banjarmasin Academic Year 2015/2016, the sample of those were Class X MIA 1 as the first ($1^{st)}$ experimental class, Class X MIA 2 as the second (2^{nd}) experimental class, and Class X MIA 3 as the third (3^{rd}) experimental class, each of those comprises 35 students. The *sampling technique* used in this research was *cluster random sampling*. *Cluster random sampling* is a technique of sampling randomly [6].

The research instrument was a test of cognitive learning achievement consisting of essay test each of which were 7 problems. To get a valid test result a validation test was conducted before hands. The validity was determined based on the evaluation and consideration of three validators: three chemistry lecturers of FKIP ULM Banjarmasin and two chemistry teachers from SMAN 6 Banjarmasin. Result of the counting process using CVR equation, CVR (*Content Validity Ratio*) was = 1. It showed that the instrument of the cognitive learning achievement was valid to be used [7]

To find out the reliability of the instrument, before being used, the instrument was tried out. The use of Alpha Cronbach formula showed that the degree of the test instrument was 0, 85: the instrument was in the high category reliability.

The technique of data analysis was conducted using the descriptive and inferential data analysis. The inferential analysis used in this research was one-way Anava and advanced analysis using *Duncan* test of **Factual Distance Difference.** The condition in applying one-way Anava are normality and homogenity of the data. This test was used in order to find out whether there were differences resulted among the first, second and third experimental groups.

III. RESULT

The research result on the percentage of students' completeness and the *N-gain* of cognitive learning result can be seen in Table 1 and Table 2

TABLE I. THE PERCENTAGE OF STUDENTS' COMPLETENESS

Score	Experiment 1	Experiment 2	Experiment 3
< 75 (Not Complete)	10	18	24
≥ 75 (Complete)	25	17	11
Class Completeness (%)	71,43	48,57	31,43

TABLE II. THE INTERPRETATION OF N-GAIN OF STUDENTS' LRARNING OUTCOME

Class	Average *N-gain*	Criteria
Experiment 1	0,72	High
Experiment 2	0,61	Medium
Experiment 3	0,49	Medium

Based on Table 1 and Table 2 it can be found out that the completeness percentage and the average N-*gain of the* cognitive learning result of students in the experimental class 1 is higher than experimental class 2 and experimental class 3. It shows that problem posing-solving used for the experimental class 1 is more effective in the learning process than that of the models implemented in the experimental class 2 and experimental class 3.

The result of the one-way Anava test and the advanced test can be seen in Table 2 and Table 3.

TABLE III. THE RESULT OF ONE-WAY ANAVA IN THE POSTTES SCORE

Source	Jk	Db	Rk	Fcount	F_{tabel}	Interpretation
Among Groups	5529,58	2	2764,79	13,02	3, 09 (5%)	Significant
In Groups	21666,85	102	212,42			
Total	27196,43	104	-	-	-	-

TABLE IV. DUNCAN TEST RESULT

Class	N	*Subset for alpha* = 0.05		
		1	2	3
Experiment 3	35	59,46		
Experiment 2	35		69,91	
Experiment 1	35			77,14
Sig.		1,00	1,00	1,00

Table 3 and Table 4 show that there was a significant difference among the Experiment Class 1, Experiment Class 2 and Experiment Class 3 to the cognitive learning result. The average of *problem posing-solving class was* higher than the average of *problem posing and problem solving class*. It showed that there was an effect of the problem *posing-solving* to students learning achievements.

IV. DISCUSSION

Based on the *Duncan* test result, H1 is accepted or there is a significance difference among the students' cognitive learning result in learning using the *problem posing-solving* model, the problem *posing* model and using the problem *solving* model only. The difference in students' achievement is caused by the implementation of the problem *posing-solving learning model*. This is in compatible with the research of [8] about the learning of problem *posing* completed with "LKS" which can increase the students' achievement. Besides that, the test result is also suitable with research done by [9] about the implementation of the *problem solving* model which can increase students' learning result.

That significant difference also shows that the learning achievements using the *problem posing-solving* model is higher than the learning achievements using the *problem posing* model and the achievements of the *problem posing* model is higher than the learning achievements using the *problem solving* model. This is parallel with research done by [3] which states that there is significant difference in the learning achievements between using learning using the problem *posing* and *problem solving* models. The difference of average cognitive scores is assumed to be appropriate to be used for learning the concept of mole with the *problem posing* learning model. The material of the concept of mole is a chemistry material which require the understanding of concept better, moreover several sub chapters in this material are abstract and full of calculation.

The model of *problem posing* itself requires students to learn repeatedly, by self-learning from different sources, and then from the teacher's explanation and learn from an experience of making problems and questions with the solutions. To make problems or questions students are required to understand the material of the concept of mole deeply, whereas in in the *problem solving* model, students only learn from the teacher and other source without having experience in making problems or problems and solutions. The repeated learning process and students' experience in making problems and problems and solutions experience in the *problem posing* learning model, makes students understand more with the material of the conc3pt of mole and this material will stick harder to the students. In the use of *problem posing* learning model, students' also have more experience in solving problems so that their ability in solving problems also higher than students using the *problem solving* model of learning.

This research is parallel with the research done by [10] which states that p*roblem posing* learning model is effective for increasing the ability to solve students' problems. During the learning process of learning using the *problem posing* model, more students are active in asking or answering questions compared to students using the *problem solving* learning model. This research is also parallel with research done by [11] which states that cognitive learning achievements which are given by the use of "PBL" using problem *posing* learning model is better than students given learning with "PBL" which use the *problem solving* model.

The *problem posing-solving* learning model is learning which requires students to make problem. Students must have self-learning, so that they must be able to develop their creativity in making problems. According to the theory of constructivism which states that a teacher does not only give knowledge to the students, but also helps students to do self-knowledge construction. The *problem solving* learning model can increase students' social interaction in a group because it requires students to solve problems from other groups. Besides, to solve problems done by the students, the steps given by the teacher must be used by the students by the use of *problem solving*.

The two learning models are also suitable to the learning theories of Jean Piaget, Vygotsky, and Ausubel which state that students must be active developing their own knowledge, knowledge will grow from experience with friends of the same age and students must be able to relate new knowledge with the former knowledge. The *problem posing-solving* learning model requires students to learn individually and in groups to grow students' knowledge about the concept of mole by making problems and solve them base on the steps given by the teacher.

The influence of the *problem posing-solving* model gives contribution in increasing the cognitive learning results. The increase can be seen from the achievement of the *N-gain* average of the experiment class 1 which is higher than in the experiment class 2 and the class experiment 3. The average *N-gain* o experiment class 1 gain increase which is classified to the high category.

In this research the completeness percentage gained is 71.43% in the experiment class 1, 48.57% in the experiment class2 and 31.43% in the experiment class 3. This shows that in the experiment class 2 and experiment class 3, the classical completeness is lower than 70%, which means that the teacher have not been successful in the learning process and they are not suggested to use the learning model. For experiment class 1, on the other hand, which classical completeness is more than 70%, which means that the___14 learning in this class is stated to be successful and for schools which uses classical completeness of 70% can use the learning model especially in the material of the concept of mole. The use of the *problem posing-solving* learning model is more effective to be used in the learning activity than using only the *problem posing model* or the *problem solving* model only. This is also shown in the achievement of completeness in classes which implement the *problem posing-solving* learning model more than he school completeness in that school, which is 70% or the school completeness and 71,43% for the completeness of implementation of that learning model.

V. CONCLUSION AND SUGGESTION

Based on the research result and discussion it is concluded that (1) there is a significant difference of cognitive learning result of students learning using the problem *posing*, *problem solving*, and *problem posing-solving* in the material of the concept of mole; (2) The use of the *problem posing-solving* learning model is more effective implemented to the learning process of the *problem posing- solving* learning process than the problem *posing* and the problem *solving* learning models.

The researcher's suggestions based on the result of the research, among others, are: (1) other teachers or education staff, especially chemistry teachers better consider the implementation of *problem solving* model assisted by interactive media to develop "KGS" and optimized the students' learning result besides using the real practicum., (2) the candidate researchers are suggested to use *problem solving* learning model assisted by the other interactive media by studying all the students KGS indicators other than which is done in this research, (3) the development of KGS better uses interactive media suited to the KGS indicators which will be developed.

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Design Research in Fraction for Prospective Teachers

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***Abstract*—Many recent studies found that students tended to have difficulty in grasping the concept of fraction. In order to overcome all the difficulties, this study presents a sequence of classroom activities aimed at constructing the understanding of fraction. This study enables prospective teachers as students to work with contextual situations. Realistic Mathematics Education (RME) underlies the design of the context and the activities. The aim of the research contributes to practical domains especially in mathematics learning using Realistic Mathematics Education. Design research was chosen as an appropriate means to achieve the aim. It was conducted in three phases, preliminary design, teaching experiment (first and second cycles), and retrospective analysis. This study involved two classes of prospective teachers (first cycle); some prospective teachers were analyzed in detail which was held at STKIP Garut. The result of this study showed that a sequence of activities could bring prospective teachers' learning from the contextual situation to more formal situation and give them the way of idea in teaching it. They could do every contextual problem with their reasoning. This result was supported by a sequence of classroom activities that have been given. It could be seen from comparing pre-test and post-test, prospective teachers' work increased and many strategies with reasoning were come up in the end of learning. Learning trajectory on this study could be used for school learning.**

Keywords—Concept of Fraction; Prospective Teachers, Contextual Situations, Realistic Mathematics Education, Design Research

I. INTRODUCTION

Educational success is influenced by the effectiveness of educators to manage learning environments. A good learning environment is expected to create a good quality of education. G. Thompson [16] states that "Education is the environmental influences on individuals to make permanent changes in habits, thoughts, attitudes and behavior". In line with these opinions [7] suggested "The primary function of education is guidance to individuals in an effort to meet the needs and desires in accordance with its potential, so that the individual obtains satisfaction in all aspects of personal life and social life".

In Indonesian curriculum of education, a lot of subjects have to be studied by students at schools, especially mathematics. Improving the quality of learning of mathematics not merely because of the mathematics urgency, but also to improve the ability of Indonesian students. Based on the mathematics test results, Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA), Indonesian students with a specific range of age represented and obtained poor results as well.

One of the innovations learning approaches that can overcome the problems seen in this study is the application of the approach of Realistic Mathematics Education (RME). RME provides opportunities for students to be more active in learning, because learning is done more centered on the students. RME who sees mathematics as a human activity that has five characteristics, namely: "(1) the use of contexts; (2) the use of models; (3) the use of students' own productions and contructions; (4) the interactive character of teaching process; (5) the intertwinement of various learning strands" [12].

There are many studies in Indonesia, which examines the approach Realistic Mathematics Education in the country, namely [17], [8], and [4]. Meanwhile, studies related to the RME outside Indonesia, including [9], [10], [11]; [1] and [2], [18], [12], [13]; [3], [19], [5], and [15]. Both research in Indonesia and abroad still yet to formulate a topic LIT fractions through RME approach.

After comparing with the research studies that have been done, both in Indonesia and abroad, it was clear that this research has significant difference and has novelty because this study was more comprehensive overall, it revealed LIT of various series of RME learning on each subtopic of fractions.

The target findings from this study is in the form of instructional design through RME approach, especially on the topic of fractions. The shape of the RME instructional design in the form of Hypothetical Learning Trajectory (HLT) has been compiled on each subtopic of fractions. All this HLT is arranged sequentially and systematically to produce more complete learning design of RME which is called the Local Instruction Theory (LIT) on the topic of fractions.

The urgency of this study consisted of: 1) the study of RME approach applied in learning; 2) the study of some HLT which was made based on various subtopics RME approach in fractions; 3) the study of the LIT on the topic systematically collected from the fragments of some HLT based RME approach; and 4) Mathematics school or college level that requires referral of this research to the development of mathematics.

This research is expected to contribute to the knowledge in providing input on the learning method matter in the form of the trajectory of activities on the topic of mathematics learning fractions. RME approach became basic guidelines for the trajectory of activities of this mathematical learning. In addition, there are some expected contributions to various parties including: 1) for the government, this study can be a reference for policy making; 2) for higher education, the results of this research can be used as a reference in order to increase the cooperation of faculty and students; 3) for the lecturer, it can be a reference in planning and implementing learning class; 4) for academicians, it can increase the ability of researching and can be used as a reference for other researchers; and 5) for the public, they gain new knowledge about mathematics education and how to implement RME approach.

II. METHOD

The research method of this study that will be discussed are: (a) research approach, (b) data collection including preparation phase, pre-teaching experiment, teaching experiment, post-test, validity and reliability; and (c) data analysis including pre-test, pre-teaching experiment, teaching experiment, and posttest.

The main object of this research is to investigate students' learning of understanding the concept of fraction. For this purpose, design research was chosen as an approach for achieving the research goals and answering the research questions. Reference [3] stated that design research is a type of research methods aimed to develop theories about both the process of learning and the means that are designed to support that learning. Therefore, in this research, a sequence of activities was designed as means to improve educational practices in understanding of fraction concept for prospective teachers.

According to [3], there are three phases of conducting a design experiment, as follows:

- Preliminary Design

In the preliminary design, the ideas which were implemented here, were inspired by studying the literature. A sequence of instructional activities containing conjectures of students' strategies and thinking was developed. The conjectured hypothetical learning trajectory was developed based on literature, adjusting the students' actual learning during the pilot and teaching experiment.

- *Teaching Experiment*

In the teaching experiment, instructional activities were tried, revised, and designed on a daily basis during the teaching experiment as in [12]. The teaching experiment is aimed at collecting data for answering the research questions. In this research, it was conducted through 150 minutes time allocation per meeting. Previously, the lecturer and the researcher discussed the upcoming activity. After each lesson ended, lecturer and researcher made a reflection in order to improve the designed activities.

- *Retrospective Analysis*

In the retrospective analysis, all the data collected during the teaching experiment were analyzed. The hypothetical learning trajectory was used as a guideline in answering the research questions; it was compared with students' actual learning.

A. Data Collection

1) Preparation Phase: In the preparation phase, the data collection was aimed to investigate pre-knowledge of students. It was collected by doing observation class, interview, and pre-test for all students. The information about students' pre-knowledge was used to fit the initial Hypothetical Learning Trajectory (HLT) considering the aspect of starting point of students. It could be adjusted before the first cycle was started. The classroom situation is also important to be concerned about how the learning process works in the class. It concerns about social norms and socio-mathematical norms. The data were collected during the lesson of the observation class; they were obtained from audio or video recording, and the researcher field notes. The researcher wrote the field notes based on the lists of the observation points.

2) Preliminary Teaching Experiment (first cycle): In the preliminary teaching experiment, the instructional activities were given to four students with respect to the differences in level of understanding (One student with high level, two students with middle level, and one student with low level) which were not different too far. The decision of choosing four students was expected to represent the ability of the other students. Four students who were selected were not from the observation class for the next following phase. In this phase, they would be taught by the researcher or one of mathematics teacher who would do teaching experiment later on; expecting that the lecturer would know better the learning trajectory before the second cycle of teaching experiment is began. During the learning process, it was recorded by one camera focusing to all students. The field notes was also taken by the researcher. The aim of the preliminary teaching experiment is collecting the data to support the adjustment of the initial HLT.

3) Teaching Experiment (second cycle): In the teaching experiment phase, the HLT which has been improved was tried out. It was given to all students in one class, but for the analysis of the experiment was focused on four students only (one group of four students). The data was gathered through two video recording, one camera, and field notes. One video recording was placed in the corner of the classroom in order to record most of the situation of learning process. And another video was placed in front of the group consisting of four students. Also, one camera was used to take some pictures of interesting moments related to the experiment, such as students' strategy when solving the problem. The researcher's role was as an observer and makes some notes; researcher focused to the group of four only. Moreover, the teaching experiment of the second cycle aimed to answer the research question.

4) Post-Test: In the post-test phase, the test was used to assess students' understanding after the lesson was done. This post-test can measure students' ability whether the lesson is succeeded or not. The test was in the written form consisting of 10 problems. The problems were in the same form with the pre-test. The post-test was given both in the first cycle and the second cycle at the end of the activities. Four students who were the focus of this study were interviewed to get deeper answer on the post-test problem. It was used to find out what their thinking and reasoning toward the problem. In this phase, the data were collected through one video recording (during the post-test and interview session) and field notes of researcher.

5) Validity and Reliability: In this study, the different types of data were involved, such as video observations, students' worksheet, field notes, and interview data. The method of triangulation data was done by involving different types of data. The triangulation data and also testing conjectures of the HLT during the teaching experiment contributed to the internal validity of the data. Data registration was more convincing that researcher works in a reliable way because the data was collected by different methods; collecting data by a video recording is more objective than making field notes.

B. Data Analysis

1) Pre-Test: In the pre-test phase, the result of pre-test data (the students' answers and calculation) was analyzed to investigate starting points of students in learning about fractions. The test result was expected to reveal students' prior knowledge about fractions; it could direct the HLT in such a way in order to make it appropriates for students.

2) Preliminary Teaching Experiment (first cycle): In the preliminary teaching experiment phase, the video recording and the students' worksheet were analyzed to find out the useful of the learning process. Officially there was a possibility that the conjectures of our HLT was not appropriate with the real situation. The HLT needed improvement because sometimes it fitted students in learning process and sometimes it did not appropriate for them.

3) Teaching Experiment (second cycle): In the teaching experiment phase, the video and the students' worksheet were analyzed; these four students were the focus. Their thinking and also their development from the beginning of the study until the end was analyzed. However, it was still possible to the other students to be analyzed as well. If there was a situation or a statement which was supported the learning process, it was possible that the other student would be included to be analyzed in this study.

4) Post-Test: In the post-test phase, the result of the test was analyzed to measure students' understanding after the lesson has finished. It could also be compared to the result of the pre-test finding out whether there was any improvement or not. The post-test aimed to investigate students' development in understanding the concept of fractions.

5) Reliability: In this study, the reliability of the data analysis covers two aspects, track-ability and inter-subjectivity. Giving a clear description on how the work on this study so that the readers easily understand the way of track-ability. The description contains the explanation of the process of how the preparation phase is done, how the teaching experiment phase (first and second cycle) happened, how the research analyzes the data; and also the conclusion. In addition, discussing with colleagues can avoid the researcher's own viewpoint toward data analysis; it is needed to attain inter-subjectivity.

C. Subject Research

This study was conducted on the first semester of the academic year 2016/2017. The subjects were the first-level of prospective teachers who signed the course of 'Kapita Selekta Matematika Pendidikan Dasar 1' in STKIP Garut. They were the students and the research subjects as well.

III. RESULTS AND ANALYSIS

A. Preliminary Research

The preliminary study was conducted by the researcher on prospective teachers in Mathematics Education STKIP Garut. The students are o the third semester and have taken the course of 'Kapita Selekta Matematika Pendidikan Dasar 1' in the first semester. They were used as the sample in this preliminary study. The aspects that were measured students' understanding of fractions in detail for each of its subtopics.

Based on the results of the preliminary study, the researcher analyzed the results of students' work on a few questions to reveal the difficulties they experienced. Tracing from the students work based on their understanding of fractions, some fundamental errors that should not be done by the prospective teachers were encountered. Students tend to answer the mathematics problems at a low level and some math problems could not be answered correctly. The students work showed that most students were still unable to think contextually on the formula or procedures. Therefore, when they were given formulas or procedures, the results did not cover the completion of the mathematics problems.

B. Initial Research

The core of a design research constitutes a cyclic process of designing instructional sequences, testing and revising them in classroom settings, and then analyzing the learning of the class so that the cycle of design, revision, and implementation could begin again as in [14]. This cyclic design could be started again for a couple of times to improve its implementation in a classroom setting. This is why researchers have done two cycles already, in academic year 2015/2016 and 2016/2017. It will also continue to the next academic year, 2017/2018.

In our study, this type of cyclic design has been implemented on fractions. Based on the result of the try out activity in the first phase of the design research, we did some revisions to change the order of the sequence activities and to add some activities. The result of revision was HLT II in learning fractions. The cycle of the design did not stop at HLT II because we continued the study to the second research. This second research was the initial research of this article. It will also become a grounded research for the next research cycle.

In this design research, there were three situations based on subtopic, i.e. fractions, decimals, and percentage. In addition, this study used some models that were related to the given subtopics, namely number line and percentage bar model. Accordingly, the given subtopics and model have raised contextual situations that obviously have important roles in the learning process.

Fig. 1. Students worked in groups

In the practice, the students were divided into a group of four (Fig. 1). They were given a worksheet in each group (Fig. 2). In the worksheet, there were some big problems needed to be solved and discussed in group. There were still some students in a class who found it difficult to give reason on their answers. They also felt afraid of making mistakes in answering the given questions and ashamed of committing the mistakes. However, it would not happen because the researchers let the students work in a small group of four. It allowed them to do a discussion in solving the problems and helped the understanding of the topic from their friends' explanation. The reform of learning and teaching mathematics based on RME apparently offers opportunities for students to discuss and construct recognizable contexts.

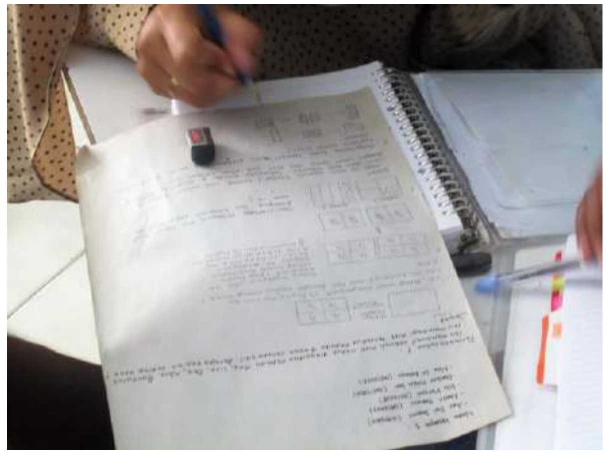

Fig. 2. Students' worksheet

The activities in our Hypothetical Learning Trajectory constituted a sequence of activities from the equivalence of fractions as the basic idea and then continued to explore decimals and percentages. Operations on fractions should be delayed until the concept of fractions and the ideas of the order and equivalence of fractions firmly established [6]. There were six main meetings in the research experiment, including the pre-test and post-test. The activities involved contextual problems for all subtopics and one educational game for decimal topic. Some of the activities were found to work out well as expected. The educational game of the decimal operation activity combined with the number line activity worked well (Fig. 3).

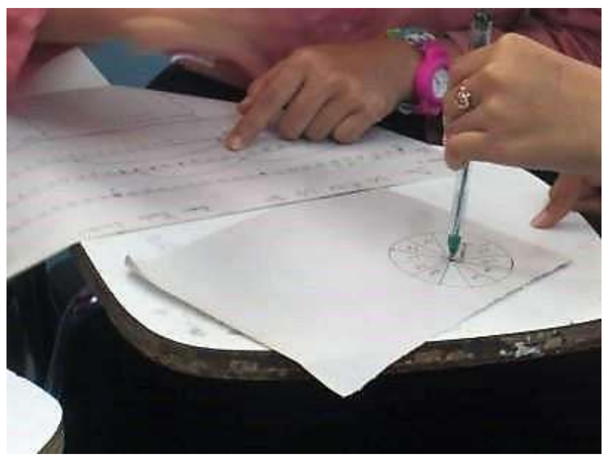

Fig. 3. One Educational game of decimals, 'Decimals Wheel'

The activities were inspired from the grounded research of International Master Program on Mathematics Education (IMPoME) students. The results of some IMPoME's research were taken to be used in learning; it succeeded to enhance students' ability of reasoning. This fact supports the researchers to use some of the result IMPoME's research.

Practically, students could experience with the contextual problems in each subtopics. On the first subtopic that was fractions, the researchers spent more than one meeting. The students were given some contextual problems of fractions. One of contextual problem was about the differences for two pieces of cake, the first cake was sliced three times to the same size vertically and the second cake was sliced two times vertically and horizontally of the same size.

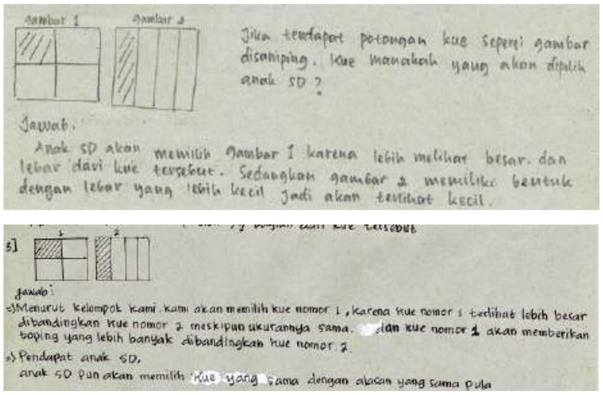

Fig. 4. Two examples of students' answer for fraction problem

There were different answers for the problem "What do you think of elementary students' choice for these two cakes? Which one will they choose?". From this problem, we took two students' answers which gave the same answer (Fig. 4). They answered that elementary students would choose cake number 1, because it seems bigger than cake number 2. From this point of view, we can see there is still problem for elementary students. They may choose one form when they have to compare two different forms although having the same size. They did not think of fractions, instead the form only.

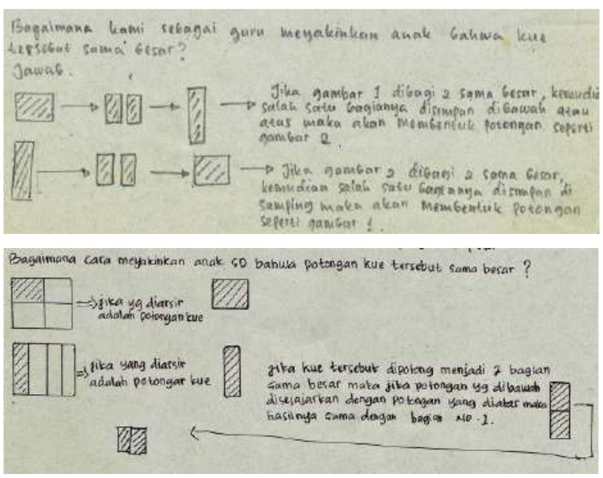

Fig. 5. The other two examples of students' answers for fractions problem

The next problem of fraction was still associated with the previous problem. However, prospective teachers were asked to find out the way they would explain so that the elementary students understand that the two different pieces of cake are the same (Fig. 5). From the two examples of students' answers, we can see these two small groups understand already. They have an easy way as real teachers to explain this problem to their future students. We provided one picture of one prospective teacher representative from her group. She tried to show an easy way explaining the problem as a teacher in front of elementary students (Fig. 6).

Fig. 6. One of the prospective teacher practiced her ability in explaining problem

One the second subtopic that was decimals, the researchers spent more than two meetings also. We not only provided contextual problem of decimals but also educational games of decimals. We expected our model for decimals, number line, could add students' understanding of decimals. The first problem that we gave to students as prospective teachers was the way they bring to elementary students about the existence of decimals. So we took the best answer for this problem (Fig. 7).

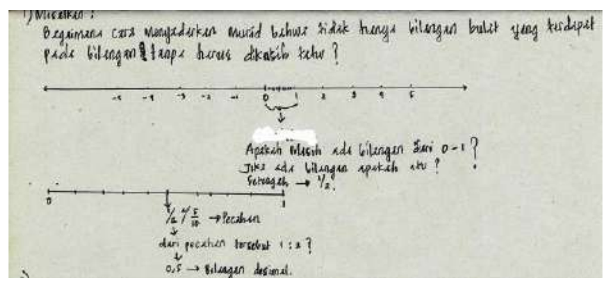

Fig. 7. One student group answer for the first problem of decimals

From the figure, it is seen that this student had a good way of thinking because she started from integer number system. She interpreted the number line and showed a problem. A problem is "What numbers that existed between integers that coincide with each other?". So the answer is not integers number, absolutely, but the other numbers, it can be fractions or decimals forms.

After giving some decimals problem to enhance students understanding of the decimals concept, we continued to an educational game of decimals. The name of the game is 'Decimals Wheel'. On the practice, each group found one representative from their group (Fig. 8). It could continue to find a champion in their class. We could see model for, number line, helped students to add decimals step by step. The number line was not only gave the picture of decimals addition but also constructed students thinking about decimals operation concept.

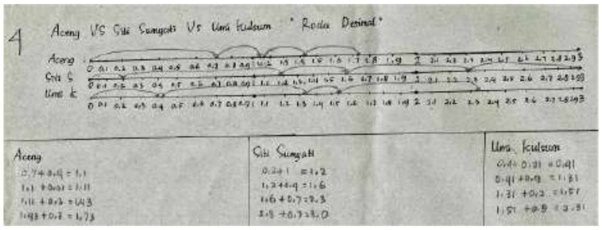

Fig. 8. Decimal wheel on one small group

After the game, we gave another contextual problem of decimals related to the decimals addition. We briefly took one example of the students' answer (Fig. 9). From the picture, we asked prospective teachers to give as many as possible answers that became elementary students' answer of thinking. This is useful for the prospective teachers to know from the start what the answer can be. So they can prepare a good answer or an easy explanation.

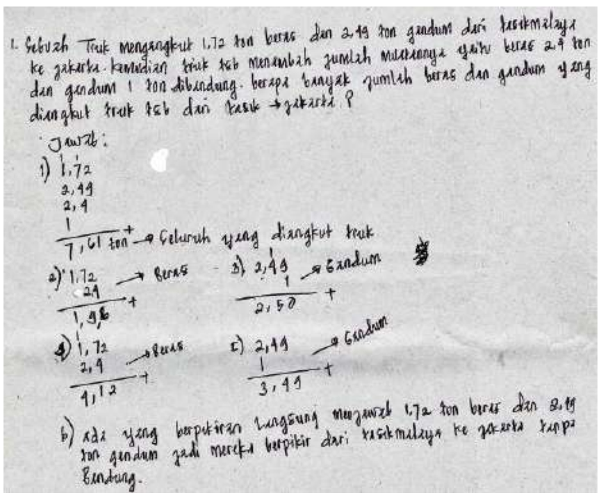

Fig. 9. One of the students' answer in solving contextual problem of decimals addition.

Finally, on the last subtopic that was percentages, we came up with the contextual percentage problem which provided with percentage bar as a model for. However, there were many different ways of answering from the students. We could call it as a 'model of'. On the figure 10, we tried to focus on number 2b.

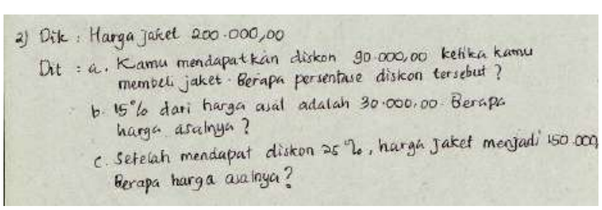
2) Dik : Harga jaket 200.000,00
Dit : a. Kamu mendapatkan diskon 90.000,00 ketika kamu membeli jaket. Berapa persentase diskon tersebut ?
b. 15% dari harga asal adalah 30.000,00. Berapa harga asalnya ?
c. Setelah mendapat diskon 25%, harga jaket menjadi 150.000 Berapa harga asalnya ?

Fig. 10. One example of contextual percentages problem.

On number 2b, the students were asked to find the real price of the jacket when there was a situation that 15% of the real price was Rp30.000. There were some different answers from prospective teachers showed on the figure (Fig. 11). We could see from the answers that the model of and model for percentages appeared. Therefore, prospective teachers' understanding of percentage were good enough, from the basic one till the existed complicated one.

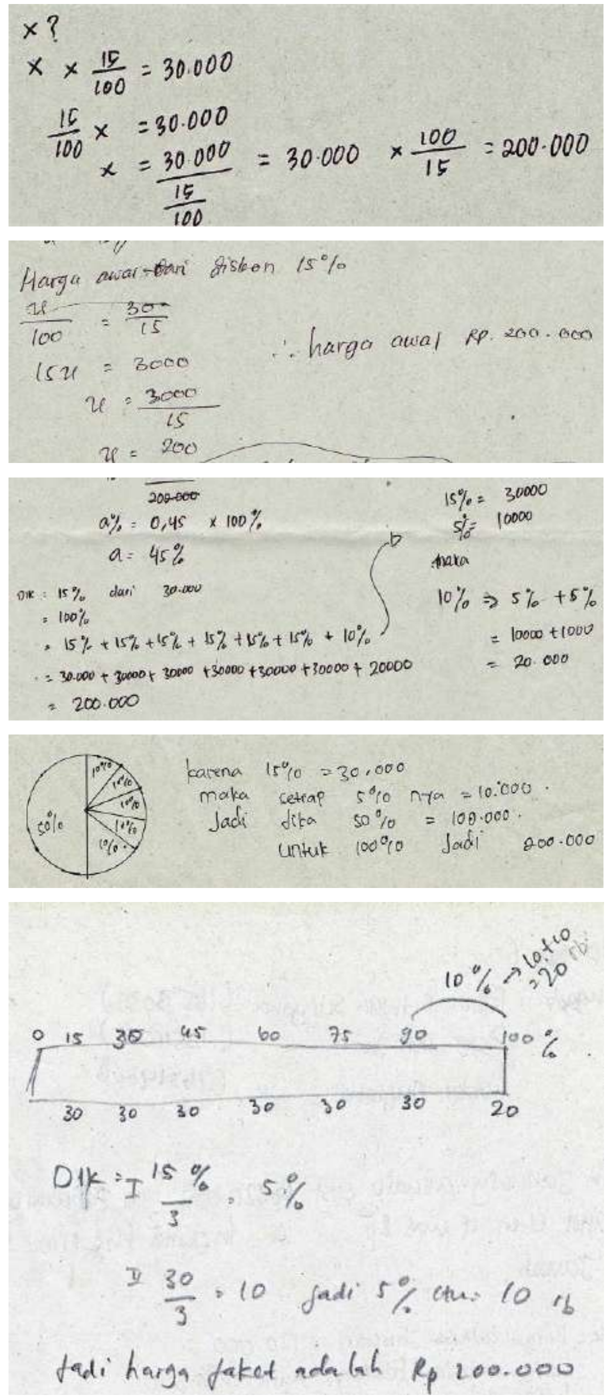

Fig. 11. Five students' answer for number 2b.

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Maximizing Students' Scientific Process Skill within Creative Product Design:

Creative Responsibility Based Learning

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***Abstract*—Physics learning has greatly contributed to the development of technology products. Why do most students face difficultly to design a product creatively? This paper describes the effectiveness of Creative Responsibility Based Learning (CRBL) to maximize the scientific process skill within creative product design. This research was conducted in four classes (physics, chemistry, biology, and science education) Universitas Lambung Mangkurat in 2016. Scientific process skill and creative product design data were obtained from the pre-test and post-test. The data were analyzed by using independent t-test, one-way ANOVA, Tukey test, and bivariate correlation. The t-value of scientific process skill was -13.156 and the t-value of creative product design was -12.640. It indicated that the average of pre-test and post-test was significantly different. The CRBL affected students' scientific process skill and creative product design. Tukey test results also indicated that all groups had no significant difference with one another. F-value of scientific process skill was 1.236 with sig 0.315, indicated that CRBL increased scientific process skill consistently. F-value of scientific process skill was 3.483 with sig 0.018, indicated that CRBL increased creative product design consistently. Bivariate correlation test indicated that there was a correlation between scientific process skill and students' creative product design. The correlation was 0.511. It was concluded that CRBL was effective to maximize the scientific process skill within creative product design. Furthermore, it is recommended that the way to make creative product design is implemented in the daily life.**

Keywords— Creative Product Design, Creative Responsibility Based Learning, Scientific Process Skill

I. INTRODUCTION

Physics is one of fields to which the phenomena or problems in it are related to the daily life [1]. It is the study of the nature matter, energy, symptoms, experienced objects in nature, as well as a foundation the development of science and technology in daily life. As a result, the physics university students must be accustomed to use the scientific process skill in designing any creative product to overcome the effects of the science and technology development. In fact, the scientific process skill has not been integrated in the learning process, so that students' creativity tends to be left [2]. Students face difficulties in making operational definition of variables, planning observational data table, planning experiment procedure, and drawing conclusion [3]. Students also find difficulties in using physics knowledge to design product creatively [4].

Scientific process skill (SPS) is included as an important aspect in physics learning [5]. Students can use the science process skills to construct science [6]. Understanding the SPS further strengthens the responsibility of students in their own learning process [7]. Some of the science process skills used by the scientists are as follows: formulating the problems; formulating the hypotheses; identifying variables; identifying operational variables definition; designing the data observation tables; designing the experimental procedures; conducting the experiments; analyzing the data; and drawing conclusion [6,8]. The science process skills contribute 40.1% to creativity development and rxy = 0.445 indicate a very significant correlation between the two variables [9]. Creativity in learning physics is often known by the scientific creativity [10]. Scientific creativity is defined as a kind of intellectual trait or ability to produce or potentially produce a certain product that is original and has social or personal value, designed with a certain purpose in mind, using given information [11]. Scientific creativity is different from general creativity since it is concerned to creative science experiments, creative scientific problem finding and solving, and creative science activity [11][12][13]. The result of scientific creativity is in the form of creative products [14]. Creative products do not have to be an object, but they can be ideas or papers, not necessarily new but can be the result of merging, altering, or adding existing ideas [15].

Various creative learning models can be used to maximize the scientific process skill to design creative products, one of which is Creative Responsibility Based Learning (CRBL) [16]. Creative responsibility means every individual has the responsibility to be creative and the resulting creative product must be individually and socially responsible. CRBL has been developed with the primary objective of increasing responsibility, science process skills, and scientific creativity of students. The responsibility is to do their best behavior during the learning process in terms of participation, respect for others, teamwork, leadership, and expression. Scientific knowledge is the knowledge gained by scientific methods. This method includes formulating the problem, formulating a hypothesis, defining variables, defining the operational definition of variables, creating tables and having experiments procedure, analyzing and drawing conclusions. Science creativity includes unusual uses, problem finding, product improvement, scientific imagination, creative science problem solving, creative experiment design, and creative product design [11][16][17]. CRBL development has a foundation of cognitive learning theory, complex cognitive processes theory, learning theory and social-cognitive constructivism theory [16]. Syntax of CRBL is summarized on Table 1 [16].

TABLE I. THE SYNTAX OF CRBL

Lecturer Activities	Student Activities
Phase 1: Generating student's creative responsibility	
1. Motivating students by asking unusual use questions. 2. Communicating the purpose of learning and the importance of the creative responsibility in life.	1. Providing answers to unusual use questions the given faculty. 2. Listening to the lecturers' explanation carefully to understand the purpose of learning and the importance of personal responsibility to be creative.
Phase 2: Organizing a creative learning needs	
1. Assisting students in understanding the logistics needed for the investigation. 2. Directing the students in the establishment of groups consists of 4-6 members and distributing the necessary logistics.	1. Trying to understand the prerequisites materials and logistics (equipment and material or media) needed for the investigation. 2. Participating actively in the establishment of the groups that consists of 4-6 members and ensuring that the group had received the necessary logistics.
Phase 3: Guiding Investigation Group	
Developing a student's sense of responsibility in the activities of the experiment and analyzing various sources of information referring to the worksheet to solve scientific problems creatively.	Trying to develop a sense of responsibility (participation, respect for others, teamwork, leadership, and expression) in understanding the problems of science, defined the formulation of the problem that they want to search, plan, and carry out experiments, and analyzing various resources to solve scientific problems creatively.
Phase 4: Establishing responsibility in showing scientific creativity	
Giving responsibility to the students to make some assessment of scientific creativity and its completion, and then discussing the results of the group's performance in front of the class.	Trying to accept and carry out the responsibility (participation, respect for others, teamwork, leadership, and expression) to make some assessment of the scientific creativity (unusual uses, problem finding, scientific imagination, product improvement, creative science problem solving, creative experiment designing, and creative product design) along with the settlement refers to examples of scientific creativity votes given, then presented the results of the group's performance in front of the class
Phase 5: Evaluation and Reflection	
Helping students to evaluate learning outcomes and learning process reflecting to its follow-up	Participating in the evaluation of understanding their scientific creativity and a responsibility, reflection of the learning process has done its follow-up.

CRBL requires learning environment investigations in a free, open, democratic and positive, involving as many scientific questions, appreciating the variety of products of imagination, innovation, and bravely accepting advice and criticism. This also provides the opportunity of cooperation and imagination to produce new and unique ideas in solving the problem. The implementation of CRBL facilitates students in solving problems, understanding the world they live in, adapting to changing societies, and designing new technologies to achieve goals [16].

II. METHOD

This is an educational research which was conducted in physics education, chemistry education, biology education, and science education of Universitas Lambung Mangkurat in 2016. This research was conducted in the fundamental physics course. The creative process was maximized by using a worksheet that can construct the scientific knowledge. This worksheet was developed based on the CRBL. Students creative process data were obtained based on the worksheet. The data were analyzed using independent t-test to determine the differences in the creative process of constructing scientific knowledge of before and after using the CRBL. Further, the difference between the creative process between one class and another was tested by using one-way ANOVA followed by Tukey test.

III. RESULTS AND DISCUSSION

A. *Studenst' Science Process Skill*

The data on the students' science process skill in this study were obtained from the pretest and posttest results. The entire scores of the four classes (physics education, chemistry education, biology education, and science education) were accumulated. The pretest result was compared to the posttest results using paired t-test. The following is the result of the paired t-test using SPSS 22.0 program.

TABLE II. THE STATISTICAL DESCRIPTION OF THE PRETEST AND POSTTEST SCORES

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	13.645	32	14.502	2.564
	Posttest	72.188	32	25.422	4.494

Table 2 is a statistical description of the pretest and posttest scores. The average pretest score was 13.65 with 14.5 standard deviation and 2.56 standard error of the mean. The average posttest score was 72.19 with a standard deviation of 25.42 and standard error of the mean of 4.49. The analysis showed that the average pretest score was higher than the average posttest score.

TABLE III. THE CORRELATION BETWEEN PRETEST AND POSTTEST

		N	Correlation	Sig.
Pair 1	Pretest & Posttest	32	.302	.093

Table 3 shows that the correlation between pretest and posttest was 0.302 with a sig. of 0.093. This shows that the correlation between the average score of pretest and posttest was strong and significant. The hypotheses of this analysis are:

H_o : the average scores of pretest and posttest are the same; H_1 : the average scores of pretest and posttest are different. The hypothesis test results are shown in Table 4 below.

TABLE IV. PAIRED DIFFERENCES BETWEEN PRETEST AND POSTTEST

		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre test - Post test	-58.5425	25.1713	4.4497	-67.6177	-49.4672	-13.156	31	.000

Table 4 shows that the t value was -13.156; with sig. 0,000. As the level of significance was <0.05, it can be concluded that H_o was rejected, meaning that the average scores of pretest and posttest were different. Thus, it can be stated that the CRBL model affected students in the science process skill of constructing scientific knowledge.

Based on this analysis, each phase in the CRBL student is able to maximize the science process skill. This can be seen from the increasing ability of students in formulating the problem, formulating a hypothesis, defining variables, defining the operational definition of variables, creating tables and experiments procedures, analyzing and drawing conclusions. Inquiry-based physics learning and fun activities aim to empower and motivate students to control their own learning [18].

TABLE V. STUDENTS' SCIENCE PROCESS SKILL IN EACH CLASS

	Mean	Std. Devia-tion	Std. Error	95% Confidence Interval for Mean		Min	Max
				Lower Bound	Upper Bound		
Physics education	.553	.218	.077	.371	.734	.23	.86
Science education	.669	.151	.054	.542	.795	.40	.92
Chemistry education	.718	.149	.053	.593	.842	.52	.91
Biology education	.638	.180	.064	.487	.788	.39	.90
Total	.644	.178	.032	.580	.708	.23	.92

Table 5 shows the description of the acquisition gain score in four classes. The table shows that the average gain score of chemistry education was the highest 0.7175. The difference between pretest and posttest scores in chemistry education the highest among the others.

TABLE VI. THE ANOVA TEST RESULT FOR THE SCIENCE PROCESS SKILL

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	.115	3	.038	1.236	.315
Within groups	.872	28	,031		
Total	.987	31			

The analysis using ANOVA aims to find whether there are differences in the average of science process skills in physical, science, chemistry, and biology education classes. The hypotheses are: Ho: The average of the entire population is identical; H_1: The average of the entire population is not identical. Table 6 shows that F was 1,236 with probability or sig 0.315. As the probability value <0.05, Ho was rejected. The conclusion of this test is that the four average classes are different. Despite getting the same treatment, the results obtained by the chemistry study program were the highest. While the gain score obtained by the physical education students was not too high. Nevertheless, it appears that in all four courses there was an increase in the score on pretest and posttest. CRBL has developed to enhance the science process skills and scientific creativity [19].

TABLE VII. COMPARISON OF GAIN SCORE IN EACH CLASS

	(I) Class	(J) Class	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	Physics Edu	Science	-.116	.088	.560	-.357	.125
		Chemistry	-.165	.088	.263	-.406	.076
		Biology	-.085	.088	.771	-.326	.156
	Natural Science Edu	Physics	.116	.088	.560	-.125	.357
		Chemistry	-.049	.088	.945	-.290	.192
		Biology	.031	.088	.984	-.210	.272
	Chemistry Edu	Physics	.165	.088	.263	-.076	.406
		Natural Science	.049	.088	.945	-.192	.290
		Biology	.080	.088	.801	-.161	.321
	Biology Edu	Physics	.085	.088	.771	-.156	.326
		Science	-.031	.088	.984	-.272	.210
		Chemistry	-.080	.088	.801	-.321	.161
LSD	Physics Edu	Science	-.116	.088	.198	-.297	.064
		Chemistry	-.165	.088	.072	-.346	.016
		Biology	-.085	.088	.344	-.266	.096
	Science Edu	Physics	.116	.088	.198	-.065	.297
		Chemistry	-.049	.088	.585	-.229	.132
		Biology	.031	.088	.726	-.149	.212
	Chemistry Edu	Physics	.165	.088	.072	-.016	.346
		Science	.049	.088	.585	-.132	.229
		Biology	.080	.088	.372	-.101	.261
	Biology Edu	Physics	.085	.088	.344	-.096	.266
		Science	-.031	.088	.726	-.212	.149
		Chemistry	-.080	.088	.372	-.261	.101

Homogeneous Subset in table 8 shows which groups have different meanings that do not differ significantly. The following table shows the Homogeneous Subsets data.

TABLE VIII. HOMOGENEOUS SUBSET OF STUDENTS' SCIENCE PROCESS SKILLS

	Class	N	Subset for alpha = 0.05
			1
Tukey HSD[a]	Physics Edu	8	.553
	Biology Edu	8	.638
	Science Edu	8	.669
	Chemistry Edu	8	.718
	Sig.		.263
Means for groups in homogeneous subsets are displayed.			
a. Uses Harmonic Mean Sample Size = 8,000.			

Table 8 shows that all groups did not show any significant difference to each other. This suggests that the results obtained by the four courses after applying the CRBL are the same. The probability value was 0.263. Since there was no difference, the CRBL model had the same effect on all sample groups. This means that the CRBL is able to maximize students' science process skills. The CRBL motivates students to try to cultivate a sense of responsibility (participate, respect others, cooperate, lead, express opinions, and solicit help) in understanding science issues, naming as many problems as possible and isolating any formulation of issues to investigate, conduct experiments, as well as review various sources of information to solve scientific problems creatively. Important recommendations of self-regulation, depth instruction in the exploration, openness of ideas, evaluate ideas, and increased attention to the nature of contemporary science and its application is an important part in the development of characteristics model. The cognitivist and constructivism views have been applied through analyzing the activity of the task, managing gradual problem solving, setting goals and measuring performance based on objectives, and promoting a learning experience that is more open [19].

B. Students' Creative Product Design

The data on students' creative product design were obtained from the pretest and posttest results. All classes scores were accumulated. The pretest result was compared to the results of the posttest using paired t-test. The result of the paired t-test using SPSS 22.0 program is as follows.

TABLE IX. THE STATISTICAL DESCRIPTION OF THE PRETEST AND POSTTEST SCORES

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest creative product design	4.7667	120	2.161	.197
	Posttest creative product design	7.9667	120	3.202	.292

Table 9 shows the average pretest score was 4.7667 with the standard deviation of 2.1605 and the standard error of the mean of 0.1972 . The average posttest score was 7.9667with the standard deviation of 3.2017 and the standard error of the mean of 0. 2923. The analysis showed that the average pretest score was higher than the average score of posttest.

TABLE X. CORRELATION BETWEEN PRETEST AND POSTTEST

		N	Correlation	Sig.
Pair 1	Pretest & posttest creatively product design	120	.522	.000

Table 10 shows that the correlation between pretest and posttest was 0.522 with a sig. of 0.000. This shows that the correlation between the average score of pretest and posttest is also strong and significant. The hypotheses of this analysis are: H_o : the average scores of pretest and posttest are the same; H_1 : the average scores of pretest and posttest are different. The hypothesis test results shown in the table below:

TABLE XI. THE PAIRED DIFFERENCES BETWEEN PRETEST AND POSTTEST

		Paired Differences					t	Sig. (2-tailed)
		Mean	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*			
					Lower	*Upper*		
Pair 1	Pretest-posttest creative product design	-3.200	2.773	.253	-3.701	-2.699	2.640	.000

The t value was -12.640; with sig. 0.000. It can be concluded that H_o was rejected, meaning that the average score of pretest and posttest is different. Thus, the CRBL affects the students in the creative product design. Based on this analysis, each phase in the CRBL student is able to maximize the creative product design. Competency framework of the 21st century has not only mastered the core subject, but also included the learning skills and innovation (critical thinking, communication, collaboration, and creativity), life skills and career (flexible and adaptive, initiative and independence, social skills and cultural, productive and accountability, leadership and responsibility), skills in using information, media, and technology [20]. The CRBL is able to influence the creative process of students in constructing scientific knowledge. The application of CRBL is able to increase the quality of the learning process and the quality of higher education graduates. The learning process has been able to provide space for the development of creativity, initiative, personality, and self-reliance in the search for and find the knowledge [21].

TABLE XII. STUDENTS' CREATIVE PRODUCT DESIGN SKILL IN EACH CLASS

	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
				Lower Bound	*Upper Bound*		
Physics Edu	1.848	1.840	.336	1.161	2.535	-2.33	5.94
Science Edu	2.941	3.530	.644	1.623	4.259	-4.50	8.89
Chemistry Edu	2.844	2.761	.504	1.814	3.875	-1.28	9.89
Biology Edu	4.107	2.446	.447	3.194	5.021	-.39	8.72
Total	2.935	2.797	.255	2.430	3.441	-4.50	9.89

Table 12 shows the description of the acquisition gain score in four classes. The table shows that the average gain score of biology education class was the highest with 4.1074. This shows that the difference between pretest and posttest scores in biology education was the highest among the others.

TABLE XIII. RESULTS OF ANOVA TEST FOR THE CREATIVE PRODUCT DESIGN

	Sum of Squares	Df	Mean Square	F	Sig.
Between groups	76.921	3	25.640	3.483	.018
Within groups	853.927	116	7.361		
Total	930.848	119			

The analysis of using ANOVA aims to find whether there are differences in the average of science process skills in physical education classes, science, chemistry, and biology. The hypotheses for this case are: H_o: the four average populations are identical; H_1: The four average populations are not identical. Table 13 shows that F was 3.483 with probability or sig. 0.018. Because the probability value <0.05, then Ho was rejected. The conclusion of this test is that the four average courses were different. Nevertheless, it appears that in all four courses there was an increase in the score on pretest and posttest. CRBL has been developed not only to enhance the science process skills, and scientific creativity, but also the attitude of student responsibility that will contribute directly to the development of scientific creativity [19]. Here is the comparison of gain score on each course.

TABLE XIV. COMPARISON OF GAIN SCORE IN EACH STUDY PROGRAM

	(I) Class	(J) Class	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	*Upper Bound*
Tukey HSD	Physics Edu	Science	-1.093	.701	.406	-2.919	.734
		Chemistry	-.996	.701	.488	-2.822	.830
		Biology	-2.259*	.701	.009	-4.085	-.433
	Science Edu	Physics	1.093	.701	.406	-.734	2.919
		Chemistry	.096	.701	.999	-1.730	1.922
		Biology	-1.167	.701	.347	-2.993	.659
	Chemistry Edu	Physics	.996	.701	.488	-.830	2.822
		Science	-.096	.701	.999	-1.922	1.730
		Biology	-1.263	.701	.277	-3.089	.563
	Biology Edu	Physics	2.259*	.701	.009	.433	4.085
		Science	1.167	.701	.347	-.659	2.993
		Chemistry	1,263	.701	.277	-.563	3.089
LSD	Physics Edu	Science	-1.093	.701	.122	-2.480	.295
		Chemistry	-.996	.701	.158	-2.384	.391
		Biology	-2.259*	.701	.002	-3.647	-.872
	Science Edu	Physics	1.093	.701	.122	-.295	2.480
		Chemistry	.096	.701	.891	-1.291	1.484
		Biology	-1.167	.701	.099	-2.554	.221
	Chemistry Edu	Physics	.996	.701	.158	-.391	2.384
		Science	-.096	.701	.891	-1.484	1.291
		Biology	-1.263	.701	.074	-2.650	.125
	Biology Edu	Physics	2.259*	.701	.002	.872	3.647
		Science	1.167	.701	.099	-.221	2.554
		Chemistry	1.263	.701	.074	-.125	2.651

*. The mean difference is significant at the 0.05 level.

Homogeneous Subset in Table 14 shows which groups have different meanings that do not differ significantly. The following table shows Homogeneous Subsets.

TABLE XV. HOMOGENEOUS SUBSET OF STUDENT'S CREATIVELY PRODUCT DESIGN SKILL

	Class	N	Subset for alpha = 0.05	
			1	*2*
Tukey HSD[a]	Physics Edu	30	1.8481	
	Chemistry Edu	30	2.8444	2.8444
	Science Edu	30	2.9407	2.9407
	Biology Edu	30		4.1074
	Sig.		.406	.277

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 30,000.

The table shows that the whole group had no significant differences with each other. This suggests that the results obtained by the four courses after applying the CRBL are the same. Because there was no difference, the CRBL model had the same effect on the entire sample group. This means that CRBL is able to maximize student's creatively product design skill.

C. Student's Scientific Process Skill Within Creatively Product Designing

The next stage of analysis is to find the correlation relationship between the results of scientific process skill and creative product design. The correlation results are shown in Table 16.

TABLE XVI. CORRELATION BETWEEN THE RESULTS OF SCIENTIFIC PROCESS SKILL AND CREATIVE PRODUCT DESIGNING

		Creatively Product Design	Scientific Process Skill
CREATIVELY PRODUCT DESIGN	Pearson Correlation	1	.511
	Sig. (2-tailed)		.489
	N	4	4
SCIENTIFIC PROCESS SKILL	Pearson Correlation	.511	1
	Sig. (2-tailed)	.489	
	N	4	4

Bivariate correlation test shows that there is a correlation between science process skill and creative product design. The correlation is 0,511. However, it is not significant. This shows that *CRBL* is able to maximize the scientific process skill, and with this increase, students' creative product design can also be maximized. CRBL requires learning environment investigations in a free, open, democratic and positive, involving as many scientific questions, appreciate the variety of products of imagination, innovation bravely accept advice and criticism. This model also provides the opportunity of cooperation and imagination to produce new and unique ideas in solving the problem. The application of CRBL is able to increase the quality of the learning process and the quality of higher education graduates. The learning process has been able to provide space for the development of creativity, initiative, personality, and self-reliance in the search for and find the knowledge [21]. The graduates of higher education have the responsibility to master the scientific fields and apply them in solving problems and adapt to the situation at hand [22].

IV. CONCLUSION

The obtained conclusion is that CRBL is able to maximize the scientific process skill within the creative product design. Based on the descriptive statistical analysis, it is seen that the CRBL affects students' science process skill and creative product designing. Tukey test results also indicated that all groups had no significant difference with one another. The F-value of scientific process skill was 1.236 with sig. 0.315, indicated that CRBL increasing science process skill consistently. F-value of scientific process skill was 3.483 with sig. 0.018, indicated that CRBL increased creative product designing consistently. Bivariate correlation test indicate that there is a correlation between science process skill dan cretive product designing. The correlation is 0.511. Furthermore, it is recommended that the way to make creative product design for students is implemented in the daily life.

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The Effect of Outdoor Study on the Geography Scientific Paper Writing Ability to Construct Student Character in Senior High School

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***Abstract*— Education and character are two important things related to each other. National curriculum includes the characters that need to be understood and implemented the Indonesian students. Teachers can build the students' character by using method that includes structured character activities. Scientific paper is a product that needs to be improved for the sake of implementing National curriculum. Students' characters can be observed from writing scientific paper. Outdoor study method can set out the students' characters through the steps of learning and scientific paper which becomes the final product. Outdoor activities can be conducted on Geography subjects because geographic objects exist in the world. The aim of this paper is to discuss the effect of outdoor study on the geography scientific paper writing ability to build the students' characters in senior high school. The research uses quasi experimental design with two groups, namely experimental class and control class. The analysis data uses independent sample t-test with SPSS 16.0. The research findings show that there is an effect of outdoor study on the geography scientific paper writing ability to build the students' characters with significant value of 0.00. The effect can be seen in the scientific paper results and activities in the outdoor study step of learning such as: class preparation, area selection, group dynamics, equipment management in the field, outdoor work, return in the classroom, and student final report. Characters can be constructed are: honesty, discipline, responsibility, caring, politenes, environmental awareness, cooperative behaviour, responsiveness, and independence.**

Keywords—Character, Outdoor Study, Scientific Paper

I. INTRODUCTION

Outdoor study is also called by various terms such as outdoor learning, outdoor activities, field learning, and learning outside the classroom. Outdoor study is an activity outside the classroom to make learning interesting and fun. It can be done anywhere with emphasis on the learning process based on the fact that learning materials are directly experienced. Reference [1], outside the classroom education is defined as education that goes outside the classroom involving experience.

Outdoor study has strengths and weaknesses. There are four types of strengths of the outdoor study related to scientific paper writing. Firstly, it uncovers the facts and obtains data by empirical observation in the field. In conducting outdoor study, teachers ask the students to visit places with certain geographic objects. Facts and data found in these objects are important parts of paper wariting on geography. Reference [2] scientific papers are produced primarily based on data and facts that they (students) have encountered in the field.

Secondly, outdoor study can encourage the student's motivation. Encouragement of learning motivation arises from directly interacting with geographical objects. This is due to something that does not contain in the book can be direcly observed in the field, so that it raises the student's curiosity. Curiosity encourages students to seek answers or work harder to complete the scientific paper. According [3], the advantage of environmental study in learning is more interesting. This can improve the students' motivation..

Thirdly, outdoor study makes into the students' learning more meaningful. Meaningful learning occurs when the students can understand the importance of science for the real life. Fourthly, outdoor study method is suitable to be applied on the Geography subject because the geographic material objects or geosphere phenomenon are available in the field. Learning experience and suitability of outdoor study on Geography subject make the students easily find the idea to be written in their scientific papers. Reference [3], that there are many advantages that be obtained from field study activity (particularly environmental study), one of which is the essence of learning that is more meaningful because the students are faced with the situation and the real condition. Reference [4], outdoor study can make the persons not be strange with their surrounding environments, and can direct their friendly attitude to the nature, and maintain its sustainability. Referene [3] states that for a geographer, a field work is a key component to understand the object. That is an important element in planning the geography curriculum with the base of outdoor activity and environmental education.

There are two weaknesses of outdoor study. Firstly, the teacher finds it difficult in organizing learning process in the field. Secondly, this kind of learning needs much travel cost. To overcome the problems, it is necessary for the teacher to organize learning in the field in such a way that the students are motivated in their study. This can be conducted based on the organized activities completed with observation sheet, documentation, interview guides, tools, and schedule of activities. To overcome the problem in the travel cost, the teacher may determine the objects of field study not far from school. Reference [5] states that a planning plays an important role; without a good planning a field study is not better learning in the classroom.

In conducting a field study, the teacher may determine the steps for organizing the field study or outdoor learning. There are several steps. In general, outdoor learning steps are same as one and another. The researchers choose [6] as a reference guide. These are: class preparation, area selection, group dynamics, equipment management in the field, outdoor work, being back to the classroom, and students' final report. The other types of steps are stated in reference 7], including: preparation, implementation, and evaluation.

Scientific paper includes in the paper work which becomes an important product and should exist in the implementation of scientific approach in National curriculum. In Geography subject, there are some topics to produce a paper work, as those in XI grade in the matters of natural resources, population, and environtment preservation. This ability is important for students to participate in scientific writing competition. The champion certificates could improve the school name, school accreditation, and supplementary documents in National Selection of Students in State Higher Education (SNMPTN.)

The selected matter in research is the environment. Environment in this case is the zone karst hills of Kendeng near the school location. The locations selected as the objects are two areas representing damage and environmental preservation of karst hills so that the students can compare the good and bad efforts. The teacher can construct students' characters using the outdoor study method that contains structured character activities. Outdoor study method can construct students' character through the steps of learning and scientific paper into the final product. Students' characters can be observed from writing scientific paper. Good efforts on the environment can improve the environmental awareness character. Other characters also can arise when students apply outdoor study method as directed by the teacher. According to [8], one of efforts to handle human with low environmental awareness can conducted with guidance to the community (including students) through formal education.

II. METHOD

This research applied quantitative methodology with quasi experimental type. Quasi-experimental research design is nonequivalent control group design. It was chosen because it has two groups that were not selected randomly. Subjects in this research were students of grade XI IIS Senior High School Muhammadiyah 1 Babat, Lamongan second semester of academic year 2015/2016, consisting of XI IIS 1 and XI IIS 2. The researcher set purposively XI IIS 1 as an experimental class and XI IIS 2 as class control based on the same abilities (geography final score of previous semester). Reference [9], states that in the nonequivalent control group design, the experimental group and control group are not chosen randomly.

Experimental class and control class get different application methods. The experimental class get treatment using outdoor study method (observation, interviews, and media map). The control class get the treatment using conventional methods (lectures, discussion, question and answer, and media images and maps).

The research instruments in this research are guidelines and assessment of scientific paper writing. The guidelines are to measure the effect of outdoor study method related to students' scientific paper quality. Paper work guidelines and assessment aspects are based on scientific writing competition of Senior High School level in UM XII Anniversary 2014. The weight of every assessment aspect, scoring, and criteria are based on the guidelines of students' creativity program 2014 to be modified.

The data collected in this research are primary and secondary data. The primary data is scientific paper writing ability on geography. Secondary data is a list of students' scores in the last semester and information about the school. Data collection in experimental and control classes was conducted by geography teacher of grade XI IIS Senior High School Muhammadiyah 1 Babat. The researcher conducted observation, and prepared lesson plans and research instruments. Data collection was carried out for six weeks.

The analysis data used parametric inferential statistics, including test precondition analysis and hypothesis test. Test precondition analysis consists of normality and homogeneity tests. Normality test used to determine whether the gain score is normally distributed or not, using one-sample Kolmogorov Smilnrov with SPSS 16.0 for Windows at significance level of 0.05. Homogeneity test used to determine whether the gain score is homogeneous or not, using Levene's test with SPSS 16.0 for Windows at significance level of 0.05. The hypothesis test used the independent sample t-test with SPSS 16.0 for Windows at significance level of 0.05.

III. FINDINGS AND DISCUSSION

A. *Findings*

The test precondition analysis result shows that the gain score is normal distributed with significance value = 0.183 in experimental class and 0.924 in control class. The gain score is also homogeneous with significant value = 0.143. This result means that the gain score qualifies to analyze with parametric inferential statistics. The research results show that the significant value is 0.000. The significance value <0.05 so that H0 is rejected. The research results indicate that there was an effect of outdoor study method on the students' scientific paper writing ability. The initial and final data about students' scientific paper writing ability in experimental class and control class can be seen in Table 1 .

TABLE I. THE STUDENT EARLY AND FINAL SCIENTIFIC PAPER WRITING ABILITY

Criteria	Score Range	Control Class				Experimental Class			
		Early		Final		Early		Final	
		f	%	f	%	f	%	f	%
Bad	0-100	0	0	0	0	0	0	0	0
Very Less	101-200	0	0	0	0	0	0	0	0
Less	201-300	9	25	4	11	11	31	0	0
Enough	301-400	21	58	23	64	20	57	0	0
Good	401-500	6	17	9	25	4	12	29	83
Very Good	501-600	0	0	0	0	0	0	6	17
Perfect	601-700	0	0	0	0	0	0	0	0
Total		36	100	36	100	35	100	35	100

Table I shows that the final data in the experimental class spread out on good and very good criteria. Students in experimental class do not get the scores in less and fair criteria as those in their initial ability. Final data of control class are distributed into less, fair, and good criteria. Students in control class get the scores in less criteria although the amount reduce (5 students). There were still many students in control class who remain in fair criteria (23 students), and those who are in good criteria increased (3 students). The final scientific paper writing ability results in control class is almost the same as the initial one. The data distribution indicates that there are differences between experimental and control class.

From the observation data and explanations above it can be concluded that the student scientific paper writing ability in experimental class is higher than control class. The average early scientific paper writing ability, control class and experimental class have almost the same scores, even control class is better than experimental class. Final scientific paper writing ability results show the opposite, that is experimental class is better than control class. This indicates that the use outdoor study method has better effect on the students' scientific paper writing ability.

The outdoor study learning method can be well followed by the students. Learning process is in accordance with the of the outdoor study. Students receive guidance from teachers at every step through the provided instruments. Each step gets good response from the students, especially in the step of outdoor work. Students are glas to conduct observations and interviews in the field. In the control class, learning activities are dominated by the use of books and the internet. This only give a little effect on scientific paper writing.

Characters covered in competency standard of National curriculum, are: honesty, discipline, responsibility, care, politeness, environmental awareness, mutual cooperation, cooperation, peace-love, responsiveness, pro-active attitude, and independence. Characters constructed during the implementation of the outdoor study, include: honesty, discipline, responsibility, care, politeness, environment awareness, cooperative behaviour, responsiveness, and independence. This shows that the outdoor study covers 75% of the characters in the basic competence. These characters are seen while following learning stages and students' scientific paper. The implementation of the method which can embed the characters can construct the good students' characters permanently.

B. Discussion

1) The Effect of Outdoor Study on the Geography Scientific Paper Writing Ability

Outdor study method has a significant effect on the students' scientific paper writing ability. It is also reflected in the learning steps during the time of research. Each step links to students' scientific paper writing ability. The first step is class preparation, in which the students' activities are prepared to study or understand the material, the instruments, and the use of the equipments by themselves. Students also begen to plan how to communicate the report (scientific papers). All activities aim to make students able to analyze the damage, preservation, and environmental preservation solutions on karst hills in the form of scientific papers. Students also learn the list of activities during outdoor study. Reference [7], in planning the field study it is necessary to consider what the product that will be made and what experience that will be obtained by the students.

The scientific paper is product made by students. Initial planning is meant to make students more systematic in writing scientific paper. Second, the step of area selection is meant to make students know the location that will be observed. Students understand the focus that will be observed (physical and social environments). The physical condition is integrity form and uniqueness of karst hills observed directly by students. Social condition is the human action on karst hills, done by whom, and what the motive. Both of these are well understood by students. The scientific papers produced by them contain location and physical and social aspects of the research object/subject. Reference [7] stated that the object of study on geography is about earth surface and all processes happened and the influence or human interaction factor.

The third step is to make group dynamics. The students are divided independently. They are led by class chairman to be divided into small groups for collecting data (interview). Group dynamics functions to make data collection (interview) more effective. Group work also continue in discussion session after outdoor work to process the data. The results of data processing are described individually in each scientific paper.

The fourth step is equipment management in the field. The students understand and practice using the instruments that will be used. Students understand the meaning of the questions in the interview guides and do exercises with friends of their group using the Java language. The second activity will be defined, prepared, and practiced using the equipments used (HCl, pipettes, and cameras). The fourth step is to make students understand more about the research method reflected in their scientific paper. Students also use the test result on karst rock in part of literature study. The second part (method and literature study) achieves the largest increase in the second and third positions with 30.57 and 25.28 point.

The fifth step of outdoor work is that students collect the data and observe the facts on the field. They collect the data through interview and observation. When observing, at the same, they conduct the test on karst rock. The observation on the hill is directly conducted. In the process of observation, they also take the picture of the hill. Each group interviews to one miner and one community (village head, village elders, sellers, and people around the hill) at the second location. Observation and interview take 1.5 hours.

The sixth step of the field study is that the students come back to the classroom and then they make final report. They make scientific paper related to environmental damage and preservation of karst hills. Their activities in this step starts from processing the data and formulating research methods from what they have experienced. They present the results of the field study in scientific paper, combined with knowledge they obtained in the classroom. In this step, they pass through two meaningful learning dimensions, that are: inputing the knowledge gained by themselves under teacher's guidance, and linking it to existing knowledge. Reference [10] states that the meaningful learning is a process of tying new information on the concepts relevant to a person's cognitive structure. Reference [11] states that the learning process outside the classroom can provide direct experience so that lesson is more concrete and real. It means that learning activities are more meaningful.

Teacher's duty is to give assistance and at the same time to observe the students' activities in the paper writing process. The results of the whole steps show are said to get better. Facts and data are presented in the students' academic paper from introduction, literature study, and to the results and discussion. The fourth section proves the highest increase in experimental class.

2) *The Effect of Outdoor Study on the Scientific Paper Writing Ability on Geography to Construct Students' Character*

The characters are improving better while attending the steps of learning during the outdoor study and scientific paper writing. These are: honesty, discipline, responsibility, care, politeness, environment awareness, cooperative behaviour, responsiveness, and independence. Honest is reflected in the step of outdoor work, when the students collect data. In data collecting, they are not fully supervised by teachers. The teachers just give a guidance and directed and they do not participate in the activities of interviews. In the efforts to control and to save time, the teachers divide the students into small groups. Reference [7] states that the number of members in each group must be considered to determine the effectiveness of the data that should be collected.

Character of *discipline* is reflected in submitting the students' scietific papers. They submit their papers in accordance with the determined time. They have high spirits to complete their scientific papers as final reports. The students' interest affects their performance in completing the scientific papers. The process of completing those papers becomes more organized as the effort to reach the target. Reference [12] states that PjBL including field study makes the students' performance in completing scientific paper more organized. Reference [13] states that the physical, mental, and emotional involvement encourages the willingness, ability, high curiosity, and at the same, functions as the effort to improve quality of learning outcomes.

Character of *responsibility* can seen when a group of students present and defend the findings of field study as written in their scientific papers to another one. Students are responsible in the academic processes: collecting data and relating the data to their knowledge. In answering the questions from other group, the students show their responsibility. Reference [5] states that the students' learning activities are more comprehensive and active when conducted through the outdoor study because it can be done in various ways. One of which is prove and test the facts that have been processed.

Care is one of the characters arising from students to directly see the problems in the mining of karst hills. The charater of care is reflected in scientific paper on geography in the form of solutions related to miners' welfare. Mining occurs because people do not other alternative jobs. The students propose solutions to resolve the problem, that the government should provide jobs for the miners. This shows that the outdoor study can improve students' social sensitivity level while observing the human element in the object of field study. Reference [14] states that outdoor study can be an effective method in helping the overall students' development, including: physical-motoric, socio-emotional and cultural, and intellectual development.

Courtesy is an important character to be built in Indonesia. Indonesian people are known to be polite by the international community. Students' courtesy is reflected when they conducted the interviews with the miners and also conservationists as the effort to collect data and facts in the field study. Each group interviews one miner and one conservationist om the karst hills. The use of the "*krama inggil* in Javanese language" shows the good manner in communication and interaction to the older people. Reference [12] states that students collect data from the field through observations and interviews with good manners can make their scientific paper better.

Observations and interviews in the field made the students more aware of the surrounding environment. It can improve the character of environment awareness. This character is reflected in the students' scientific paper in the form of explanation on the environmental damage. They state that the environmental destruction should be avoided. Activity of conservation as a good behavior should be continually maintained. Preservative solution implies behavior of environmental awareness, such as: tightening the permits of karst mining, planting fast-growing trees, expanding green areas, making the guarding team of green hills, and determining penalties for hill destroyers. Reference [15] states that the outdoor study makes students more familiar with the environment. Reference [9] states that one of the ways to control environmental damage is by ethiques determined for maintaining the environment. The ethiques are expected to have good impact for building the community's (including students') characters.

Character of cooperation is reflected when the students work in groups to collect, process, and present the data. They work in small groups to accomplish their duties together. Teachers can assess whether or not the students work in groups based on their compactness during the process of field study. Compactness also can be assessed by the group coordinator by noting them as passive members. Reference [5] states that the students' learning activities through the outdoor study are more comprehensive and active due to their group working.

Responsiveness expreses a thought to respond problems quickly. This responsiveness is reflected in the students' academic writing, that the ex-mining area is proposed to be a tourism determination area. This can be said an effort to stop the damage and increase the welfare of the local population. This is based on the reason that the rest of the hill due to mining activities form a beautiful cliff. The students' idea shows their response toward miners who still operate without permit due to not having a job. The tourist determination area can be made by the ex-miners as for the trading area. Here, they can sell food, drinks, and other merchandise.

Independence character can be seen from all the outdoor study steps. Teachers act as a motivator and facilitator. Students work independently in collecting data and making scientific paper. Observations are also independently conducted; the teachers just give motivation and guidance during observations. During the interview, the students are given the interview guidelines. Observation and interview guidelines function as the students' working indicator, so that the teachers do not need to monitor one by one. Reference [16] states that the application of outdoor study implies that the teachers are not necessary to monitor too much due to all the students work independently in groups.

IV. CONCLUSIONS AND SUGGESTIONS

A. Conclusions

The result of research shows that there is an effect of the outdoor study in building the students' characters as reflected in the steps of the field study and in the students' scientific papers on geography in senior high school with significance value of 0.00. Characters reflected are: honesty, discipline, responsibility, care, politeness, environmental awareness, cooperative behaviour, responsiveness, and independence. The teacher can build the students' characters through the outdoor study based on the structured character building activities.

B. Suggestion

When a teacher will conduct an outdoor study as an alternative method to train the students in writing scientific papers, it is suggested to set up an instrument as a controlling means for the students' activities in the field. The instrument covers the schedule of outdoor study, equipment (including cameras), and interview guides. Interview guidelines is suggested to developed by the teacher based on the problems in location of the field study. This instrument is useful as controlling means for the students' activities.

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The Development of A Handout on Eubacteria Concept for High School

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***Abstract*—In regard to Eubacteria, basic competencies in Biology for tenth grade students include the ability to provide data on characters and roles of bacteria in life. Amongst the disadvantages of bacteria as exemplified by *Escherichia coli* is as the agent of human diseases. One way to overcome bacterial infection is by using natural products. The present study was focused on the development of a handout for providing information based on existing data on the sensitivity of *Escherichia coli* to gandaria (*Bouea macrophylla*) seed. This study applied a research and development approach as proposed by Borg & Gall (2006) up to product revision step. The results showed that the overall validity of the handout was very high (82,28%), including the content (81.25%), presentation (80%), and language (85,58%) aspects. For the aspect of the readability, students suggested that the handout was highly readable (83%).**

Keywords—Bouea Macrophylla, Development of A Handout, Eubacteria, Sensitivity Of Escherichia Coli

I. INTRODUCTION

Based on the 2013 curriculum syllabus revision in 2016 issued by the Indonesian Ministry of Education and Culture [1], Biology has 11 basic competencies that must be mastered by students in class X of SMA/MA (junior high school) within 2 (two) semesters. One material that must be mastered by the students in class X in the first semester is about archaebacteria and eubacteria. In the curriculum, students are required to learn about archaebacteria and eubacteria by identifying their structure, way of life, reproduction, and role in life. Interesting topic to be studied is the role of bacteria in life.

The bacteria that exist in nature have their respective roles, either beneficial or detrimental role. For example, beneficial role of *Escherichia coli*, which is the normal flora in the human gut, is to help digestive process. However, these bacteria can also contribute harm if the amount is above the threshold. Excessive *Escherichia coli* bacteria can cause infection/diarrhea disorders [2]. There is much of the information about human efforts in tackling the dangers of harmful bacteria using natural materials. However, there is not much information on the matter in the form of learning support materials like handouts, especially for the students of class X at SMA for the first semester derived from research. Thus, it is necessary to make additional information on natural materials (particularly from plants typical of a region) that have the potential to inhibit the growth or even to kill bacteria that cause disruption. However, this growth inhibitory potential depends on the sensitivity of bacteria to natural materials presented to them, so it is important to notice the sensitivity of bacteria or bacterial sensitivity to the natural material.

One of typical plants of South Kalimantan is Ramania ('Gandaria' in Indonesian language). Ramania is a bog plant that is still little known beneficial as a medicinal plant. Ramania *(Bouea macrophylla)* is one type of Anacardiaceae family, originating from the islands of Indonesia and Malaysia [3]. According to [4], based on the results of screening chemical constituents contained in the methanol extract of the seeds of Ramania *(Bouea macrophylla)*, Ramania is a class of flavonoids and triterpenoids/steroids. With the presence of both secondary metabolites, Ramania seed is thought to have the ability to inhibit bacterial growth. It needs to be proven scientifically. Therefore, the potential for inhibition of bacterial growth is evidenced by exposing it to bacteria in vitro test. This study aimed to produce teaching materials in the form of handout containing additional information about sensitivity of *Escherichia coli* that is tested using infuse Ramania seed *(Bouea macrophylla)* for the material of eubacteria. The handout is quick learning materials, sourced from some of the literature relevant to the basic competencies and subject matter being taught to students [5]. It is expected that generated handout will be able to add information about the characteristics of the bacteria studied by students, especially *Escherichia coli*. The handout will be distributed to students through the validation phase. According to [6], validity is a measure that states the level of validity of an instrument and an instrument is considered valid if the instrument is able to measure what should be measured.

II. METHOD

This study was the R&D research (Research and Development). R&D research aims to produce and test the effectiveness of products [7] through development process. The development model used was a modification of the Borg and Gall, which aimed to get the procedure custom development.

This study procedure was adapted the development model of Borg and Gall. The research steps included potential and problems, information collection, the initial product design, design validation, and revision of the design.

(1). Potensial and Problems. Tuhepaly's research results [7] on the phytochemical screening of Ramania seed or Gandaria showed that there is the content of secondary metabolites such as flavonoids and triterpenoids/steroids. Both of these contents are thought to have antibacterial activity that is able to inhibit the growth of bacteria. Therefore, research on the potential of this Ramania seed is against a growth of bacterium *Escherichia coli* in the form of infusion. Meanwhile, in the tenth grade high school in the first semester, there is a basic competence of the archaebacteria and eubacteria that requires students to get to know the characteristics of bacteria and some examples of bacteria that play a role in human life. One is the *Escherichia coli* bacterium that can cause diseases of the digestive tract, especially diarrhea. Thus, additional information regarding *Escherichia coli* needs to be delivered to students.

The question is how to convey the information to the students in learning in order to be a material enrichment or additional information about concepts of eubacteria. One effective way to deliver information according to [8] is to provide teaching materials. Therefore, information about the sensitivity of *Escherichia coli* bacteria is used as a material for the enrichment of this concept, which is designed in the form of handout. In addition, the handout made is not only material enrichment of Eubacteria but also the potential of using the local vegetation typical of Borneo.

(2). *Information Collection.* Collecting information was done through a research on the sensitivity of *Escherichia coli* to infuse seed Ramania *(Bouea macrophylla).* The results of this study were designed in the form of a simple form of handout as additional information about the concept of Eubacteria. In addition, the researchers examined references and other learning resources related to this concept, in particular about *Escherichia coli* bacterium.

Research on *Escherichia coli*'s bacterial sensitivity refers to the testing methods of anti-microbe by Kirby-Bauer. These antimicrobial material test uses disc diffusion method (Disc Diffusion Method). The steps of test of antimicrobial material are as follows: (a) making infuse Ramania seed which refers to the technique of making infuse simplicia according to Pharmacopoeia Indonesia, (b) making a bacterial suspension test in accordance with the standards of Mc. Farland 0.5, (c) testing the minimal inhibitory concentration (MIC) by the concentration series of 50%, 25%, 12.5%, 6.25% and 3.125%. Then, the basis concentration for testing of antibacterial by the MIC test is determined, (d) testing the antibacterial ability of Ramania seed with disc diffusion method by taking the following procedure:

i. Infuse concentration of 40%, 45%, 50%, 55%, and 60% (MIC = 50%) was made.
ii. Mueller-Hinton seaweed medium was made and put into a test tube screw cap, and then sterilized.
iii. After it is sterile, let it remain in a liquid state and the medium temperature around 40 ºC and inoculating 200 µl bacterial suspensions. Then, it was made into homogenous state.
iv. The mixture was poured into a sterile Petri container, and it was left solid.
v. Meanwhile, the paper discs were soaked in sterile cups for each concentration treatment.
vi. Once solidified, the medium was divided into 7 sectors; 5 sectors for 5 infuse concentrations of test, one sector to distilled water as a negative control, and one sector for amoxicillin antibiotics as a positive control.
vii. The paper discs of each concentration treatment were put to each sector.
viii. The entire treatment was incubated in an incubator at 37 ° C for 24-48 hours.
ix. After incubation, the width of the diameter of *Escherichia coli* bacterial growth inhibitory was measured and formed as a clear zone around the paper disk.
x. The data were processed and analyzed.

(2). The Initial Product Design. Handout framework by the Ministry of Education [9] contains the title and supporting information only. Therefore, the handout is one of the teaching materials that are easily made and understood by users.

TABLE I. MODIFIED HANDOUT FRAMEWORK (2008)

No	Component	Description
1	Title	a. Cover b. Preface c. Table of contents
2	Standard competencies and basic competencies	Standard competencies of Biology for grade X of high school Basic competencies 3
3	Main material	Learning materials about the roles of bacteria in life
4	Supporting information	a. Supporting information: Introduction (Background, roles of bacteria in life, Mitigation efforts to handle hazard of bacteria, general information about Ramania, secondary metabolites on Ramania seed as antibacterial agents) b. Research methods
5	Material content	a. Potency of Ramania seed infusion as *Escherichia coli* antibacterial agent for in vitro b. Conclusions c. Exercises d. Glossaries e. Bibliographies

The steps to create teaching materials in the form of handout adapted from [5] are as follows:

(a). Determining the appropriate handout title to the results of the research of sensitivity of *Escherichia coli* to antibacterial material of Ramania seed *(Bouea macrophylla)*

(b). Collecting reference material as the supporting material handouts. Reference used is a current and relevant reference to the subject matter.

(c). Designing a handout outline

(d).Making handouts with regard understandable writing techniques for high school students

(e). Placing images and text to be proportional and interesting

(f). Evaluating the design and content of the handout

(3). Design Validation. The handout was validated by two experts as supervisor 1 and supervisor 2. The readability validation was performed by students of class X in SMA 7 Banjarmasin. The two experts did the steps of validation of contents (material) as follows:

(a).Giving the assessment instruments that include feasibility aspects of content, presentation feasibility aspects, and aspects of language assessment

(b). Checking the results of the charging instrument by experts

(c). Cultivating a score as a percentage (%) by using the formula:

$$Pi = \frac{Xi}{Yi} \times 100\% \quad (1)$$

Where Pi = the percentage of assessment for the i-th aspects; Xi = number of assessment that validator answers to for the i-th aspects, and Yi = the number of maximum value to aspects for the i-th

(d). Comparing the scores obtained with the validity criteria instructional materials

Readability test was conducted toward five students of class X in SMA 7 Banjarmasin as follows:

(a). The handout was distributed to five students of class X in SMA 7 Banjarmasin.

(b). An assessment instrument that includes aspects of language assessment, the appeal of the students to read, the level of ease the passage, as well as suggestions was distributed

(c). The results of the charging instrument by students were checked and the final value was calculated using the formula:

$$P = \frac{\text{Obtained Scores}}{\text{Maximum Scores}} \text{ X } 100\ \% \quad (2)$$

(d). The scores obtained with readability criteria of teaching materials were compared.

(4). *Design Revision.* After the test of validity by expert and readability test by students, the handout design was revised based on the validation and test results. Design improvements were made with reference to the criticisms and suggestions given by the validators and the students.

III. Result and Discussions

A. The Developed Material

The material developed in this study was the result of study on the sensitivity of *Escherichia coli* to the seeds of Ramania *(Bouea macrophylla),* which was designed to be a handout as one of instructional materials for additional information regarding the teaching materials of eubacteria. The results of this study was as a means to exploit local potential as a basis for developing teaching materials in schools.

A need analysis (potential and problem) was done by assessing the Biology syllabus for class X of SMA / MA in first semester corresponding to the study conducted. Basic competence was developed into a handout with basic competencies 3.5, namely identifying the structure, way of life, reproduction, and the role of bacteria in the material life in the role of bacteria in life. Subject matters in biology about the role of bacteria in life are: (1) the role of beneficial bacteria, (2) the role of harmful bacteria, and (3) the impact mitigation.

B. Collected Information

Information through research of infuse seed Ramania *(Bouea macrophylla)* testing against *Escherichia coli* bacteria in vitro was supported with the other references. Testing was conducted by experiments using total plate count method. Of Minimal Inhibitory Concentration (MIC)

Determination of minimal inhibitory concentration used the series of dilution method with a concentration that is from 50%, 25%, 12.5%, 6.25%, up to 3.125%. After incubation of 24 hours at a temperature of 37^{o}C, the results is shown in Table II.

TABLE II. MIC Test Result of Ramania Seed Infusion

Concentration	Bacteria Colony
50%	0 colony
25%	32 colonies
12,5%	TNTC
6,25%	TNTC
3,125%	TNTC

Information: TNTC (Too Numerous To Count)

C. Sensitivity Test of Escherichia coli

The sensitivity test of *Escherichia coli* refers to the antibacterial testing according to the Kirby-Bauer method. The results show the wide diameter of growth inhibition of *Escherichia coli*.

TABLE III. THE INHIBITION DIAMETER WIDTH THAT FORMED ON AGAR

No	Conc.	Inhibition Diameter Width (mm)				Average (mm)
		1	2	3	4	
1	Negative control	6,00	6,00	6,00	6,00	6,00
2	40%	9,08	14,03	9,03	8,10	10,06
3	45%	12,08	16,03	14,04	9,58	12,93
4	50%	16,03	16,08	10,08	15,03	14,30
5	55%	18,03	16,04	14,07	11,09	14,80
6	60%	23,02	17,06	19,01	21,01	20,02
7	Positive control	24,90	26,05	23,00	22,07	24,01

*Inhibition zone diameter measurements including disc diameter 6 mm

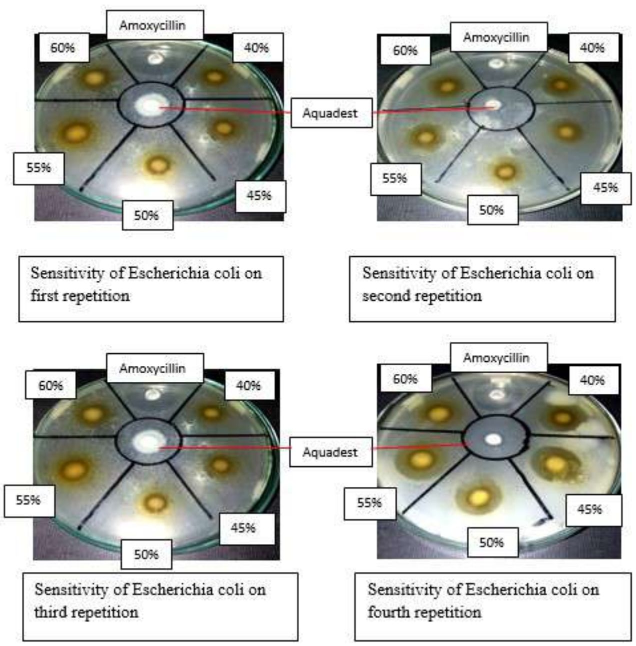

Fig. 1. Sensitifity of Escherichia coli on each repetition

The sensitivity of bacteria and inhibitory infuse Ramania seeds from each treatment were also determined by reference to the Clinical and Laboratory Standards Institute in 2012 (Table IV).

The sensitivity of *Escherichia coli* to infuse fruit seeds of Ramania is possible because of its active compound content. Chemical constituents contained in the methanol extract of the seeds of Ramania *(Bouea macrophylla)* are a class of flavonoids and triterpenoids/steroids. Flavonoids and triterpenoids/steroids are one of secondary metabolites capable of acting as an antibacterial. Sensitivity and strength of power resistor (Table IV) has potential as an antibacterial material. The presence of antibacterial compounds could be developed by human being as an attempt to overcome the dangers of bacteria.

TABLE IV. MIC TEST RESULT OF RAMANIA SEED INFUSION

No	Concentration	Average (mm)	Sensitivity	Strength
1	Negative	6,00	Resistant	Moderate
2	40%	10,06	Resistant	Moderate
3	45%	12,93	Intermediate	Strong
4	50%	14,30	Intermediate	Strong
5	55%	14,80	Intermediate	Strong
6	60%	20,02	Intermediate	Strong
7	Positive	24,01	Sensitive	Very strong

Information: Resistant (0-11 mm), *intermediate* (11-19 mm), sensitive (> 20 mm), weak (< 5 mm), moderate, (5-10 mm), strong (11-20 mm), and very strong (> 20mm)

D. Initial Product Design

The handout framework was developed by designing handout as review of references, namely:

- COVER PAGE
- FOREWORD
- TABLE OF CONTENTS
- INSTRUCTIONS LEARN
- CORE COMPETENCE
- BASIC COMPETENCIES
- INDICATOR
- LEARNING MATERIALS
- CHAPTER I INTRODUCTION

1.1 Background,
1.2 Roles Of Bacteria In Life
1.3 Mitigation Efforts To Handle Hazard Of Bacteria
1.4 General Information About Ramania
1.5 Secondary metabolites on Ramania seed as antibacterial agents
1.6 Research Methods
1.6.1 Research Equipments and Materials
1.6.2 Sampling
1.6.3 Research Procedure

CHAPTER II *Escherichia coli* SENSITIVITY TOWARD RAMANIA SEED INFUSION (*Bouea macrophylla*) FOR IN VITRO
CHAPTER III CONCLUSION
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GLOSSARY

E. Design Validation

Teaching materials in the form of handout developed become enrichment materials for the tenth grade at first semester on Biology as a material on role of bacteria in life. Two experts (supervisor 1 and 2) validated this handout. The results of the validation tests conducted by 2 experts are shown in Table V.

TABLE V. VALIDATION RESULT OF CONTENT ASPECTS

Indicator	Description	Validator 1	Validator 2
A. Suitability of materials with standard competencies and basic competencies	1. The completeness of material 2. The depth of material	3 3	4 3
B. Accuracy of Material	3. Acuracy of concepts and definition 4. The accuracy of the facts and data 5. The accuracy Example 6. The accuracy of exercises 7. The accuracy of drawings, diagrams and illustrations 8. The accuracy of the reference library	3 4 3 3 4 3	3 4 3 3 4 4
C. Supporting learning material	9. Reasoning 10. Lingkage 11. Communication 12. Application 13. The attractiveness of the materials 14. Encourage to seek further information 15. Coompliance with the materials science development 16. Drawing, diagrams and actual illustrations 17. Using the examples cases in and outside Indonesia	3 3 4 2 3 4 3 4 3	3 3 3 4 3 3 3 3 3
D. Recency of material	18. Recency of the library	3	3
Total Scores (Maximum 72 points)		58	59
Validaty Score		81,25%	

TABLE VI. VALIDATION RESULT OF PRESENTATION FEASIBILITY ASPECTS

Indicator	Description	Validator 1	Validator 2
A. Presentation technique	1. Consistency systematic grain in learning activities 2. The coherence of presentation	3 4	3 4
B. Accuracy of Material	3. Introduction 4. Table of contents 5. Summary 6. Bibliography	3 4 2 3	3 4 3 4
C. Learning presentation	7. Student engagement 8. The introduction 9. Content 10. Closing	2 3 4 3	2 3 4 3
Total Scores (Maximum 40 points)		31	33
Validaty Score		80%	

TABLE VII. VALIDATION RESULT OF LANGUAGE ASPECTS

Indicator	Description	Validator 1	Validator 2
A. Straightforward	1. Accuracy of sentence structure 2. The effectiveness of the sentence	3 3	4 3
B. Communicative	3. Standard term 4. Readability message 5. The accuracy of the use of language rules 6. Ability to motivate the message or information	3 3 3 4	3 4 4 3
C. Dialogic and interactive	7. The ability to encourage critical thingking 8. Compliance with students' intellectual development	4 3	3 4
D. Compliance with the learners development level	9. Conformity with the level of emotional development	3	4
E. Coherently and integration flow of thought	10. Coherently and integration between learning activities 11. Coherently and the compositeness of paragraphs	3 4	3 3
F. The uses of terms, symbols, or icons	12. Consistency of the use of the term 13. Consistency of the use of the symbol or icon	4 4	3 4
Total Scores (Maximum 52 points)		44	45
Validaty Score		85,58%	

The criteria used were based on Pratama (2014) with a very valid statement (79,78 to 100), valid (59,52 to 79,77), less valid (39,26 to 59,51) and invalid (19,00 to 39,25). Based on these criteria, the handout made in the study on the feasibility aspect of the content, presentation feasibility aspects, and aspects of language assessment was categorized very valid.

TABLE VIII. READABILITY TEST RESULT

No.	Aspect	Score			
		1	2	3	4
1.	Design of cover page already attractive and describe the content.	0	0	5	0
2.	Pictures inside the handout attractive and appropriate with the topic.	0	0	5	0
3.	Pictures are clear and not blurry.	0	0	3	2
4.	Handout use clear font, combination of font, color, and picture are match.	0	0	2	3
5.	Sentences in handout are easy to understand.	0	1	3	1
6.	Pictures are clear and easy to understand the meaning.	0	0	1	4
7.	Terms inside the handout are easy to understand.	0	0	5	0
8.	Materials that served inside the handout are in order.	0	0	2	3
9.	There is no ambiguous words.	0	0	4	1
10.	Enrichment materials are easy to understand.	0	0	3	2
Total Score		0	1	33	16
Readibility Score		82,50%			

Teaching materials in the form of handout were created through the process of testing the readability. Readability tests involved five students of class X in SMA 7 Banjarmasin. The test results are presented in Table VIII. The readability test was performed to determine students' opinion, which later used as the teaching materials developed.

Readability score refers to [10] with the modification of the scoring criteria as follows: 0%-24.9% (very readable), 25%-49.9% (very illegible), 50%-74.9% (illegible), and 75%-100% (very readable). Based on this, the teaching materials in the form of handout that made have been classified as very legible.

F. Imprived Design

Once validated, the handout was made through the process of revision based on the suggestions of the validators. The suggestions given by the validators on the first validation is an input in the revision process (Table IX).

TABLE IX. SUGGESTION FROM VALIDATOR 1 AND VALIDATOR 2

Validator 1
1. There are no case examples. 2. Create biology evaluation questions base on the research result. 3. Follow handout presentation format. 4. Introduction should not be too much to discuss about the curriculum but focuses on bacteria and antibacterial agents. 5. Make a short procedure but more communicative.
Validator 2
1. Add evaluation questions that suitable with learning purposes and basic competencies. 2. Connect the content with material/concept that suitable with basic competencies. 3. Make more communicative and could motivate the students. 4. Make students to use their critical thinking skills. 5. Make students to be more motivated to find information. 6. Make students to be more involved.

The students who did readability test also gave feedback and input. The suggestions given by the five students on the test of readability were as input in the revision process (Table 10).

TABLE X. SUGGESTION FROM STUDENTS

Suggesstion
1. Cover page's color is opaque. It should be replaced with a more attractive color. 2. The handout lacks of figure. Addmore figures along with an explanation. 3. Enhance image quality. 4. Color photos / pictures a little murky and unattractive.

IV. CONCLUSION

The product in the form of handout about Eubacteria materials based on research about sensitivity of *Escherichia coli* to infuse Ramania fruit seeds can be summarized as follows: (1) The growth of Escherichia coli significantly ($P<0.05$) could be hampered by infusion of Ramania seed infusion *(Bouea macrophylla)*; 2) The handout with the topic of the sensitivity of *Escherichia coli* toward Ramania seed infusion *(Bouea macrophylla)* was regarded very valid (81,25%) on the feasibility aspect of the contents, very valid (80%) on the feasibility aspect of presentation, and language aspects was also regarded very valid (85,58%), as well as expressed by students as very readable handout (82,50%).

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The Effect of *Handep* Cooperative Learning Model on Social Skill and Motivation to Learn Mathematics

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***Abstract*— The aim of this research was to evaluate the effect of H*andep* cooperative learning model to the student's social skill and motivation in mathematics learning. It was conducted through the posttest only control group design. The sample were 68 students of sixteen to seventeenth years old, selected from the population of 309 students. The results showed that there was the significant difference social skill and motivation in learning mathematics of students who learned using *handep* cooperative learning model than those who learned by using conventional teaching model. In other words, the students who were taught by using *handep* achieved higher social skill and motivation than those who learned by using conventional teaching model. The results of the study have implications for the selection method of learning mathematics in school that teachers, need to pay attention to aspects of the cultural background of students. The application of the cooperation model of mutual help in the study of mathematics material backed with reflective questions in teaching materials.**

Keywords*— *Handep Cooperative Learning, Social Skills, Motivation, Mathematics Learning.

I. Introduction

The cultural background plays an important role in the learning of mathematics. The cultural background influences the thinking of mathematics [1]. Reference [2] finds that the ideas of all cultural groups generate mathematical ideas, reference [3] find the cultural practice to be richer in mathematics learning. Reference [4] finds that the cultural practices can be seen to be an influencing factor in promoting this ability. Students in the class is a representation of the communities, which have a cultural background. The *Dayak* tribe communities in Borneo of Indonesia, have long been working together in a traditional mutual help and cooperation called *handep* [5], [6].

In order to improve the students understanding on mathematics, the research inspired the *handep* mechanism of mutual cooperation, as basis to construct a cooperative learning model. *Handep* cooperative learning model as a model of teaching [7] has several components of scenario, model orientation, objective and assumption, key concept, and teaching model. Teaching including components of syntax, social system, principle of reaction, support system model, instructional impacts and nurturant impacts.

The results of design and development of *handep* cooperative learning model through expert validation of education technology in 2010 year showed that the components of a scenario, the syntax, the principle of reaction, the support systems, and the applications have all been eligible as a learning model. The expert predicted that the instructional and nurturant impacts would reach above 85%. The *handep* cooperative learning model which has been developed and revised as well as expert recommended before, needs to be tried out in a field test [8]

The *handep* cooperative learning model validations has been done to a small group of students of Mathematics Education Study Programs of Teacher Training and Education Faculty of University of Palangka Raya in Central-Kalimantan, Indonesia. The validations through observation showed that the *handep* cooperative learning model had fulfilled: (a) the components of cooperative learning [9] respectively by 98.68% and 96.7%, (b) the principles of effective learning [10] of 95.59% and 95.60% and the rules of Quantum Teaching [11] by 75% and 87.50%. The nurturant impact such as social skills respectively achieved 86.60%. The expert recommended field tests of the *handep* cooperative learning model in schools to test the effectiveness and attractiveness of *handep* cooperative learning model [9].

The attractiveness was focused on the analysis of the effect of *handep* cooperative learning model toward the social skills and motivation. Is it the *handep* cooperative learning model was able to motivate the students to learn mathematics and develop the social skill? Is it the social skills and motivation to mathematics learning of students who learned using *handep* cooperative learning model higher than the conventional teaching?

Social skills and motivation is affective domain as implications of application the instructional model. *Handep* cooperative learning using for develop social skill. Social skills is the one important element of cooperative learning. References [12] and [13] said develop social skills is a goal of cooperative learning. Dimensions of social skills such are cooperation/collaboration, team capability, and communication [14], [15]. Research finding of [16] showed that the cooperative learning give effect to social skills at a good level, that including, interest and intention to join the team activity, giving opinions, accepting others', and determination to work.

Cooperative learning model can develop motivation to learn mathematics. References [17], [18] finding, that implementation of cooperative learning in classroon can improve motivation of students. Research of [19] found that there are two type of motivation, intrinsic and extrinsic motivations. That type of motivation formed inside, and other formed outside of individual. The factor of intrinsic motivation, that the pleasure-oriented motivation played a strongly positive role than the factor of extrinsic motivation productivity-oriented motivation in students' achievement of mathematics.

II. METHOD

The research was carried out using the posttest only control group design [20]. Mathematics instruction used *handep* cooperative learning model was applied in the treatment group, and those using conventional teaching was applied in the control group. The 68 students as sample were selected by cluster random sampling from the population of 309 students. The sample students were divided into 34 students as a treatment group and 34 students as a control group.

The researchers and teachers did the mathematics instruction in a team teaching. They conducted a workshop to develop the lesson plan and learning materials. The workshop have been done to explain the syntax of *handep* cooperative learning and conventional teaching to the mathematics teachers, the determination of learning materials, the design of lesson plans and worksheets, and peer-teaching.

The instruments used consisted of rubrics of social skill assessment, and questionnaire on motivation to learn mathematics. The social skill rubrics including three components i.e. the attitude of having mutual respect to each other, helped each other, and skill of suggested opinions. The rubric had four levels of social skill (1 = very poor, 2 = poor, 4 = good, 5 = very good). Social skill get through classroom observation. The achievement motivation questionnaire have reliability coefficient of α–Cronbach of 0.73. Data analysis including descriptive statistic, t-test, and of homogeneity assumption using the Levene test, used SPSS-17.

III. RESULT

Handep cooperative learning model was developed based on [7] structure of models of teaching that consisted of scenario, orientation of model, objective and assumption, keynote concept, and teaching model. The variables of instructional objective were problem solving ability and mathematical concept mastery. The variables of nurturing impact were social skill and motivation.

The syntax of *handep* cooperative learning model includes: (1) understanding of the initial ability; (2) dividing the students into teams of 3-4 students; (3) each member in team reflect his/her problem individually; (4) each member present his/her problem to others in team and discuss it to get meaningful understand about the problem deeply; (5) the team make an agreement about the sequence of solve the problem; (6) the team solve the individual problem together, one by one in turns; (7) the team evaluate the solution; (8) the team present the solution and celebrate their success [8].

Result of research focused on analysis the effect of *handep* cooperative learning compared to conventional teaching, on that is social skill and motivation, as presented below.

A. Social skill

Table 1 presents the mean score of students' social skill after they learned using *handep* cooperative learning model and those using conventional teaching. The mean of students' social skill who learned using *handep* cooperative learning model was 10.44. The social skill mean of students who learned with conventional teaching model was 8.74.

TABLE I. THE MEAN AND STANDARD DEVIATION OF SOCIAL SKILLS

Teaching Models	**N**	**Mean**	**Standard Deviation**
Handep cooperative learning	34	11.62	1.46
Conventional teaching	34	8.97	1.31

Homogeneity test and mean difference presented in Table 2. Levene's test for equality of variances yielded F = 0.52, and p = 0.47, which indicates that the data of social skills has homogeneous variance. The mean difference of social skill showed through value of t = 7.87, and significant at p = 0.00. The mean of experiment group higher than the mean of control group. Research finding based on this analysis is the social skills of students taught using *handep* cooperative learning model higher than conventional teaching model. The social skills consist of attitude of having mutual respect to each other, helped each other, and skill of suggested opinions of students taught using *handep* cooperative learning model better than the conventional teaching.

TABLE II. HOMOGENEITY TEST AND TEST OF DIFFERENCE MEAN

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	.52	.47	7.87	66	.00	2.65	.34	1.98	3.32

B. Motivation

The attractiveness of *handep* cooperative learning model may be shown by the visible impact of that model on student's motivation. Student's motivation to learn rational exponent concept of mathematics taught using *handep* cooperative learning model and those using conventional model is presented in Table 3. Motivation to learn of students who learned using *handep* cooperative learning model resulted in mean of 50.68, while the motivation to learn of students who learned using conventional teaching model resulted in mean of 47.24.

TABLE III. THE MEAN AND STANDARD DEVIATION OF MOTIVATION SCORES.

Teaching Models	N	Mean	Standard Deviation
Handep cooperative learning model	34	50.68	2.72
Conventional teaching	34	47.24	3.65

Levene's test for homogeneity assumption test yielded F value of Levene's test of 0.85, p = 0.08. This value shows that the data of motivation to learn of students of both groups had homogenous variance. Table IV presents the value t = 4.41, at significant of p = 0.00, which shows there is a different of motivation to learn of students who learned using *handep* cooperative learning model and those using conventional teaching. The finding of research based on this analysis, that student's motivation through *handep* cooperative learning model is higher than conventional teaching.

TABLE IV. HOMOGENEITY TEST AND THE TEST OF DIFFERENCE MEAN.

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Differ-ence	Std. Error Dif-ference	Lower	Upper
Equal variances assumed	3.28	.08	4.41	66	.00	3.44	.78	1.88	4.99

IV. DISCUSSION

Handep cooperative learning model designed to develop the mathematics problem solving skill and mastery of concepts. The nurturing effect would be risen as the result of implementation the *handep* cooperative learning are social skill and motivation to mathematics learning. The finding of research, presented that *handep* cooperative learning influence students social skill and motivation. This finding proved that teaching and learning model can be develop base on mutual cooperation culture of community. As well as the research finding in some cultural context of [1], [2], [3], [4]

Handep cooperative learning model has more advantages in facilitating the process of collaboration. Collaboration process is facilitated with steps in syntax of cooperative team. The impact of steps in cooperative team can facilitate the students to elaborate their cognitive by peer modeling and assessment. Reference [21] explained that the process of cooperative learning can enhance learning by elaborated explanations, peer modeling, cognitive elaboration, peer practice, peer assessment and correction.

Various ability in team and rotation help each other mechanism can provide scaffolding for students. Students can ask and discussion to their friends in team, who high ability in mathematics. Students who have less ability can learn the difficult material from other students in the group who understand the material more. In this context, social skill to be developing naturally. Reference [13], cooperative and collaborative process are the way to enhance the students' thinking. References [12] and [22] said, cooperative learning can help students with low and high abilities work together in order to finish their task. The students with high ability can tutored to the students with low ability.

Problem solving in mathematics to be challenge for students in learning mathematics. *Handep* cooperative learning provide for help them solve the problem. The mutual cooperation to motivate students solve their individual problem together. Problem solving through *handep* cooperation to encourage students help each other and give them to express their opinion, in order to develop the reasoning strategy, metacognition to optimize the reflective thinking. Social skill developed through this condition. When the students help each other in team, they learn accepting to other [16] and they become positive interdependence in team [9]. When students express their opinion, face-to-face interaction and sharing their knowledge can be happen. It is make interpersonal intelligence can improve better.

The research finding showed that motivation to learn mathematics of students learning using *handep* cooperative learning model better than conventional teaching model. This result is relevant to [21], [17], and [18] in which cooperative learning can motivate the students to learn. When students in team to discuss their problem, they have motivation to solve the problem. Student low ability can learn to other student high ability of mathematics. They thinking aloud, to exertion, never give up, found solution of their individual problem, together. Extrinsic motivation productivity-oriented motivation become grows in this process. And also the pleasure-oriented motivation to be risen, such as look happy to learn to solve math problems, they are vigorous discussion and do not look burden while studying. Reference [19] found that the kind of motivation is indicators have strongly positive role to mathematics achievement.

V. CONCLUSIONS

Mutual cooperation of a tribe to be a based to design and development cooperative learning model. *Handep* cooperative learning model implementation in mathematics classroom context, risen the good social skill in team working and motivation to solve mathematics problem. In order to improve mathematics problem solving skill, *handep* cooperative learning is a model alternative that can use in every context of curriculum.

Implication of research, teacher should monitoring the reflective thinking process and encourage discussion within the group, and also manage the time allocation as possible. Students need the sufficient time allocation to understand the problem, thinking aloud to find solution through discussion and help each other.

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Students' Peer Assessment and Perception on ICT-based Instructional Media

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***Abstract* –Instructional media play an important role in supporting teaching and learning process, especially in the era of ICT nowadays. The use of the media needs a careful preparation, planning as well as effective implementation in order that the media would optimally enhance the teaching and learning process. This study reported the result of a training which was given to the students who took Instructional Media and ICT course on how to design and apply PowerPoint presentation and video appropriately in teaching and learning process. More particularly, the problem of the study was addressed to investigate the students' peer assessment and perception on the use of PowerPoint presentation and video as ICT-based instructional media. This study used descriptive explanatory design and employed questionnaires as the instrument. After the students joined the training, they were asked to utilize the media in teaching *Bahasa Indonesia* Subject and subsequently fill in questionnaires to give peer assessment on their peers' performance in utilizing the media in the teaching and learning process. They also stated their perception in the given questionnaire. The results of the questionnaire were analyzed by using descriptive statistics. The results showed that the students generally gave positive peer assessment to their peers' performance. This study also suggested that the training helped them in designing and applying the media appropriately to support the learning objective. Training in using instructional media is considered beneficial for the optimal implementation of the media in the classroom context.**

Keywords –Instructional Media, Peer Assessment, Perception, Powerpoint Presentation, Video

I. INTRODUCTION

Instructional media have been considered as pivotal factor in helping teachers to conduct on optimal teaching and learning process. The advancement of technology has made instructional media more sophisticated and in turn, boost their capability in optimizing the teaching and learning process. By utilizing ICT-based instructional media, the delivery of learning material will be clearer and interesting, so students can grasp the material easily. The clear delivery of learning material is more likely since instructional media, especially in the form of visual aids, can help students to develop a holistic understanding that words cannot convey [1]. Delivering learning material using instructional media would help students to get simple and meaningful display of the complex concepts and process as well as restructure information from the material easily [2], [3][4].

ICT-based Instructional media assist not only the delivery of learning material, but they also assist to create positive learning experience for students. Ref [5] assert that the use of instructional media encourages teachers to use various teaching methods without merely using verbal communication. Further, students can do more activities by using the media since they do not only listen to their teacher, but they can also observe, perform, and demonstrate [5]. Instructional media play important role in making the learning activities interesting and interactive; therefore, students will be more motivated to participate in the activities [6].

A number of studies have been conducted to give empirical data about the benefits of instructional media from the viewpoint of students. Reference [7] conducted survey which investigated the perceptions and experiences of students from seventh, eighth and ninth grade in utilizing the multimedia technology during their summer technology camp. Based on the results of the survey, the students perceived that the use of multimedia technology makes their learning more fun and easier. It has also boosted their motivation and participation in the learning process. The similar result is also revealed by [8] in that the students gave strong support toward the use of multimedia technology in their learning activities. More particularly, [1] investigated students' and teachers' attitudes toward the usage of visual aids, which were PowerPoint presentation, Prezi presentation and video, in teaching and learning process. The students in [1] study showed positive attitude toward the use of the visual aids. The students considered the visual aids beneficial to increase their participation in the classroom, their interest and motivation. Ref. [1] study also revealed that incorporating videos and presentations to bring the real world as the contextualization of the language content to the classroom has made the learning activities more meaningful for the students. Thus, the use of ICT–based instructional media contributes positively to students' learning experience.

In addition to students' positive perception on the use of ICT-based instructional media, teachers were also found to have also positive perception towards the utilization of instructional media in classrooms [9], [10]. The factors which influence the teachers' perception toward the use of instructional media are the availability of media technology equipment and appropriate materials, teachers' knowledge on the media, and proper teacher training [10]. Unfortunately, in spite of teachers' positive perception, the study conducted by [1] and [10] showed that the teachers in the settings of their studies infrequently use the available multimedia devices. Reference [1] further mentioned that in reality the use of instructional media is infrequent although teachers in her study consider preparing visuals as instructional media as their regular job. Thus, it can be inferred that the influential factors in the use of instructional media which should be more taken into account are teachers' knowledge on the media and proper teacher training. Teachers might show positive perception on the use of instructional media, yet they need knowledge, ability, and skill to put the use of instructional media into real practice.

The lack of knowledge, ability and skill may hinder teachers to make use of ICT-based instructional media. Ref. [1] pointed up that 67% of teachers in her study stated that they have not received appropriate training on how to use instructional media in the classrooms and this finding might explain why the ICT-based instructional media, including presentation and video, in the setting of her study were infrequently used. Moreover, [11] found that there was significant difference in the perception between trained teachers who were exposed to instructional technology while at college and untrained teachers who were not. Reference [11] concluded that pre-service training affects the teachers' perception. Regarding this case, [9] suggest that "teachers need to motivate themselves on the significance of media use in classrooms and also to undertake in-service courses on ICT utilization in teaching and learning". Besides in-service courses, there should be a training for students especially teacher-to-be students on integrating ICT-based instructional media into their teaching and learning practices [8].

The importance of ICT-based instructional media, the lack of teachers' knowledge and ability in utilizing the media, as well as the need of training on integrating ICT-based instructional media in teaching practice as previously outlined underpinned the present study which focused on the use of ICT-based instructional media by students who are taking educational degree and are preparing themselves to be teachers in their future career. To anticipate the hindering factors and to equip the students with sufficient knowledge and experience, a training on the utilization of ICT-based instructional media in the form of PowerPoint presentation and video was conducted. This present study aimed to investigate the students' peer assessment and perception on the use of PowerPoint presentation and video in the real practice after they have followed the training. Peer-assessment was considered as potential assistance in the training since peer assessment can provide feedback and reflection on what to be improved from students' teaching practice in implementing the instructional media. Peer assessment has been considered beneficial in promoting student learning, enhancing student understanding on the work they should make, and improving student performance [12][13]. A number of studies have shown positive perception of students with regard to peer assessment [14][15].

The research questions were formulated as follows:

1. How is the students' peer assessment on the use of PowerPoint presentation and video in teaching practice?
2. How is the students' perception on the use of PowerPoint presentation and video in teaching practice after the training?

II. METHOD

In this study, the respondents were 27 students who took Instructional Media and ICT course in Teacher Training and Education Faculty, Lambung Mangkurat University, Banjarmasin, Indonesia. There were 3 male students and 24 female students.

The training was conducted as the specialized part of the course. The training included direct instruction and modelling, observation, presentation and discussion of the observation result, preparation of PowerPoint presentation and video as the media, micro-teaching practice using the media, and school-based teaching practice. The training started with direct instruction by the researcher who was the lecturer of the course. The direct instruction covered the importance of instructional media in language teaching, the types of the media, and the use of PowerPoint presentation and video in language teaching. The direct instruction was also complemented with modelling of the use of PowerPoint and Video in teaching particular material in *Bahasa Indonesia* subject. The materials used in the training were *Media Pendidikan* written by [6] and *Instructional Technology and Media for Learning*.

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At the next phase, the students did micro-teaching practice using the media and were given peer-assessment by other students. The students had to revise their teaching scenario, the content and design of the PowerPoint presentation and video based on the given feedback in the peer-assessment form. Following the revision was the school-based teaching practice for 45 minutes in three accessible schools. The students' performance was recorded. At the end of the training, the lecturer played some samples of the video, discussed them together with the students, and asked some students to express their opinion about their teaching experience. After the training has finished, a questionnaire was administered to the students to find their perception on the use of PowerPoint presentation and video in their school-based teaching practices.

Two instruments were used in this study, namely peer assessment form and questionnaire of students' perception. Peer assessment form was adapted from media evaluation form by [6]. The form consisted of two parts, namely the way of utilizing the media and the quality of the media. The way of utilizing media covered clarity of the presentation or delivery, strategies in making use of the media and speed of presentation. The quality of PowerPoint media included the suitability with instructional objective, material arrangement, key points, comprehensibility of the slide content, readability of fonts and color, and the suitability of pictures. The quality of the video included the suitability with instructional objective, comprehensibility of the video content, visual quality and audio quality. The assessment used 5 likert-scales ranging from 'very good' to 'very poor'. The questionnaire of students' perception was adapted from [1] and [10] considering the suitability and comprehensibility of the instrument items for the purpose of this study. The classification of the scores in peer assessment was shown in Table 1.

TABLE I. THE CLASSIFICATION FOR SCORES FROM PEER ASSESSMENT

Index Range	Score Category
85 – 100	Very good
69 – 84	good
53 – 68	fair
37 – 52	poor
20 – 36	Very poor

III. RESULTS AND DISCUSSION

This study reported the result of the training on the utilization of PowerPoint presentation and video as indicated by the results of peer assessment and students' perception. The results of peer assessment comprised two parts, namely the way of utilizing the media and the quality of the media. The students' mean score for the first part was 74.62. This showed that generally the way the students utilized the media was at good category. The detailed scores can be seen in Fig. 1.

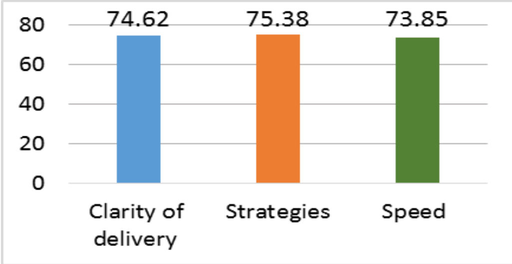

Fig. 1. Mean score of the way students utilized the media

Based on Fig. 1, the peer assessment resulted in the mean score of 74.62 for the clarity of students' delivery or presentation in utilizing the media. The mean score for the strategies in utilizing the media was 75.38, while the mean score for speed of presentation was 73.85. The highest mean score in this part was attributed to the students' strategies in utilizing the media. On the comment section of the peer assessment form, most of the students suggested that their peers explained the material using the PowerPoint presentation and gave instruction more clearly. They also suggested that their peers considered to lower the speed.

The result of peer assessment on the quality of students' PowerPoint presentation also indicated good category with the mean score of 78.9. The detailed scores for all sub-components can be seen in Fig. 2.

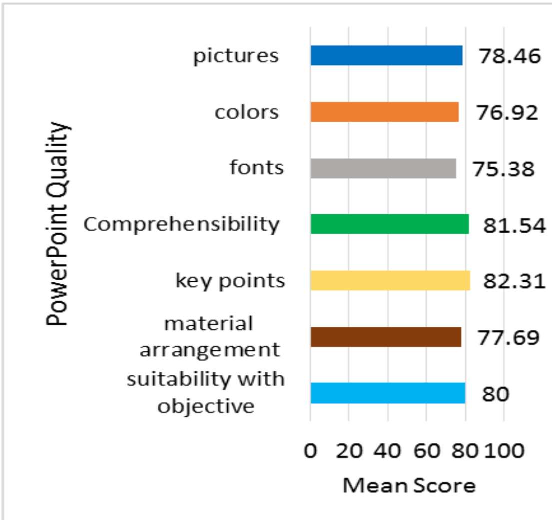

Fig. 2. Mean score of PowerPoint quality

Based on Fig. 2, the three highest mean scores were indicated on the quality of key points, comprehensibility of the slide content and the suitability of the content and slide use with the instructional objective, namely 82.31, 81.54, and 80, respectively. The readability of fonts obtained the lowest score, namely 75.38. This was aligned with the students' comments which highlighted the size of fonts in the students' slides. Some of the students suggested that the fonts were enlarged and given different color as an emphasis.

The peer assessment on video quality resulted in the highest mean score, namely 80.58, which was also at good category. The detailed scores for all sub-components can be seen in Fig. 3.

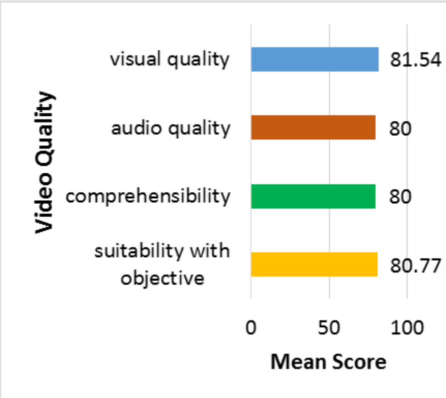

Fig. 3. Mean score of video quality

Fig. 3 showed that the highest mean score among the sub-components of video quality was indicated at visual quality, namely 81.54. This mean score was followed by the mean score for suitability with the instructional objective, which was 80.77. The mean scores for comprehensibility of the video content and audio quality were equal, namely 80. These findings were aligned with the positive comments of the students in the peer assessment form.

The second major result of this study was the students' perception on the use of PowerPoint presentation and video in teaching practice. The students' perception was divided into two aspects: (1) students' interest in using ICT-based instructional media and (2) their perception on its usefulness. At the end of the questionnaire, the students were also required to give their perception on the peer assessment and the training as the additional data of this study. The results of the questionnaire showed that the students' interest in using ICT-based instructional media was quite high. Fig. 4 showed the detailed percentage of the students' response.

Based on Fig. 4, the majority of the students (81.48%) stated that they were very interested in using ICT-based instructional media, while 18.52% of the students stated that they were fairly interested in the usage. The students explained that they selected 'very interested' option because they were aware that the media were beneficial for teaching and learning activity and the use of the media helped them in their teaching practice a lot. Some of them also mentioned that the use of PowerPoint and video has attracted their students' attention and made them motivated to pay attention to the lesson. The students who selected 'fairly interested' generally stated that they still needed to practice more in using the media.

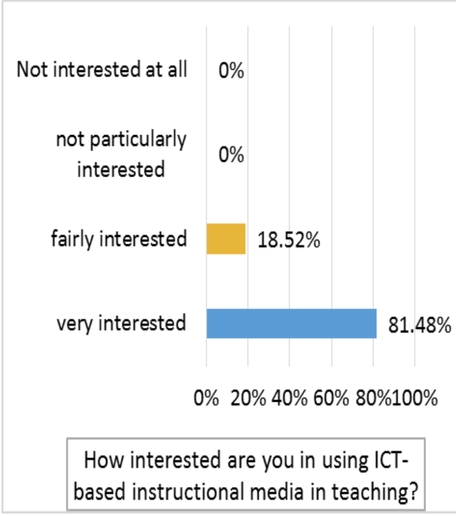

Fig. 4. Students' interest in using ict-based instructional media

The next part of the questionnaire was students' perception on the usefulness of PowerPoint and video as visual aids in ICT-based instructional media. The detailed item of this part is shown in Table 2. The term 'learners' was used to refer to the students in the school setting where the students, the respondents of this study, did their teaching practice.

TABLE II. QUESIONNAIRE ITEMS FOR STUDENTS' PERCEPTIONS ON THE USEFULLNESS OF THE MEDIA

No.	Item
1.	I enjoy using PowerPoint and video in teaching.
2.	I am personally committed to the use of PowerPoint and video in teaching.
3.	I know how to use and apply PowerPoint and video in language classroom.
4.	I consider that the use of PowerPoint and video in the language classroom may help learners to focus their attention on the topic.
5.	I believe that the use of PowerPoint and video in the language classroom increases learners' motivation and participation in the class.
6.	I use visual aids (PowerPoint and Video) in my lessons to support my explanations
7.	Visual aids can provide learners with more than one way to access information.
8.	Visual aids can provide learners with sufficient variety to maintain their interests.
9.	I am willing to invest time and energy in providing the media (i.e., through classroom preparation).

The results of the questionnaire showed that 18.52% of the students strongly agreed that they enjoyed using PowerPoint and video in their teaching practice, while 81.48% of the students agreed with the statement. At the second and third items, all of the students agreed that they were personally committed to the use of PowerPoint and video in teaching and they had the knowledge of the usage. At the fourth item, approximately half of the students (55.56%) gave strong agreement and the other half (44.44%) gave agreement toward the benefit of PowerPoint and video in focusing the attention of the learners in their teaching practice.

The next results showed that 48.15% of the students strongly agreed that the use of the media made the learners motivated and participated more in the learning activities, while 51.85% preferred 'agree' option. For the item indicating the support of PowerPoint and video to the explanation of the lesson, 62.96% of the students showed strong agreement and 37.04% showed their agreement. Furthermore, the majority of the students (88.89%) strongly agreed that PowerPoint presentation and video provide the learners with more than one way to access information. Finally, for the last two items, all of the students agreed that the media could maintain the learners' interest, and they were willing to invest their time and energy in preparing the media in the future teaching practice.

The last part of the questionnaire revealed the students' perception on the peer assessment and the training wherein they have taken part. The students perceived that peer assessment was really useful for the improvement of their teaching performance and the quality of their media. They could be aware of the lack of their performance from the peer assessment. The students also regarded the training as the empowerment for their ability in using media in teaching. They asserted that they felt more self-efficacious in using PowerPoint and video in teaching after the training since they could get knowledge, model, instruction, feedback, and meaningful experience on the utilization of the media. Some of the students also stated that they needed to practice more in preparing media for teaching need since the preparation took time.

The findings of this study on peer assessment conform to the benefits of peer assessment postulated by scholars [12][13] in terms of the improvement on students' performance. Moreover, the students in this study highly valued peer assessment confirming the study by [14] and [15].

This study showed that the students had positive perception on the use of PowerPoint and video in their teaching practice. This finding is aligned with [9][1], and [10] who involved teachers as the respondents. Although the students are still at college, they have already perceived that the use of ICT-based instructional media is worth-conducting, for the media could make learners more motivated, increase learners' participation and focus learners' attention based on their teaching experience. The students' perception confirmed that the use of instructional media plays important role in affecting learners' motivation and participation positively [6]. The increased motivation and participation of learners might be influenced by the supports PowerPoint presentation and video provide in bringing the contextualization of the real world experience to classroom [1].

This study further revealed that giving a specific training on the utilization of instructional media could improve the students' self–efficacy in using the media in their teaching practice. Self-efficacy in using instructional media is necessary to solve lack of knowledge and ability as the problems hindering the implementation of instructional media in teaching practice [1][11]. It is important to note that the training enables the students to see the importance of utilizing instructional media and experienced its real use from real teaching practice. The students' experience during the whole training increased their interest in using the media. This early high interest is positive since motivation in using instructional media is prominent to actualize successful implementation of the media in teaching practice [9]. This study also confirmed that giving training could address the solution for the inadequacy of knowledge and ability in the use of instructional media as highlighted by [1]. Giving training is also one of the solutions to equip and encourage teacher-to-be students and teachers to utilize ICT-based instructional media of any kinds in classroom instructions [8][9].

IV. CONCLUSION

Knowledge, ability, and skill in using ICT-based instructional media in teaching any subjects at any school levels have become prominent issues to be taken into account by those who intend to be teachers and practitioners. These issues need to be addressed and coped with in early teacher education. The importance of ICT-based instructional media in teaching and learning activities is already pertinent, yet actualizing the theories, knowledge, and skill in using the media into practice remains challenging. This study has revealed that a training in utilizing ICT-based instructional media in the form of PowerPoint presentation and video assists students of teacher education to prepare, plan, and apply the use of the media in teaching activities. The peer assessment in the training showed that the students had good performance in using the media in teaching practice and it gave positive impact for the improvement of the students' performance. This study also pointed up students' positive perception on the use of the media, peer assessment and the training. In a nutshell, an early specific training on utilization of ICT-based instructional media is necessary and worth-conducting to enhance students' ability in using instructional media for teaching purpose.

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Students' Peer Assessment and Perception on ICT-based Instructional Media

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***Abstract* –Instructional media play an important role in supporting teaching and learning process, especially in the era of ICT nowadays. The use of the media needs a careful preparation, planning as well as effective implementation in order that the media would optimally enhance the teaching and learning process. This study reported the result of a training which was given to the students who took Instructional Media and ICT course on how to design and apply PowerPoint presentation and video appropriately in teaching and learning process. More particularly, the problem of the study was addressed to investigate the students' peer assessment and perception on the use of PowerPoint presentation and video as ICT-based instructional media. This study used descriptive explanatory design and employed questionnaires as the instrument. After the students joined the training, they were asked to utilize the media in teaching *Bahasa Indonesia* Subject and subsequently fill in questionnaires to give peer assessment on their peers' performance in utilizing the media in the teaching and learning process. They also stated their perception in the given questionnaire. The results of the questionnaire were analyzed by using descriptive statistics. The results showed that the students generally gave positive peer assessment to their peers' performance. This study also suggested that the training helped them in designing and applying the media appropriately to support the learning objective. Training in using instructional media is considered beneficial for the optimal implementation of the media in the classroom context.**

Keywords –Instructional Media, Peer Assessment, Perception, Powerpoint Presentation, Video

I. INTRODUCTION

Instructional media have been considered as pivotal factor in helping teachers to conduct on optimal teaching and learning process. The advancement of technology has made instructional media more sophisticated and in turn, boost their capability in optimizing the teaching and learning process. By utilizing ICT-based instructional media, the delivery of learning material will be clearer and interesting, so students can grasp the material easily. The clear delivery of learning material is more likely since instructional media, especially in the form of visual aids, can help students to develop a holistic understanding that words cannot convey [1]. Delivering learning material using instructional media would help students to get simple and meaningful display of the complex concepts and process as well as restructure information from the material easily [2], [3][4].

ICT-based Instructional media assist not only the delivery of learning material, but they also assist to create positive learning experience for students. Ref [5] assert that the use of instructional media encourages teachers to use various teaching methods without merely using verbal communication. Further, students can do more activities by using the media since they do not only listen to their teacher, but they can also observe, perform, and demonstrate [5]. Instructional media play important role in making the learning activities interesting and interactive; therefore, students will be more motivated to participate in the activities [6].

A number of studies have been conducted to give empirical data about the benefits of instructional media from the viewpoint of students. Reference [7] conducted survey which investigated the perceptions and experiences of students from seventh, eighth and ninth grade in utilizing the multimedia technology during their summer technology camp. Based on the results of the survey, the students perceived that the use of multimedia technology makes their learning more fun and easier. It has also boosted their motivation and participation in the learning process. The similar result is also revealed by [8] in that the students gave strong support toward the use of multimedia technology in their learning activities. More particularly, [1] investigated students' and teachers' attitudes toward the usage of visual aids, which were PowerPoint presentation, Prezi presentation and video, in teaching and learning process. The students in [1] study showed positive attitude toward the use of the visual aids. The students considered the visual aids beneficial to increase their participation in the classroom, their interest and motivation. Ref. [1] study also revealed that incorporating videos and presentations to bring the real world as the contextualization of the language content to the classroom has made the learning activities more meaningful for the students. Thus, the use of ICT–based instructional media contributes positively to students' learning experience.

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20 – 36	Very poor

III. RESULTS AND DISCUSSION

This study reported the result of the training on the utilization of PowerPoint presentation and video as indicated by the results of peer assessment and students' perception. The results of peer assessment comprised two parts, namely the way of utilizing the media and the quality of the media. The students' mean score for the first part was 74.62. This showed that generally the way the students utilized the media was at good category. The detailed scores can be seen in Fig. 1.

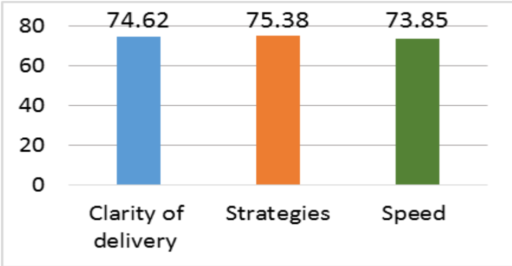

Fig. 1. Mean score of the way students utilized the media

Based on Fig. 1, the peer assessment resulted in the mean score of 74.62 for the clarity of students' delivery or presentation in utilizing the media. The mean score for the strategies in utilizing the media was 75.38, while the mean score for speed of presentation was 73.85. The highest mean score in this part was attributed to the students' strategies in utilizing the media. On the comment section of the peer assessment form, most of the students suggested that their peers explained the material using the PowerPoint presentation and gave instruction more clearly. They also suggested that their peers considered to lower the speed.

The result of peer assessment on the quality of students' PowerPoint presentation also indicated good category with the mean score of 78.9. The detailed scores for all sub-components can be seen in Fig. 2.

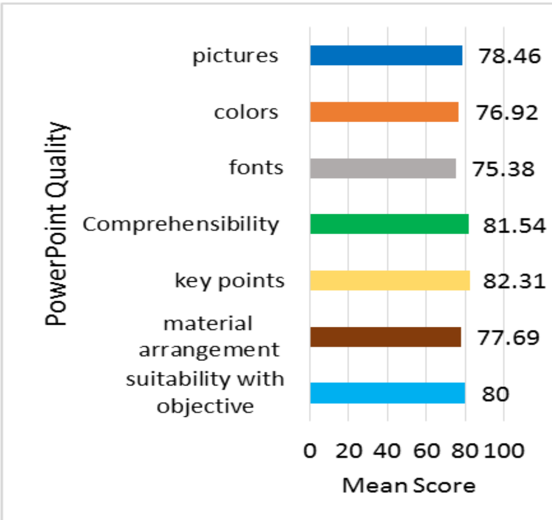

Fig. 2. Mean score of PowerPoint quality

Based on Fig. 2, the three highest mean scores were indicated on the quality of key points, comprehensibility of the slide content and the suitability of the content and slide use with the instructional objective, namely 82.31, 81.54, and 80, respectively. The readability of fonts obtained the lowest score, namely 75.38. This was aligned with the students' comments which highlighted the size of fonts in the students' slides. Some of the students suggested that the fonts were enlarged and given different color as an emphasis.

The peer assessment on video quality resulted in the highest mean score, namely 80.58, which was also at good category. The detailed scores for all sub-components can be seen in Fig. 3.

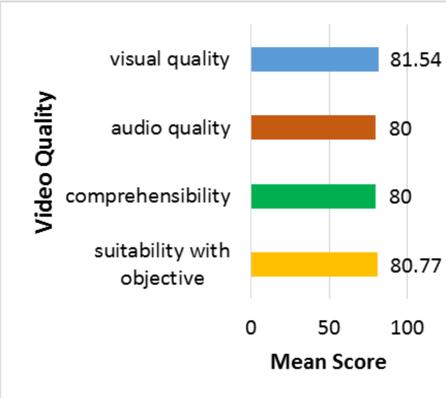

Fig. 3. Mean score of video quality

Fig. 3 showed that the highest mean score among the sub-components of video quality was indicated at visual quality, namely 81.54. This mean score was followed by the mean score for suitability with the instructional objective, which was 80.77. The mean scores for comprehensibility of the video content and audio quality were equal, namely 80. These findings were aligned with the positive comments of the students in the peer assessment form.

The second major result of this study was the students' perception on the use of PowerPoint presentation and video in teaching practice. The students' perception was divided into two aspects: (1) students' interest in using ICT-based instructional media and (2) their perception on its usefulness. At the end of the questionnaire, the students were also required to give their perception on the peer assessment and the training as the additional data of this study. The results of the questionnaire showed that the students' interest in using ICT-based instructional media was quite high. Fig. 4 showed the detailed percentage of the students' response.

Based on Fig. 4, the majority of the students (81.48%) stated that they were very interested in using ICT-based instructional media, while 18.52% of the students stated that they were fairly interested in the usage. The students explained that they selected 'very interested' option because they were aware that the media were beneficial for teaching and learning activity and the use of the media helped them in their teaching practice a lot. Some of them also mentioned that the use of PowerPoint and video has attracted their students' attention and made them motivated to pay attention to the lesson. The students who selected 'fairly interested' generally stated that they still needed to practice more in using the media.

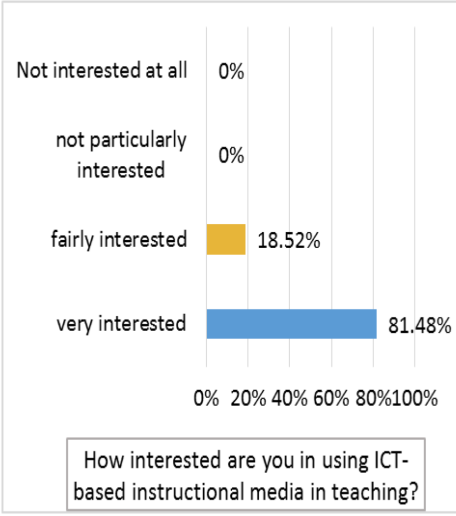

Fig. 4. Students' interest in using ict-based instructional media

The next part of the questionnaire was students' perception on the usefulness of PowerPoint and video as visual aids in ICT-based instructional media. The detailed item of this part is shown in Table 2. The term 'learners' was used to refer to the students in the school setting where the students, the respondents of this study, did their teaching practice.

TABLE II. QUESIONNAIRE ITEMS FOR STUDENTS' PERCEPTIONS ON THE USEFULLNESS OF THE MEDIA

No.	Item
1.	I enjoy using PowerPoint and video in teaching.
2.	I am personally committed to the use of PowerPoint and video in teaching.
3.	I know how to use and apply PowerPoint and video in language classroom.
4.	I consider that the use of PowerPoint and video in the language classroom may help learners to focus their attention on the topic.
5.	I believe that the use of PowerPoint and video in the language classroom increases learners' motivation and participation in the class.
6.	I use visual aids (PowerPoint and Video) in my lessons to support my explanations
7.	Visual aids can provide learners with more than one way to access information.
8.	Visual aids can provide learners with sufficient variety to maintain their interests.
9.	I am willing to invest time and energy in providing the media (i.e., through classroom preparation).

The results of the questionnaire showed that 18.52% of the students strongly agreed that they enjoyed using PowerPoint and video in their teaching practice, while 81.48% of the students agreed with the statement. At the second and third items, all of the students agreed that they were personally committed to the use of PowerPoint and video in teaching and they had the knowledge of the usage. At the fourth item, approximately half of the students (55.56%) gave strong agreement and the other half (44.44%) gave agreement toward the benefit of PowerPoint and video in focusing the attention of the learners in their teaching practice.

The next results showed that 48.15% of the students strongly agreed that the use of the media made the learners motivated and participated more in the learning activities, while 51.85% preferred ‘agree’ option. For the item indicating the support of PowerPoint and video to the explanation of the lesson, 62.96% of the students showed strong agreement and 37.04% showed their agreement. Furthermore, the majority of the students (88.89%) strongly agreed that PowerPoint presentation and video provide the learners with more than one way to access information. Finally, for the last two items, all of the students agreed that the media could maintain the learners’ interest, and they were willing to invest their time and energy in preparing the media in the future teaching practice.

The last part of the questionnaire revealed the students’ perception on the peer assessment and the training wherein they have taken part. The students perceived that peer assessment was really useful for the improvement of their teaching performance and the quality of their media. They could be aware of the lack of their performance from the peer assessment. The students also regarded the training as the empowerment for their ability in using media in teaching. They asserted that they felt more self-efficacious in using PowerPoint and video in teaching after the training since they could get knowledge, model, instruction, feedback, and meaningful experience on the utilization of the media. Some of the students also stated that they needed to practice more in preparing media for teaching need since the preparation took time.

The findings of this study on peer assessment conform to the benefits of peer assessment postulated by scholars [12][13] in terms of the improvement on students’ performance. Moreover, the students in this study highly valued peer assessment confirming the study by [14] and [15].

This study showed that the students had positive perception on the use of PowerPoint and video in their teaching practice. This finding is aligned with [9][1], and [10] who involved teachers as the respondents. Although the students are still at college, they have already perceived that the use of ICT-based instructional media is worth-conducting, for the media could make learners more motivated, increase learners’ participation and focus learners’ attention based on their teaching experience. The students’ perception confirmed that the use of instructional media plays important role in affecting learners’ motivation and participation positively [6]. The increased motivation and participation of learners might be influenced by the supports PowerPoint presentation and video provide in bringing the contextualization of the real world experience to classroom [1].

This study further revealed that giving a specific training on the utilization of instructional media could improve the students’ self–efficacy in using the media in their teaching practice. Self-efficacy in using instructional media is necessary to solve lack of knowledge and ability as the problems hindering the implementation of instructional media in teaching practice [1][11]. It is important to note that the training enables the students to see the importance of utilizing instructional media and experienced its real use from real teaching practice. The students’ experience during the whole training increased their interest in using the media. This early high interest is positive since motivation in using instructional media is prominent to actualize successful implementation of the media in teaching practice [9]. This study also confirmed that giving training could address the solution for the inadequacy of knowledge and ability in the use of instructional media as highlighted by [1]. Giving training is also one of the solutions to equip and encourage teacher-to-be students and teachers to utilize ICT-based instructional media of any kinds in classroom instructions [8][9].

IV. CONCLUSION

Knowledge, ability, and skill in using ICT-based instructional media in teaching any subjects at any school levels have become prominent issues to be taken into account by those who intend to be teachers and practitioners. These issues need to be addressed and coped with in early teacher education. The importance of ICT-based instructional media in teaching and learning activities is already pertinent, yet actualizing the theories, knowledge, and skill in using the media into practice remains challenging. This study has revealed that a training in utilizing ICT-based instructional media in the form of PowerPoint presentation and video assists students of teacher education to prepare, plan, and apply the use of the media in teaching activities. The peer assessment in the training showed that the students had good performance in using the media in teaching practice and it gave positive impact for the improvement of the students’ performance. This study also pointed up students’ positive perception on the use of the media, peer assessment and the training. In a nutshell, an early specific training on utilization of ICT-based instructional media is necessary and worth-conducting to enhance students’ ability in using instructional media for teaching purpose.

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The Difference between Students Critical Thinking Skill Using Problem Based Learning and Think Pairs Share on Coordination System Material

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***Abstract*—Global development requires education to always empower higher order thinking skills (HOTs). These skills are a sign that somebody has learned and thought to compete globally. Therefore, education has a pertinent role in preparing qualified human resources. In line with this, the teaching of biology has a potential to empower these HOTs, one of which is critical thinking skill. The purpose of this study was to determine the differences of students' critical thinking skill between students who were taught by using Think Pair Share (TPS) model and Problem Based Learning (PBL) models. The quasi-experimental study using pretest-posttest design non-equivalent control group design was employed in this study. The control group was taught by using TPS while the experimental group was taught by using PBL model. 51 students of the eleventh grade of senior high schools in Banjarmasin were involved. The data were collected from the essay tests. Meanwhile, in regard to the critical thinking skill assessment, it referred to [1]. Then, the data were analyzed through ANACOVA with SPSS 17.0 program. The results of this study showed significant information on the results of a pretest to posttest scores for the critical thinking skills of 0.004 <0.05. These results pointed out that the students who were taught by using PBL have better critical thinking skill than those who were taught by using TPS.**

Keywords—*Critical Thinking, PBL Model, TPS Model*

I. INTRODUCTION

Teaching and learning process is an educational process which offers the opportunity to students to explore their inner potential. The teaching and learning process guides the students to experience the changes which later called learning. The changes as the result of the learning process can be reflected from the behavior changes, skill or ability improvement, habit or the changes on other individual aspects. The result of teaching and learning process equips students to be able to solve life challenges. Therefore, the teaching and learning process underlines an important part especially on the students' thinking skill empowerment.

Empowering students thinking skill can be trained through several teaching designs. Then, the teaching designs can be integrated with specific teaching models which potentially can improve students thinking skill. The teaching design in this matter is the process of teaching and learning process which explores students 'ability and skill to find out, process, and evaluate information critically. The well planned teaching and learning process will be able to empower students' critical thinking. It shows how important a teaching and learning process in educational world.

The quality of human resources took an important part to be improved and developed in which the parameter is the academic result of the students [2]. In the same line with [2], Ref. [3] mentioned that the teaching and learning process is essentially the teaching of chained thinking which focuses on particular mental skill, for example critical thinking.

In line with the ideas above, the teaching of Biology has big potential in empowering students' critical thinking. The Biology teaching and learning process trains students to participate and get involved in delivering questions, finding information, and conducting investigation. However, the fact shows that one of the problems faced by the teacher in the teaching and learning process is the lack of understanding toward the concept of the material. It means that students' critical thinking level is still low.

The teaching of Biology in senior high school itself is still dominated by unsuccessful result, which is shown by students' scores that are under or on the minimum completeness criteria. Most problem lies on the teachers' style in dominating the class and create students minimum involvement. Thus, the teaching and learning process seems monotones and lack of variation, especially in terms of the teaching model and teaching method [4].

This statement is supported by [5] who stated that based on interview of Biology teachers; it was found that the teaching of Biology is dominated by knowledge aspect instead of thinking aspect. There are no specific activities which support the teaching and learning process with students activeness oriented. There are also no activities which create exposure for the students to be able to gain, get familiar, understand, and apply the knowledge concept meaningfully.

Based on the issues above, the researchers believe that innovation especially in the teaching and learning process is highly needed. The implementation of Problem Based Learning (PBL) is sufficiently relevant for its potential to provide the chance to practice the students' critical thinking. PBL model is an innovative teaching model where students can actively get involved in solving the problem scientifically. Besides that model, another teaching model with similar ideas is Think Pair Share (TPS). The TPS model helps students to interpret their ideas and construct their understanding through discussion. With this model, it is hoped that there is a fun, active, creative, and effective learning environment. Therefore, the study is aimed on finding out the differences between PBL and TPS model in improving senior high school students' critical thinking in Banjarmasin.

II. RESEARCH METHOD

This research was a quasi experimental study with pretest-posttest non-equivalent control group design. The population of this study was the students of XI IPA of all SMAN of Banjarmasin. Before conducting the study, the researcher conducted a sample equivalence test in order to determine the control and experiment group. The result of the test showed that the academic level of the students of XI IPA 1 of SMAN 12 and XI IPA 3 of SMAN 13 was equal. Later, it was decided that the students of XI IPA 1 of SMAN 12 would be taught with TPS model, while XI IPA 3 of SMAN 13 would be taught with PBL model. The data of this study were obtained through pretest and posttest. Both test were given in form of essay and scored by using the critical thinking scoring system adapted from [1]. The score was in range of 0- 4. The data were analyzed by using ANACOVA test using SPSS 17.0 program.

III. RESULT AND DISCUSSION

Based on the normality test result through Kolmogorov-Smirnov, it was shown that the data were distributed normally (0.273), then the homogeneity test through Levene's test showed that variant between data was homogeneous (0.854). The analytical result for the differences between PBL learning model and TPS model toward students' analytical thinking are shown in Table 1.

TABLE I. THE SUMMARY OF ANACOVA RESULT ON STUDENTS CRITICAL THINKING SKILLS

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	3225.09[a]	2	1612.55	27.54	0.000
Intercept	7567.98	1	7567.98	129.25	0.000
Pretest	540.01	1	540.01	9.22	0.004
Model	3185.15	1	3185.15	54.40	0.000
Error	2810.45	48	58.55		
Total	147656.25	51			
Corrected Total	6035.54	50			

Table 1 above shows that there were significant differences between learning model and students' critical thinking. The differences are represented by significance value (sig) = 0.000 < 0.05. Further, Heterogeneity test shows significant result was 0.004 < 0.05 which means there were differences on the students' critical thinking. Those data were also supported by the comparison result on improvement of PBL and TPS learning method toward students' critical thinking skill in Table 2.

TABLE II. THE COMPARISON RESULT BETWEEN PBL LEARNING MODEL IMPROVEMENT AND TPS LEARNING MODEL IMPROVEMENT TOWARD STUDENTS' CRITICAL THINKING

Learning Strategy	Average		Improvement	Improvement (%)
	Pretest	*Postest*		
PBL	12.50	59.53	47.03	376.29
TPS	18.02	45.00	26.97	149.71

Based on Table 2 above, if the average corrected-score of students' critical thinking is in percentages then the class which was facilitated by PBL learning model had 47.03 score improvement or 24.40 % higher than TPS learning model. The data result above means PBL learning model has a better potential to improve students' critical thinking skills.

This research gave information that learning model influences students' critical thinking. The PBL learning model is assumed to give a positive effect to students' critical thinking. If we analyze the data thoroughly, the result implies that PBL stages learning model excess the TPS model. The PBL stages give the problems or questions related to the learning material to trigger the students' activity for gaining the information as much as possible, after that the students in group investigate and try to find the solution toward the problem given. On the next stage, students are able to develop their thought through analysis and evaluation the investigation process.

PBL successfulness depends on how good our ability in giving realistic problems to the students so we can help the students to develop problem solving skill and *self-directed* [6]. In addition, PBL tries to help the students to become independent learner and *self-regulated* [7].

According to [8] PBL applies learning approach which uses an authentic problem as learning sources, so that the students are trained to have higher order thinking skill and develop their character through the problems and real life activities. Additionally, PBL model for problem solving uses scientific learning approach based on deductive and inductive learning process. This learning process is conducted systematically and empirically [9].

Then, the learning style by group work plays important role related to motivation and responsibility. It is assumed that the students' actively involvement as well as curiosity, challenge, and the task given are the reasons. It also urges the students to do the investigation, dialogue, and critical thinking development together as well. Therefore, PBL has a potential to direct the students learning to be meaningful [10].

IV. Conclusion

This study showed significant differences between learning model in relation to students' critical thinking. This study pointed out that the students who were taught by using PBL have better critical thinking skill than those who were taught by using TPS.

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Poster Exhibition Based Learning on Human Reproduction Concept

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***Abstract*—Students' understanding on human reproduction concept at Pharmacy Major of ISFI Vocational Middle School Banjarmasin was low because of too many words and scientific terms in Greek. In addition, the process was too complicated and abstract. Based on this condition, it was necessary to implement an appealing model of learning which helps students to master the learning materials. One of the strategies is poster exhibition based learning. The aim of this research was to assess learning quality, students' motivation and implementation of poster exhibition based learning on human reproduction concept at Pharmacy Department of ISFI Vocational Middle School in Banjarmasin. This research was a quasi-experimental design which compared poster exhibition based learning and conventional learning on human reproduction concept. The treefold results showed that poster exhibition based learning on human reproduction concept was effective for learning quality, the students had high motivation, and the result on the assessment of classical learning mastery was high.**

Keywords—Human Reproduction Concept, Learning, Poster Exhibition

I. INTRODUCTION

Science and technology are developing rapidly. The mastery of science and technology can be obtained through a learning process in formal educational institution. School as formal educational institution performs educational activities and transfer of science and technology. Unfortunately, educational process and transfer of science and technology are sometimes not smooth. These matters are also difficult to be absorbed and mastered by students. Thus, a method of learning that enables students to master learning materials is needed.

Pharmacy Major of Vocational Secondary School prepares students to become an assistant pharmacist engaged in community service in the field of health, in particular the pharmaceutical field. Biology is one of the subjects taught in Pharmacy Major of Vocational Secondary School. Like other educational institutions that have Biology, learners seems to have difficulties in mastering the study material. The reasons are most likely because there are too much rote and too many scientific terms in Greek and the process is too complicated and abstract. Thus, in addition to memorization, students also need a good understanding in Biology. This students' difficulty appears to be more apparent when it comes to the concept of human. The concept of human reproduction at Pharmacy Major of Vocational Secondary School is taught at the third grade on sixth semester. The concept of human reproduction includes sub-concept of human reproductive organs; sex cells; fertilization; division phase; blastula, gastrula, morula, organogenesis; embryonic membranes and twins [1].

Based on the background, an attractive learning model is needed to enable students to master the learning material. Efforts should be made to optimize the student's mastery on human reproductive material by learning with the implementation of poster exhibition based learning on human reproduction concept. A learning model in general is characterized by the task structure, the structure of interest and reward structures. Task structure refers to the way learning is organized and the type of student activities. The structure of interest is the amount of interdependence on task, while the reward structure is a student satisfaction in achieving learning outcomes (mastering learning materials) at the completion of learning [2].

Biology learning based on poster exhibition is a method of learning in which students can share their experience about biology projects either in individuals, groups or the whole class with other students in their school. The poster exhibition based learning on the concept of the human reproduction is a learning that presents the atmosphere of the poster exhibition. This learning environment can increase the activity of students in learning. The increased activity of students in the learning process will improve the quality of learning and learning outcomes [3]. The poster exhibition based learning project is a combination of various models, learning strategies and learning methods as portfolio learning model [4], cooperative learning model [2], discussions method, group work, and simulations [5][6]. The learning approach used is also a combination of various approaches such as systems approach [7], process skills approach, active student approach, and mastery learning approach [8]. Poster mentioned in this research is charts made on standard size poster board in the form of images, graphs, charts or maps concepts.

The objective of this research was to assess learning quality, students' motivation and assessment of learning implementation based on poster exhibition project on human reproduction concept at Pharmacy Major of ISFI Vocational Secondary School in Banjarmasin.

II. Method

This research was a quasi-experimental design which compared poster exhibition based learning and conventional learning on human reproduction concept. The instruments used in this research were the observation sheet for the learning, student questionnaire and an evaluation sheet for learning outcomes.

The population of the research was third grade students on Pharmacy Major of ISFI Vocational Secondary School in Banjarmasin. The total samples were divided into two classes with students' similar abilities from each class. Both classes were treated with different treatment. Class III A, consisting of 44 students, was treated with conventional learning dominated by lectures as a control class, while Class III B consisting 43 students was treated with poster exhibition based learning. Both classes learned the same human reproduction material.

The research was conducted with the following steps: (1). Conventional learning was implemented in Class III A and was dominated by lectures. (2) Poster exhibition based learning was implemented in Class III B. Learning steps were carried out as follows: (a) Students were divided into 10 groups and each group consisted of 4-5 students; (b) Each group was given the task at home for 10 days to examine the different sub concepts on the concept of Human Reproduction. The results of the study were outlined in the form of a poster (pictures, graphs, charts or maps concept); (c) Observation of the learning process was carried out by other teachers in both classes. The observer then filled the observation sheet. (3) After the learning process ended, a post-test was conducted for both classes. The post-test was conducted to determine student learning mastery. Individual's learning mastery is achieved if the students passed the 65% of post-test score, whereas accumulative learning mastery is achieved when at least 85% of students in class passed the 65% of post-test score.

The results were analyzed by means of: (1) The quality of learning was analyzed based on observation sheets filled out by observer. (2) Student motivation was analyzed based on the questionnaire filled by the students. (3) Student learning outcomes were analyzed based learning mastery both individual and accumulative. Individual learning mastery can be achieved if the students can master the learning material at least 65%. Whereas the accumulative mastery learning can be achieved if at least 85% of students can master the learning material at least with 65% achievement.

III. Result and Discussion

Before Student motivation in the implementation of poster exhibition based learning on the human reproduction concept at Pharmacy Major of ISFI Vocational Secondary School Banjarmasin was shown from intensive activities of students in learning participation. Four students managed to get very good with A score in motivation, participation, creativity and skills of students. Although the students' attention could not obtain A score, the quality was quite good with B score. Teacher activities had very good quality with A score in the use of learning strategies; communication and interaction with students; mastery of the learning concept, and encouragement of students' activity. Teacher activities had good quality with the B score in learning management; learning resources and time; demonstration of the teaching method; the relevance of concepts and learning materials.

The result of conventional learning showed a lower quality of student activity with the score of E, creativity and skills of students with the score of D, students' participation with the score of C. The teacher activity showed a lower score with the score of E, use of learning strategies with the score of D, communication and interaction with students, demonstration of the teaching method with the score of C, the relevance of concepts and learning materials with the score of B.

Student learning outcomes in the learning implementation based on poster exhibition achieved an average score of 97.67% and accumulative mastery achieved score of 86.46%. Moreover, student learning outcomes in conventional learning showed a lower learning outcomes with an average of 70.002 and a level of accumulative mastery achieved score of 79.55%.

Problems in the implementation learning based on poster exhibition that students need a long time to prepare posters, but the problems did not interfere learning process because of the time allocation for implementing poster exhibition based learning outside of regular school hours. In addition, students need to have a lot of skills such as the ability to read, understand, summarize, draw/paint and explain. Teachers' problems in the implementation of poster exhibition based-learning were necessary preparation as well as intensive and comprehensive monitoring. The problems of students in conventional learning were elusive and less attractive learning concept, while the problems of teacher were difficulties in encouraging the students.

The increase of students' activity in poster exhibition based learning is caused by how much students' participation involved in this learning method, starting from planning, preparing, executing and evaluating. Poster exhibition based learning challenges the students to develop their creativity. Students become motivated, involved and open minded when they have only a little problem regarding their learning [9]. Aside from that, the sympathy and understanding of students have a good influence to their learning process [10]. While in conventional method, students tend to only wait for and accept what the teachers explained and in turn cause them to be more passive with low to almost none motivation and attention. There is even chance that if the topic of learning material is not about human's reproduction, the motivation of the student might be worse. Conventional method of learning is dominated by lectures. Consequently, the students cannot develop their creativity. There is no room to increase their own creativity in conventional learning method.

The problem in poster exhibition based learning is the time needed for the preparation. However, with extra time given for the preparation, teachers can get a better focus on the learning and feel an exciting challenge in the learning [11]. Learning needs more time and more skill like reading, understanding, citing, painting and giving a presentation. Lot of skills and expertise are needed by the students in poster exhibition based learning since this learning model indirectly teaches students to learn skill that they have not mastered yet. The students can also learn from their peers who have mastered the skills. This shows that there is a good teamwork and organization among the students. Interaction among groups also occur when it comes to presentation on the exhibition so that everyone will try their best to master their exhibition's topics. Other groups will try to understand and get the knowledge from the exhibition they visit. The only obstacle in conventional learning is that the teacher needs preparation to do the lecture with students' focus on the learning as the aim. In this way, it is even still difficult for the teachers to keep the students as active as possible. The use of learning sources needs teacher's competency to guide students so that they get enough materials [12].

Teachers' activity in poster exhibition based learning has a good quality with A score on strategy component, communication and interaction with students, mastery of the topics and how the teacher makes the students more active. B score was obtained on routine assignment component, facility and time, and teaching method demonstration. This good quality of teacher's activity can happen if the planning is executed well. Besides, art expertise, intuition, perspective emotional reflection and intellectuality can help the teachers in using learning methods [13]. The variation in the learning context could also help the learning process [11]. In conventional learning method with same materials in the other class, lower quality of teacher activity was found . It seems that class with conventional learning method shows that the teacher as the center of learning could not develop the students' learning process.

Poster exhibition based learning has a better learning quality as Roestiyah said that a good learning process focuses on the main concept and principle [5]. Besides, discipline of science is involved, students' skills are developed through assignment, and students are given chance so that they could learn by themselves and construct their own knowledge. This is supported by [14] who says that to learn something, listening, seeing and asking about it are necessary.

Poster exhibition based learning showed a better result compared to the conventional method. This shows that a better learning process is also followed by a better learning outcome. In a suitable condition, every student is able to learn well and get a better result [15]. It means that anyone who studies well will also get a good learning and enough time [8].

IV. Conclusion

Based on this research and discussion, it can be concluded that learning based on poster exhibition with human reproduction as its topic on Pharmacy Major of ISFI Vocational Secondary School in Banjarmasin shows a good learning quality and high learning motivation. The accumulative learning mastery reaches 97.67% with a high average score of 86.48.

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The Effect of Problem Based Learning Instruction on Students Science Process Skills in Physics

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***Abstract*—This research was aimed to examine how problem based learning model of instruction related to junior high students' science process skills in physics. The data were taken from eight students of the eight grade selected randomly. To control other variables and to ensure that the problem based learning was the only variable affecting students' process skills. A group was used. This group was initially given a pretest of science process skills. This pretest examined the science process skills of students in identifying problem, formulating a hypothesis, identifying independent, dependent, and control variables, planning an experiment, performing the experiment, analyzing data, and making conclusion. This group was then given problem based learning of instruction using the topic of force; and eventually was given a posttest concerning those students' science process skills. A paired test used to analyze the data showing that the problem based learning instruction increased significantly and affected the students' science process skills.**

Keywords—Problem Based Learning, Science Process Skills

I. INTRODUCTION

Students who really want to master science well should first understand the nature of science; otherwise, they will fail to do so. Why is it important for students to understand the nature of science? Understanding of the nature of science is an important goal for education because it can increase students interest, develop awareness of the impact of science in society, and help student develop accurate views of what science is [1].

Science can be expressed in three ways: science as a product, science as a process, and science as an attitude. Consequently, the lack of failure to understand these may cause failure in understanding of what science is.There are some evidence why students do not understand the nature of science. Research studies revealed that the nature of science has not been well transferred yet by teachers. A study on how students defined science was held by NRC (1996) showing that students viewed science primarily as a knowledge to be studied and learned; they lack incomplete views of the science as processes. These views of science by students are understood since literature showed evidence that this aspect of science is most often ignored by school curricula and least understood by students [1]. Another evidence, an investigation of instruction on scientific literacy held by Mitman, *et al.* (1987) in [1] revealed that 11 seventh-grade life science teachers in the study rarely or never used the contexts of science. Students perception data showed that they viewed science as factual content from the predominant explanation for teachers' instruction [1].

Additionally, research done by [2] also implied that science as process was not well comprehended by the students. This domain of science is poorly addressed in the majority of curricular materials, and when it is addressed it is often misrepresented [2]. While another study done by [1] revealed that the nature of science was not always being directly transferred to students either by the curriculum or by the teachers. When students performed several experiments, they were not told neither by written text or teacher that this was a process used by scientists to produce scientific knowledge. Therefore, students would seperate dimensions of the nature of science and they would not be able to make the connections among these.

Besides, students failure on understanding the nature of science may root from these: first, they do not comprehend many technical terms not associated with any experience accessible to students, and second because the material is presented by teacher too rapidly and too great a volume for understanding of ideas, concepts, or theories; third, most science textbooks focused on processes of testing theories, not on the processes which generated this knowledge.

From the description above, it can be concluded that textbooks expositions and science teacher behaviors are not aligned with the nature of science as the two most obvious sources for student misconceptions about the nature of science. Science textbooks and even the 'newer' curricula, with few exceptions, do not deal with the relationship among scientific explanations and contain statements that portray science as consisting of unalterable, fixed truths [1]. Rather than helping students to develop meaningful understanding about scientific knowledge and the conditions by which it develops, science text materials contribute to the development of student view that scientific knowledge is an array of unconnected facts and concepts [1].

From these evidence, we summarize that traditional education fails in attaining the education needs for the current generation of students. However, this traditional or expository method has been used for many years and is still the prevalent method of teaching science classes. Research studies in this area have found that this method is highly inadequate. Largely dependent on textbased, content aquisition and passive flow of fragmented concepts from the teacher to students, this method is widening the gap between valuable learning experiences and the mere compliance of the academic exercise.

As a matter of fact, science teachers have an opportunity to teach students how science makes the world work. Unfortunately, reducing the teaching budgets and being apathy sometimes makes it difficult to get students' interest in the topics like biology, earth science, anatomy, physics, and chemistry. Teachers should use techniques such as peer learning, role playing, and incorporating current events in science lesson plans. These techniques can help engage students and make them understand the importance of science. They will also make teaching scientific concepts more fun and help students understand common topics in scientific world.

Current reforms in science education emphasize teaching science for all, with the ultimate goal of developing scientific literacy. Science, as an academic discipline involves learning the key concepts, as well as the processes of science. Accordingly, it is important for students to learn science process skills. The increased importance of science process skills of students poses a serious challenge of finding ways to improve teaching as a means of elevating the educational outcomes. Interest in developing thinking skills has encouraged added emphasis on process skills instruction. In this view, science instruction must go beyond simply teaching science as a body of knowledge. Today's teachers should be challenged to engage students in a broader view of science (NRCl, 1996). In other words, science teachers are increasingly being encouraged and required to teach about the nature of science [2]. Besides, science educators have related teaching about the nature of science to increased students' interest [2].

One of the instruction models using science process skills is Problem Based Learning (PBL). In Phase 3 of PBL, it is stated that teacher's activity is to help students perform an experiment. In this activity students are trained to do the activities of identifying problem, hypothesizing, identifying variables, defining variables, performing experiments, analyzing data, and drawing conclusions. The use of *problem based learning* approach is viewed as an alternative to deal with this educational need [3].

The aims of this research are to describe the profile of students science process skills of junior high school students before and after participating in learning by using PBL.

II. REVIEWING LITERATURE

A. Definition of Science

Science is a human activity through which problems and questions dealing with natural phenomena can be identified and defined, and solutions proposed and tested, or science is a human activity, a process used to investigate natural phenomena, a process used to add an existing knowledge base, and a social enterprise [1]. On the other hand, Sutrisno (2006) defined science as *a body of knowledge*, *a way of thinking*, *a way of investigating*. Other terms are also used to describe that science is a product (*knowledge*), an attitude (*a way of thinking*), and a process (*a way of investigation*).

B. The Nature of Science

Three principle components of the nature of science that were defined by the National Council on Science and Technology Education are:

1) Scientific world view: the world is understandable, scientific ideas are subject to change, scientific knowledge is durable, and science cannot provide answers to all questions.

2) Scientific methods of inquiry: science demands evidence, science is a blend of logic and imagination, science explains and predicts, scientists try to identify and avoid bias, and science is not authoritarian, and

3) Nature of the scientific enterprise: science is a complex social activity, science is organized into content disciplines and is conducted in various institutions. There are generally accepted ethical principles in the conduct of science, and scientists participate in public affairs both as specialists as citizens.

On the other hand, the nature of science as identified by educators are three domains of science that are critical to develop scientific literacy (ability to understand media accounts of science to recognize and appreciate the contributions of science, and to be able to use science in decision-making on both everyday and socio-scientific issues). The first of these is the body of scientific knowledge. Of the three, this is the most familiar and concrete domain, and includes the scientific facts, concepts, theories, and laws, typically presented in science textbooks. Scientific methods and processes comprise the second domain, which describes the wide variety of methods that scientists use to generate the knoewledge contained in the first domain. Science curricula delve into this domain when they address process skills and scientific methodology [2].

The nature of science constitutes the third domain and is by far the most abstract and least familiar of the three. This domain seeks to describe the nature of the scientific enterprise, and the characteristics of the knowledge it generates. This domain of science is poorly addressed in the majority of curricular materials, and when it is addressed it is often misrepresented [2]. The nature of science can be represented in the diagram below.

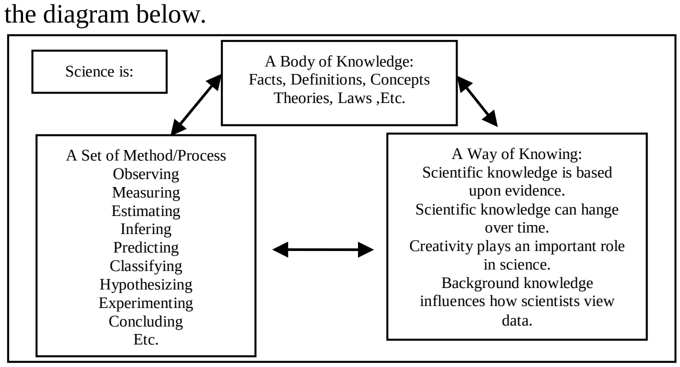

Fig. 1. Three Domains of Science [2].

Since physics constitutes science, we can think analogically that the nature of physics has something in common with the nature of science, that is, the nature of physics as product (knowledge), physics as attitude (way of thinking), and physics as process (way of investigating). On the nature of physics as product, the pile of knowledge can be facts, concepts, priciples, laws, formulas, theory, and model. Physics as process has the following indicators: observing, clasifying, measuring, questioning, hyphotizing, planning investigating/experiments, interpreting, and communicating. Meanwhile, physics as attitude has the following indicators: curiousity, emphaty, responsibility, honesty, open minded, and cooperation (Sutrisno).

The nature of physics as product, process, and attitude has consequently the impact on how to teach physics in classes. Physics instruction mostly performed by teachers are commonly the manifestation of physics learning as product that is merely teaching concepts, theory, formula, etc. Thus, learning physics as attitude as well as process has not got enough attention yet.

Learning physics as a process is also important for students to comprehend and investigate principles, laws, theories, natural phenomena and their relationship. Learning physics as process consequently has relationship with the process of investigating the natural phenomena as well as the cause-response it yields. The investigation activities include observing, classifying, measuring, questioning, hyphotesizing, planning experiment, interpreting, and communicating. These activities in physics learning are recognized as science process skills [4]. Through learning these skills students are expected to understand the nature of science, especially physics.

C. *Overview of Teaching Methods*

Teaching approaches used to develop students' understanding on the nature of science include the following: 1) learning cycle lessons taught to peers (including a reflective analysis about what was learned about science and science teaching, 2) the design and implementation of a research experiment, a written research report, and sharing of results with peers, 3) a follow-up reflective analysis of the experiment, summarizing what was learned about the nature of scientific inquiry and knowledge and how such an experiment might be structured in an elementary classroom, and 4) a quiz on the nature of science and scientific knowledge [1].

In addition to the above explanation, we should involve students in an experience which requires them to use the processes of science in the design and conducts their own research study. Students work by themselves in a group of 2-4. They are in a complete control of this experience, from the development of a research question which interests them to the formulation of a hypothesis, the design of an experiment, the collection and recording of data, the interpretation of results, and the drawing of conclusions based on their results. Students are then required to submit a written report of their work and share their results with the 'scientific community' of their peers [1].

Besides, real life scenarios are recomended to use for teaching the nature of science. Real life scenario reinforces classroom learning. The scenarios are ideal for classes of any size, but they work best when each student has access to special needed equipment. Case studies should be relevan to students as this will make it easier to engage them in learning [5].

Additionally, hands-on activities with follow-up work are also encouraged. Hands-on activities are a great way to introduce students to the world of science and excellent opportunity for learning. All hands-on activities should be followed by follow-up work, whether teachers assign an essay or ask students to complete a group project. Assignment questions should be directed to ask students to analyze the results of the activities and explain why a certain set of events may have occured. These assignments reinforce learning and help students understand scientific principles better [5].

D. *Science Process Skills*

One of the most important goals of science education is to teach students how to get involved in inquiry. In other words, students should integrate skills, knowledge, and attitudes to develop a better understanding of scientific concepts. Therefore, teachers must focus on teaching science skills such as facts, concept and theories to encourage students through scientific investigation. Science process skills are a necessary tool to produce and use scientific information, to perform scientific research, and to solve problem (Aktamis & Ergin).

1) *Teaching the Science Process Skills*

There are three dimensions of science that teacher should pay attention when teaching students about science. The first is science knowledge. It is the content of science, the basic concepts, and our scientific knowledge. This is the dimension of science that most people first think about, and it is certainly very important. The second is processes of doing science. It is the science process skills that scientists use in the process of doing science. Since science is about asking questions and finding the answers to the questions, the searching is actually the same skill that we all use in our daily lives as we try to figure out everyday questions. When we teach students to use these skills in science, we are also teaching them skills that they will use in the future in every area of their live. The third dimension of science focuses on the characteristic attitudes and dispositions of science. These include such things as being curious and imaginative, as well as being enthusiastic about asking questions and solving problems. Another desirable scientific attitude is a respect for the methods and values of science. These scientific methods and values include seeking to answer questions using some kind of evidence, recognizing the importance of rechecking data, and understanding that scientific knowledge and theories change over time as more information is gathered.

2) *Six Basic Process Skills*

The Science Process Skills form the foundation for scientific methods. There are six basic science process skills namely observation, communication, classification, measurement, inference, and prediction. These basic skills are integrated together when scientists design and carry out experiments or in every day life when we all carry out fair test experiments. All the six basic skills are important individually as well as when they are integrated together. The six basic skills can be put in a logical order of increasing sophistication, although even the youngest students will use all of the skills along side one another at various times. In the earliest grades, students will spend a larger amount of time using skills such as observation and communication. As students get older they will start to spend more time using the skills of inference and prediction. Classification and measurement tend to be used across the grade levels more evenly, partly because there are different ways to do classifying in increasingly complex ways, and because methods and systems of measuring must also be introduced to children gradually over time.

Integrating the basic science process skills together and gradually developing abilities to design fair tests are increasingly emphasized in successive grade levels, and is an expectation of students by the fourth grade (www.longwood.edu).

3) *Integrated Science Process Skills*

Integrated Science Process Skills include predicting, communicating, controlling variables, hypothesizing, experimenting, and data interpreting. Predicting means forecasting a future occurence based on past observation or the extension of data. While communicating means using words, symbols, or graphics to describe an object, action or event. Controlling variables is manipulating and controlling properties that relates to situations events for the purpose of determining causation. Hypothesizing is stating tentative generalization of observations or inferences that may be used to explain a relatively larger number of events but that is immediate oe eventual testing by one or more experiments. Experimentation is testing a hypothesis through the manipulation and control of independent variables and noting the effects on a dependent variable: interpreting and presenting results in the form of a report that others can follow to replicate the experiment. Data interpreting means arriving at an explanation, inference, or hypothesis from data that have been graphed or placed in a table .

E. *Problem Based Learning*

1) *Outcome of PBL.*

PBL model of instruction has several learning outcomes, including 1) thinking skills and problem solving. High order thinking, such as analzing, criticizing, and making conclusion based on inference and reasonable considerations are skills aimed to achieve in PBL, 2) imitation of adults. PBL is also aimed to help students take action in real life situation and learn the important role of adults, 3) independent learner. PBL strives to help students become independent learner and self regulated learner [6], 4) long life learning skills.

2) *Syntax of PBL*

TABLE I. SYNTAX OF PBL

Phase	Teacher Behavior
Phase1: Direct students to the problem.	Teacher explains the aim of instruction, describes the importance logistic needs, and motivates students to be involved in problem solving activities.
Phase2: Organize students to learn.	Teacher helps students define and organize learning tasks related to the problem.
Phase 3: Help students to work independently and in group investigation.	Teacher fosters students to collect relevant information, perform the experiment, and seek explanation and solution.
Phase 4 : Develop and present artifact and exhibition.	Teacher helps students in planning and preparing relevant (SESUAI) artifact, such written report, video, and model, as well as helping them in collaboration.
Phase 5: Analyze and evaluate problem solving process.	Teacher helps students reflect the investigation and the process they use.

Source: [6]

III. METHODS

This reseach was aimed to investigate the difference between science process skills (SPS) before and after the implementation of PBL instruction. The students' SPS include the skills of identifying problem, formulating hypothesis, indentifying variables, planning experiments, performing experiment, organizingdata, analyzing data, and drawing conclusion.

The research was conducted at Junior High School Lukmanul Hakim, located at Jl. Perjuangan, Samarinda, East Kalimantan. The participants were the VIII grade; 8 out of 16 were chosen as the sample of the research.

The instrument used to take the data of students' science process skill was a set of students' work sheet containing questions concerning with science process skills to be answered by those students. Besides, an observation sheet was also used to get the students' data concerning with their performance in conducting the experiment.

The skills were graded with the scale of 0-5 (for identifying problem, hyphotiszing formulation, indentifying variables) and 0-10 for planning experiments, performing the experiment, data organizing, data analysis, and drawing conclusion, where getting 0 means the students did not answer the item addressed, and getting 5 (for identifying problem, formulating hypothesis, and indentifying variables) and 10 for planning experiments, performing the experiment, organizing data, analyzing data, and drawing conclusion means he/she answered it perfectly. This can be summarized in Table 2.

TABLE II. MAXIMUM SCORE OF ITEMS OF SPS

No of item	Science Process Skills	Maximum Score
1	Identifying problem	5
2	Formulating hypothesis	5
3	Identifying variables: - Independent variable - Dependent variable - Control variable	 5 5 5
4	Planning experiment	10
5	Performing experiment	10
6	Organizing data	10
7	Analyzingdata	10
8	Drawing conclusion	10

First, the data of each component of science process skills were examined qualitatively by finding its average. These data could show what the most difficult component of science process skills for the students was. The data of science process skills of students before and after problem based learning instruction were compared using paired-t test. Similarly, the difference between science process skills before and after problem based learning instruction for each component was examined.

IV. RESULT

The profile of the science process skills grading before and after problem based learning instruction was on Table 3 and Table 4.

TABLE III. SCIENCE PROCESS SKILLS BEFORE PBL INSTRUCTION

No	Name	1	2	3			4	5	6	7	8	Tot
				a	b	c						
1	RY	2	0	0	0	0	5	6	0	0	0	13
2	MI	4	2	0	0	0	5	6	1	0	0	18
3	YBS	0	0	5	2	5	6	4	4	6	0	32
4	DR	1	1	1	1	1	6	6	1	0	0	18
5	GA	0	1	0	0	0	3	4	0	0	0	8
6	Adit	3	5	4	2	1	7	6	3	4	0	35
7	DHA	4	1	5	2	1	6	6	1	2	0	28
8	M	3	1	1	3	2	5	4	4	0	0	23
	Tot	17	11	16	10	10	43	42	14	12	0	175

TABLE IV. SCIENCE PROCESS SKILLS AFTER PBL INSTRUCTION

No	Name	1	2	3			4	5	6	7	8	Tot
				a	b	c						
1	RY	5	2	0	0	0	4	7	4	4	4	30
2	MI	4	3	5	4	5	9	9	10	8	0	57
3	YBS	0	0	1	1	0	7	6	10	8	6	39
4	DR	5	1	5	0	1	9	8	8	6	0	43
5	GA	0	0	0	0	0	5	5	4	0	0	14
6	Adit	4	4	5	2	1	8	9	10	10	8	61
7	DHA	4	4	2	2	2	7	9	10	9	7	28
8	M	5	1	0	0	0	6	7	6	8	8	23
	Tot	27	15	18	9	9	55	60	62	53	33	341

The cumulative score before the implementation of Problem Based Learning instruction for identifying problem was 17 which was 42.50 % of the maximum score 40. Then, for hypothesizing was 12.50%, for identifying variables was 30%. For planning experiment was 53.75%, performing experiment was 52.5%, 17.5%, data organization was 68.5%, for data analysis is 15%, and drawing conclusion was 0.

The cumulative score after the implementation of Problem Based Learning instruction for identifying problem was 27 which was 67.50 % of the maximum score 40. Hypothesizing was 37.50%, for identifying variables was 30%, for planning experiment was 68.65%, performing experiment was 75%, 17.5%, data organization was 77.5%, for data analysis was 66.25%, and drawing conclusion was 41.25.The mean score for the science process skills before problem based learning instruction was 175 (29.17%); while it was after problem based learning instruction was 341 or 56.83% .

It means that before the implementation of PBL instruction the students did not know how to make a hypothesis, problem formulation, variables identification, design an experiment, organize data, analyze data, and draw conclusion. After the PBL instruction, their average score was better significantly in most aspects, except in identifying variable. The cumulative score for science process skills before problem based learning instruction is evaluated as a poor display of basic and integrated science process skills; while it was after problem based learning instruction was still poor, but it showed significantly better performance.

The paired t-test for the two means showed that there was significant difference between the two skills in the science process skills which was not among the priority of the traditional class as can be seen on Table 5. The teaching of these skills through the traditional lecture mode faced with problems such as time constraint. Likewise, the limited opportunity for students to participate in inquiry and hands on activities may not serve the students' need for more enhanced psychomotor development.

TABLE V. PAIRED T-TEST OF THE MEAN SCORE IN THE SCIENCE PROCESS SKILLS

No	Components	T	T table	Conclusion
1	Identifying problem	2.4	2.365	Significantly different
2	Hypothesizing	0.83	2.365	Insignificantly different
3	Identifying variables	0.46; 0.18; 0.126	2.365	Insignificantly different
4	Planning experiment	2.81	2.365	Significantly different
5	Performing experiment	7.19	2.365	Significantly different
6	Data organization	11.47	2.365	Significantly different
7	Data analysis	5.00	2.365	Significantly different
8	Drawing conclusion	3.198	2.365	Significantly different

The mean score for the science process skills before problem based learning instruction is considered low. The possible cause of this unexpected score may be caused by the students who have not yet been introduced to science process skills. They used traditional instruction which was text based and lack of direct experience of experiment and not connected to daily phenomena around them.

The mean score for the science process skills after problem based learning is judged still low, but there is a significant improvement in students' science process skills. The estimated cause of this because students have had already acquainted with these skills after the PBL instruction, the prior knowledge may function as their advanced organizer to perform better, and they got enough information they needed and sufficient scaffolding by the tutor and peers.

However, there is one aspect that has not been yet improved, that is identifying variables. The suspected cause is probably that the students lack information and prior knowledge concerning with these, lack of students' prior knowledge and supporting literature, students need more guidance from tutor and peer, lack of students' skills and interest.

Based on the discussion of this study, the ways on how to improve PBL instruction in teaching of weight are using better material (better elasticity of elastics) and better way of measuring, prepare students with more prior knowledge and skills.

V. Conclusion

The average of science process skills of the students prior to problem based learning instruction was very low (29.17%). The average of science process skills of the students after problem based learning instruction was low (56.83%). The difference of average of science process skills of the students before after problem based learning instruction was significantly different.

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Students' Creative Thinking Ability Profile in Problem Solving of Animals Ecology

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***Abstract*— In the era of a global economy based on knowledge and technology, lead free competition occurs with the trend of open systems. Therefore, Indonesian nation must improve the quality of human resources. The quality of human resources is marked by rapid development patterns of thinking in the form of creative thinking, critical thinking, problem solving and decision making. Orientation of creative thinking in this research consists of 3 aspects, which are fluency, flexibility and novelty. Creative thinking can be seen from its activities in the problems solving. The purpose of this research was to describe the profile of students' creative thinking in problem solving of animal ecology and to describe the characteristics of students' creative thinking in problem solving of animal ecology. The type of this research is descriptive research with a qualitative approach. The research subjects were students who have taken animal ecology course. Based on the results of written assignment 1 and written assignment 2 done by students, the level of students' creative thinking ability was at quite creative level. The highest aspect of creative thinking possessed by students was fluency, and the lowest aspect was novelty.**

Keywords—Animals Ecology, Creative Thinking, Problem Solving

I. Introduction

Creative thinking ability is one of the essential competencies as part of life skills that become one of the goals of national education. The 2013 curriculum aims to prepare Indonesian generation to have the ability to live as individuals and citizens who believe, are productive, creative, innovative and effective, and able to contribute to the life of society, nation, and state and civilization of the world [1]. Moreover, as described in the Law of the Republic of Indonesia Number 12 of 2012 on Higher Education, in order to enhance the nation's competitiveness in the face of globalization in all areas, higher education is required to develop science and technology, and to produce intellectuals, scientists, and/or professionals who are cultured and creative, tolerant, democratic, have strong character, and dare to defend the truth for the sake of the nation.

Every individual requires the creative thinking ability to solve problems in life. It is because the individual's creative thinking ability can be trained to solve problems in different ways and various with appropriate priority. This is in line with [2] who stated that the creative thinking ability to solve a problem is indicated by the filing of a different idea of solution in general. Creative thinking of each person will be different and related to their way of thinking in the approach to the problem. Creative thinking related to knowledge is possessed by someone along with relevant ideas or creative measures.

The importance of creative thinking ability is also strengthened by the Guilford in Munandar statement that most of the graduates of our universities are quite capable of performing the tasks given, but they could not solve problems that require new ways. Guilford emphasize how research in the field of creative thinking is very less.

On the other side, the researchers also gained an overview of the biology education program students from S-1 level of Lambung Mangkurat University, Banjarmasin, who have programmed the Animal Ecology course. Based on the interview with a lecturer of Animal Ecology, it was found that early concept of the course was one of the materials which got most attention. If students already have the understanding of the early concept of the Animal Ecology course, creative thinking ability of students can be seen. It is also said that during the learning and teaching in the Animal Ecology course, creative thinking ability is always become a target, especially during the students' practicum on the field.

Based on the information obtained from the lecturer of the course, it is known that the students are trained for creative thinking ability in teaching and learning activities in the classroom and on the field. However, the presence of creative thinking ability of students overall is unmeasured. Students are accustomed to working in groups when solving the problems. According to the lecturer of the course, each group usually divide the tasks to be done by each of their members. A trend that looks is that only one or two people who are very dominant in discussion and problem solving, while others get a little portion of the task. This makes the measurement of creative thinking ability has not been implemented holistically.

Problem solving is the process of activities to sharpen logic, argumentation and problem resolution as well as the ability to determine the cause, develop alternatives, analyze and choose a good settlement. Solving the problem is an attempt to find a way out of a difficulty to achieve a goal soon [3].

Administration of problems to be solved by the students can track the creative thinking ability as well since to solve the problem, one must have the creative thinking ability. This is in line with [4] who stated that the creative thinking ability does not grow in a vacuum. It requires a means. The means refers to the activity of problem resolution. Problem solving activity will be visible for improving creative thinking ability of students. It is also reinforced by [5] who argued that the development of creative thinking ability requires activities.

One way to achieve it is by doing the activity of problem solving.

II. Research Methods

This research was descriptive research with a quantitative approach, which described the incident as the center of attention (creative thinking ability of students) and based on quantitative data.

Subjects in this study were students of the Biology Education at S-1 level of Lambung Mangkurat University who have been taking course of animal ecology in the second semester of the academic year 2015/2016.

Instruments used to obtained, process and analyze the data in this study were the written assignment for creative thinking ability and the assessment rubric of written assignment. The researchers set written assignment customized with steps to problem solving. In the assessment rubric of written assignment, scores were assigned by the researchers and adjusted to the aspect of creative thinking ability. Thus, from the results, the researchers could determine the creative thinking ability.

Data obtained were then assessed using an assessment rubric of creative thinking ability that have been developed by the researchers. Subsequently, the percentage of the achievement indicating each level of creative thinking ability was determined by the following formula:

$$NP = \frac{R}{SM} x\ 100 \quad (1)$$

Information:
NP = Percentage
R = Raw scores obtained by student's
SM = Maximum score
Source: [6]

III. Results and Discussion

A. Results

1) Aspects of Creative Thinking Ability

Based on the results of written assignment 1 and written assignment 2 done by students of biology education FKIP Lambung Mangkurat University, the percentage of achievement for each aspect of creative thinking ability is listed in Table 1 and Table 2.

TABLE I. Aspect of Creative Thinking Ability (ACTA) of Students in a Written Assignment I

Num.	ACTA	The Number of Values	Percentage (%)
1.	Fluency	308	20.62
2.	Flexibility	246	19.22
3.	Novelty	174	13.59

Notes:

Percentage fluency = *(The Number of Values/448)*30%*

Percentage flexibility = *(The Number of Values/448)*35%*

Percentage novelty = *(The Number of Values/448)*35%*

The data obtained from the written assignment 1 done by students of Biology Education FKIP Lambung Mangkurat University showed that the three aspects possessed by students in a sequence are aspect of fluency (20.62%), aspect of flexibility (19.22%), and aspect of novelty (13.59%).

TABLE II. Aspect of Creative Thinking Ability (ACTA) of Students in a Written Assignment II

Num.	ACTA	The Number of Values	Percentage (%)
1.	Fluency	311	20.83
2.	Flexibility	255	19.92
3.	Novelty	166	12.97

Notes:

Percentage fluency = *(The Number of Values/448)*30%*

Percentage flexibility = *(The Number of Values/448)*35%*

Percentage novelty = *(The Number of Values/448)*35%*

The data obtained from the written assignment 1 done by students of Biology Education FKIP Lambung Mangkurat University showed that the three aspects possessed by students in a sequence are aspect of fluency (20.83%), aspect of flexibility (19.92%), and aspect of novelty (12.97%).

B. Discussion

1) Aspects of Students' Creative Thinking Ability

Creative thinking ability is the ability to see or think of extraordinary, unusual, combining seemingly unrelated information and sparking new solutions or ideas that are reflected in the fluency, flexibility, and novelty of thinking [7]. This study describes the context in creative thinking ability profile in students' activity to solve the problem. Giving students a problem to be solved by creative thinking ability enable us to track the ability well. It is because to solve the problem, one must have the creative thinking ability. This is in line with [4] who stated that creative thinking ability requires a means in the form of the activity of problem-solving.

Based on Figure 1, the highest aspect of creative thinking ability seen in Students's of Biology Education FKIP Lambung Mangkurat University highest was fluency, followed by the aspect of flexibility, and the lowest aspect was the aspect of novelty.

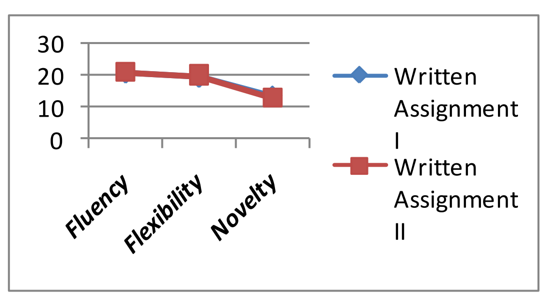

Fig. 1. Graphic Aspects of Creative Thinking Ability of Students

2) Aspect of Fluency

Fluency in problem solving refers to the many answers given by students. The results of the written assignment 1 and written assignment 2 showed that almost all the students have been able to provide an answer to fulfill aspect of fluency. Look at Figure 1 showing fluency as the highest aspect which is owned by the students in creative thinking ability. This indicates that the students have good ability in providing a wide variety of ideas/solutions on problems. This aspect of fluency is an aspect of creative thinking ability which ranks the lowest when compared with the aspect of flexibility and novelty [8]. Thus, students' achievement on the aspect of fluency of the highest rank.

The tudents are more likely to have a dominant aspect of fluency. This can be proved by looking at the results of written assignment 1 and written assignment 2 done by the students. They were able to give more than one answer to each given question. This is in line with the opinion [7] that fluency can be seen from how the students like asking a lot of questions, respond with a number of answer to any questions/problems, have many ideas about a problem, and fluently express ideas.

3) Aspect of Flexibility

Flexibility in problem solving refers to provide many different answers by students. The results of the written assignment 1 and written assignment 2 showed that the students were able to provide answers to fulfill aspect of flexibility. While looking at the Figure 1, the aspect of flexibility occupied the second position under the aspect of fluency, with the achievement percentage which was not much different. This indicates that the students have good ability in providing a wide variety of ideas/solutions to given problems. Aspect of flexibility is the second most important aspect after the aspect of novelty because the aspect of flexibility shows of productivity ideas/solutions that are used to solve a problem [8]. Aspect of flexibility applies when students are required to be able to provide various ideas/solutions.

Students have been able to show the aspect of flexibility in problem solving. This can be proved by looking at the results of written assignment 1 and written assignment 2 done by students. They were able to give more than one answers which were diverse to each given question. This is in line with the opinion of [7] in that flexibility can be seen from how the students give a variety of unorthodox use of an object, providing all kinds of interpretation of a problem, and give consideration to the different situation given by others.

4) Aspect of Novelty

Novelty in problem solving refers the ability of students to answer the question or problem with several different answers but it is true or unusual answer given by other students. Based on the results of the written assignment 1 and written assignment 2, not all students showed the aspect of novelty in solving the given problem. Most students still gave an answer that was similar to the other students. Only a few students gave a unique answer or unusual.

This indicates that not all students have good ability in providing a wide variety of answers/ideas/solutions which were unique and unusual. Aspect of novelty is placed in the high position between two other aspects of creative thinking ability because aspect of novelty is the main characteristic in evaluating a product or idea creative thinking that should be different from the previous or the others [8]. Thus, the aspect of novelty is considered very important to know the level of creative thinking ability of students.

Although most students have not been able to demonstrate the aspect of novelty in solving the problems, there were some students who were able to show it. This can be proved by looking at the results of written assignment 1 and written assignment 2 done by some students. They were able to give answers that were true or unusual (unique). This confirms that novelty can be seen from how students think about problems or things that are not thought by others [7].

IV. CONCLUSION

Based on the results and discussion in this research, the aspect of creative thinking ability that can be achieved by the students with the highest percentage was aspect of fluency, while the aspect of creative thinking ability with the lowest percentage was the aspect of novelty. This research revealed the level of creative thinking ability of 28 students from the overall written assignment. Based on this research, 4 students were at the level of very creative, 4 students were at the level of creative, 15 students were at the level of quite creative, and 5 students were at the level of less creative.

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Application of Assessment as Learning In Mathematics Instruction

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***Abstract*— This research was conducted to determine the best approach to implement the assessment as learning in mathematics instruction. Assessment as learning is a classroom-based assessment that applies the principles of self-assessment by students on each of the instruction process. The main principle in the assessment as learning is that students know what they know and what they do not know. Based on both of these, students can improve their learning achievement independently with the teacher's guidance. There are two approaches taken in the application of this assessment in mathematics instruction namely: group assignments and individual assignments. Group assignment is a task assigned by the teacher to be done as a group, while the individual-assignment is a task to be done individually. Each assignment consists of presenting and problem solving. The results showed that the presenting task that was done in groups results as the best learning activities, whereas the highest learning achievement was taken place when students work the problem solving individually.**

Keywords*— *Assessment as learning, Mathematics instruction.

I. INTRODUCTION

In the last decade, there has been a rapid change in social, economic, cultural, political, and technological. The situation means that education has been subjected to change. As society changes, teachers realize that they have to make changes to face these changes, as well as mission of school. Today's mission of schools have to less focused on merely sorting students and more focused on helping all students success in meeting standards. In order accomplish the mission; changes in various aspects of education, including changes in instruction are required.

Nowadays teacher's instruction tends to follow a general and predictable pattern. The instruction begins with teaching, followed by evaluating the students' understanding on the teaching material, making assessment on students' achievement based on the evaluation result (classroom assessment), and then moving on to the next unit of tlearning material. In these cases, classroom assessment is considered as a mechanism for providing an index of learning only. Moreover, [1] stated that historically, a major role of assessment has been to detect and highlight differences in student learning in order to rank students according to their achievement.

Assessment is not only aimed to determine the rank and grade, but more importantly to achieve other functions in educational process. Reference [2] Newton, assessment has been used for multiple purposes, such as providing student grades, system monitoring, student placement or monitoring, determining interventions, improving teaching and learning, or providing individual feedback to students and their parents. Meanwhile, [3] stated that assessment is process of gathering information that accurately reflects how well a student is achieving the curriculum expectations in a subject or course. Thus, there are some purposes of assessment, although the primary purpose of assessment is basically to improve student learning.

Based on its purpose, assessment is classified into three types, namely the assessment of learning (Aol), assessment for learning (AfL), and assessment as learning (AaL).The purpose of AoL is to measure, certify, and report the level of students' learning, so that reasonable decisions on students' achievement can be made, whereas in AfL, teachers use assessment as an investigative tool to find out what their students know and can do as much as they can, and what confusions, preconceptions, or gaps they might have [4]. The principal distinction between the two assessments is that AFL is used in making decisions that affect instruction in the near future, while AoL is used in recording and reporting material has been learned. In short, the nature of AoL is determined by what the information is used for.

Moreover, reference [5] stated that AfL is a vital component of effective teaching practice as teachers and students cannot avoid giving and getting feedback from any learning activity. AfL is concerned with practices that maximize the value of the feedback process to ensure that learning is optimized. The feedback includes the informal and formal one. Oral comments given immediately to learners as they think through problems are examples of formal feedback, whereas written note is an example of formal feedback. Written feedback such as rubrics is an instrument that help to clarify and scaffold learning and assessment objectives.

Reference [6], feedback is an important part of the learning cycle, but both students and teachers frequently express disappointment and frustration in relation to the conduct of the feedback process. Students sometimes complain that the feedback is unhelpful or unclear, and even demoralizing. Additionally, students sometimes report that they are not given guidance to use feedback to improve their subsequent performances. Even worse, students sometimes note that the feedback provided is too late and irrelevant. On the other hand, lecturers frequently comment that students are not interested in feedback comments and are only concerned with the grade. Furthermore, lecturers sometimes express frustration since students do not incorporate feedback advice into subsequent tasks.

On the other hand, AaL focuses on students and emphasizes assessment as a process of metacognition (knowledge of one's own thought processes) for students. AaL emerges from the idea that learning is not just a matter of transferring ideas from someone who is knowledgeable to someone who is not, but mainly an active process of cognitive restructuring that occurs when individuals interact with new ideas. AaL is based on research about how learning happens, and is characterized by students reflecting on their own learning and making adjustments so that they achieve deeper understanding [4]. As an important part of the instruction, the teacher plays an important role in the successful implementation of AaL. Teachers engage in AaL by helping students develop their capacity to be independent, autonomous learners who are able to set individual goals, monitor their own progress, determine next steps, and reflect on their thinking and learning [3]. There are some instruments in the implementation of AaL that teachers can utilize to help students, such as: presentations, conferences, essays, demonstrations, interviews, observations, quizzes, tests, and examinations. When applying these instruments, teachers perform an observation to obtain information about what students already known and what they have not known. Teachers can also find information about students understanding through various instruction activities, namely comments, explanations, questions, answers, and other students' activities in the classroom.

II. METHOD

The research was conducted using action research method. Action research (AR) including classroom action research (CAR) has many definitions, depend on the experts and field studies. The class action research also called teacher research or teacher as researcher is an approach designed to develop and improve teaching and learning in order to improve students' learning outcome that performed in several stages.

In this study, the CAR was implemented in six-step process of consciously and deliberately as proposed by [7], namely planning, taking actions, fact finding (data analysis and reflexing), revising plan, follow-up actions, and further analysis.

A. *Planning*

Planning was conducted in three stages. Firstly, the instrument preparation activities, which is a development assessment as learning. The assessment is adapted to learning materials and learning approaches used. The assessment must concurrent and integrate with learning material. Secondly, the determination of the success criteria of study. Success criteria used are student activity and learning achievement. Finally, learning goal discussion with students.

B. *Taking Actions*

The research consists of four actions and each actions consists of two cycles. The actions taken in the application of this assessment were group presentation, individual presentation, group problem- solving, and individual problem solving.

C. *Fact-finding*

After presentation and problem solving, students undertook a self-evaluation. Reference [8], self-evaluation is a process by which the student gathers information about, and reflects on his or her own learning. There are four criteria that are used to perform a self-evaluation, namely knowledge, skills, communication, and insight. Some samples of question adapted and developed from Paul's guidance in maintaining focus on the learning outcome [4], as self-evaluation:

Knowledge: Do I understand operations with ……………, and why are they important to learn? What are some prior knowledge that I need to understand..........? What are some concepts that I need to understand it well to have a comprehensive knowledge? Do I ask thoughtful questions to help me understand better?

Skills: Can I do operation with ………….., and know when to use them? Have I done the test using the procedure properly? Am I sure that my work does not contain calculation errors? What are the mistakes that I do? Why do I (still) do such mistakes?

Communication: Have I presented my task and explained my idea clearly and accurately so that other can understand? Can I show my understanding in picture, in writing, in speaking, and in numbers and symbols? Have I used correct mathematical model?

Insight: Can I find alternative ways to solve the problem? Can I use the formula to solve a different problem? Do I understand ……….. well enough to use them (it) in different contexts?

In addition to the students' self-evaluation, teachers carry out observations. The observations were made by observing the student activity in learning process. The observations were carried out to ensure the learning was done well and was used to revise plan if necessary.

D. *Revising plan*

Revising plan was conducted based on the result of the observations. There are three possibilities in this phase, namely: change the planning, modify the planning, and continue the action without any changes at all.

E. Follow-up actions

Follow-up action was conducted based on the result of revising plan. Through this step, the study was also conducted to obtain data on the evaluation of student success in learning.

F. Further analysis

Besides improving the instruction process, further analysis on the data was also conducted in order to evaluate the students' learning success. Students learning success is evaluated by using two indicators, namely the student activity and student achievement. Student activity were evaluated by using observation guidelines developed by [7], while the learning achievement carried out by using a test. The test are arranged in the form of essays and evaluated by using a holistic rubric. The data obtained from the test results were analyzed by using statistical techniques t test, to test scores of students among the four groups.

The subject of the research was 30 students who took mathematical statistics course at Mathematics Education Department, University of Papua. Mathematical statistics is a course that applies mathematics into statistics. Mathematical techniques which are used for the course include mathematical analysis, linear algebra, stochastic analysis, differential equations, and measure-theoretic probability theory.

III. RESULT AND DISCUSSION

The research result shows that the implementation of AaL tends to increase student's instruction activities and student's achievement. There are three results of observation and test, where result of observations presented in two studies, students' weaknesses and student's activities, while the test results was used to measure of student's learning achievement. Another result of the research was the procedure application of AaL in mathematics instruction.

A. The student's weaknesses

Based on the observations, there are two main problems of the student's weaknesses during discussions and working on test questions, namely:

- Students seem still face difficulty in understanding the problem.
  The main weakness is they misunderstand the purpose of questions. Reference [9] understanding the problem is an important step in solving mathematical problems. Understanding the question is a crucial aspect in problem-solving. The question needs to be understood, so that the problem could be solved.
- Students have not been able to use the formula that has been studied.
  In this case, students could not apply to similar formula on different problems appropriately. In order to be able to use the formula proficiently, the students need to do a lot of practices. Reference [9] stated that solving the mathematical problem is a practical art, like swimming, or skiing, or playing the piano: you can learn it by imitation and practice. If you wish to learn swimming you have to go into the water. If you wish to become a problem solver to have to solve problem. It may be easy to imitate a solution of a problem by solving closely similar problem. Such imitating action may be more difficult and scarce if the similarity of the problem is not so close.

B. Student's Activities

Student's activities are number of things that students can do to achieve the success of the learning process. Student activities are also the efforts of students in learning. There are four indicators used to evaluate the student's activities in the study, namely: asking question, respond to question, delivering opinion, and debating average of student's activities on four actions as presented in Table I.

TABLE I. AVERAGE PERCENTAGE OF STUDENT'S ACTIVITIES ON FOUR ACTIONS OF INSTRUCTION.

Indicator	**Action**			
	A	**B**	**C**	**D**
Asking questions	45	40	42	44
Respond to question	75	70	80	68
Delivering opinion	50	45	48	50
Debating	35	30	30	25

Explanation:
A: Presenting group assignment;
B: Problem solving on group assignment;
C: Presenting individual assignment;
D: Problem solving on individual assignment.

Table 1 shows that students are more active when they are presenting the task on group compared to others, except for indicators respond to the question. Unlike individual presentation, in a group presentation students are involved in a lot of careful discussion, note making, and other activities. The advantage of group presentations over normal presentations is students have an opportunity to collaborate with their peers or colleagues.

C. Student's Achievement

There are many variables that can impact the success of student achievement, but the most influential is classroom instruction. Classroom instruction consists of preparation, implementation, and evaluation of learning. System of evaluation utilized in this study is the assessment as learning by using four approaches. Results of research on student achievement in some statistics are presented in Table 2.

TABLE II. AVERAGE PERCENTAGE OF STUDENT'S ACTIVITIES ON FOUR ACTIONS OF INSTRUCTION.

Actions	Statistic			
	Min	Max	Mean	St.dev
Action A	49	77	63,00	6,83
Action B	52	78	63,53	6,34
Action C	56	78	67,10	7,10
Action D	58	80	70,50	6,28

Based on Table II, students who conduct problem solving on individual assignment have the best statistics value compared to the statistics of students in the three other groups. Students in the individual assignment group have a maximum, minimum, and average value of the highest with the smallest standard deviation.

Moreover, the result of statistical test using the t test shows that the performance of students who conduct problem solving on assignment individually is significantly better than to the performance of students in other groups. Thus, it can be stated that among the four groups, students who conduct problem solving on individual assignments produce the best performance in applying the AaL.

D. Application of Assessment as Learning

Based on the observation and evaluation, there are several things concerning on the application of the AaL obtained in mathematics instruction, especially the procedure of AaL as follows:

Preparation: Some aspect should be prepared before applying the AaL. First of all, the assessment should be concurrent and integrated into instruction. Teacher should explain learning goals and success criteria to students before the instruction. It should be done at the outset of learning to ensure that students and teachers have a common and shared understanding of these goals and criteria as learning progresses. Teachers should also use assessment in order to inform instruction, to guide next steps, and to help students monitoring their progress towards achieving their learning goals.

Observation: Observation is an acquisition of information from a primary source, in these case students. Teachers should collect information about student's ability. The observation should be done before, during, and at or near the end of a period of instruction. The information is collected by using a variety of assessment strategies and tools.

Data analysis: Data and information about evidence of learning collected should be analyzed and interpreted.

Tutoring: Teachers should tutoring students to give and receive specific and timely descriptive feedback about their learning. Teacher should also help students to develop skills of self-assessment.

IV. CONCLUSION

The results of research and discussion concluded that students presenting in task groups is the best learning activities, whereas the highest learning achievement was students working on the problem solving individually.

Moreover, assessment as learning has not been completely applied to the students in mathematics instruction. Students still need guidance from teachers. Students still face difficulties to know what they already known and what they have not known. However, there are some things that need to be conducted in implementing the AaL in mathematics instruction, namely preparation, observation, data-analyzed, and tutoring.

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Viva Video Development Using Local Wisdom for Improving The Quality of English Learning

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***Abstract*—Media development based on local wisdom to use application of viva video aimed to produce viable instructional media used in learning that is active, innovative, creative, effective and fun. This study used an ASSURE models through six stages, namely analyzing learning, stating objectives, selecting methods, media, and materials, requiring learner participation, evaluating and revising. The study involved 30 junior high school students of VII class in individual testing, small group piloting and large group trial. The study involved 30 junior high school students of class VII. The data were collected from subject matter experts, media experts, and the students. The instruments for data collection were questionnaires and tests of learning. The results of the study showed the assessment of display, attractiveness, language, and operation aspects. The aspect of display obtained 80% responses indicating a very viable and feasible display. Attractiveness aspect obtained 86.6%. The aspect of language was considered highly decent with 96.6% responses from 29 students out of 30. Further, operation aspect was considered decent and qualified as indicated by the average value of 93.3% responses. The use of media is very effective related to the mastery level of factual knowledge, concepts, and procedural learning.**

Keywords—Media Development, Local Wisdom, ASSURE Models

I. INTRODUCTION

This in teaching and learning process, communication will not run well when the message delivered by teachers is hard to understand. Learning process will be effective and efficient if teachers can create good atmosphere in the classroom. To create it, teachers should have good communication and some media to support their activities.

Media in teaching and learning process will support the effectiveness of learning [1]. It means that media really help teachers in delivering their materials.

In choosing media, teachers should consider the students' learning styles. There are four learning styles, namely visual, audio, visual and audio and kinaesthetic. Based on this consideration, teachers can create teaching and learning process more effectively and efficiently.

Since Indonesian government have released 18 values in education or national characters in 2011, teachers should consider and involve these on their material and media especially nation characters number 16. It discusses about environment. This demands school parties to ask teachers, students and all elements to give attention to their environment. It means that teachers should create the material and media based on local wisdom.

Based on the Indonesian English syllabus, the students at seventh grade should master English texts, such as descriptive text and procedure text. In this case, teachers need to create material based on the local wisdom. SMP Darul Hijrah Putra is located in Cindai Alus Martapura, a farming area, so the English teachers should design the text especially Procedure text based on the background of Cindai Alus. Cindai Alus has produced cassava and people in this place make it as crisp.

Even though environment has been issued in education but in reality not all teachers create their material and media based local wisdom. It will be a hindrance for students to understand the material. That is why teachers need to involve local wisdom in their material. The benefits are that students care not only about environment but they also understand the material easily because the material has been created based on their background knowledge. In this study, the researchers discussed the development of learning medium by using Viva video to support teachers to create teaching and learning process based on local wisdom.

II. THEORETICAL REVIEW

The use of multiple media formats for the presentation of information includes texts, still or animated graphics, movie segments, video, and audio information [2]. Computer–based interactive multimedia includes hypermedia and hypertext. Hypermedia is a computer–based system that allows interactive link of multimedia format including text, still or animated segments, video, and audio. Hypertext is non-linear organized and accessed screens of text and static diagrams, pictures, and tables.

Multimedia is the digital integration of text (written), graphic (the interface of the program), audio (dialog, stories, sound effect), still images (pictures and visual stimuli), and motion video [3]. Through the integration of all these media, the learning experience becomes an interactive one mirroring everyday experiences. In this study, viva video was discussed to help the teachers to design a medium that can help them to deliver their material. Viva video is an application video maker and video editor. This application has been designed specially for smartphone.

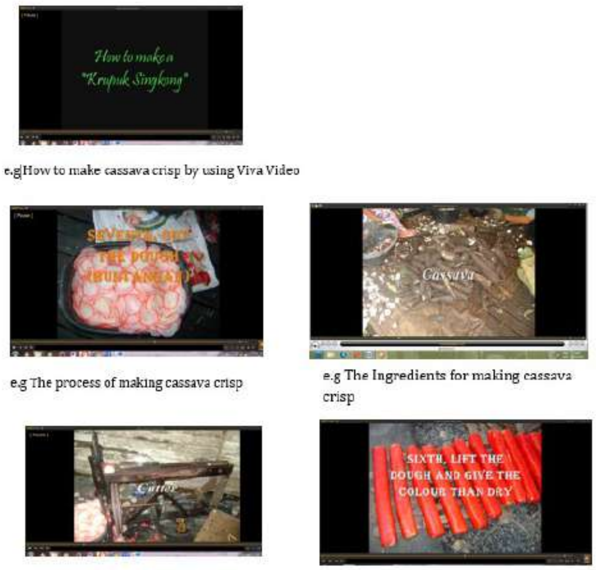

Fig. 1. Viva Video

Local wisdom is in the form of certain principles and ways adopted, understood, and applied by the local community in interacting with the environment and transformed in the form of customary value system and norms [4]. Ref [5] stated that local wisdom refers to knowledge that comes from community experiences and this is accumulated from local knowledge. Local wisdom can be in society, community and individual.

III. Method

This study used research and development (R&D) with assure model. Learning medium by using assure model was designed by using problem solving approach and it has been arranged systematically with 6 steps: analyzing learner; stating standards and objectives; selecting strategies, technology, media and materials; requiring learners' participation; evaluating and revising. These steps are as follows: (1) Identifying students' characteristic. The media planning is based on students' needs. The indicators of students' needs are students' ability, skill and affective which they should master: (2) Formulating objective. The learning media should help students to achieve their learning goal; (3) Selecting, changing, and designing learning media. Getting appropriate learning media usually has 3 possibilities, namely selecting the available learning media, trying to revise the available learning media, and designing new learning media; (4) Formulating materials. The material should relate to English subject; (5) Requiring learners' participation. Teacher should require the students in applying the media; (6) Evaluating. The evaluation goals were to select the media used in the class, to check procedure in applying the media, to check whether the media was utilized well or not, to assess teacher in applying the media, to give some information for administration and to fix the media itself.

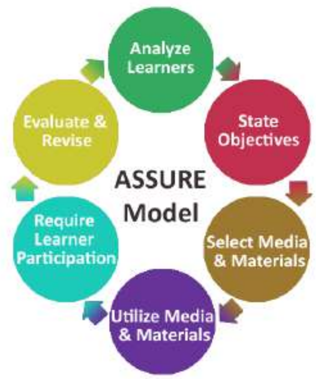

Fig.2. Assure Model

The setting of this study was at SMP Darul Hijrah Putra. It is located on Jalan Cindai Alus Martapura, Banjar region. This study was conducted in academic year 2015/2016. This study involved 30 seventh grade students.

The qualitative and quantitative data were used in this study. The data were described qualitatively. Qualitative data came from media experts, material expert and students, while quantitative data came from questionnaire score. To analyze the questionnaire data about the students' opinion, percentage technique was used [6].

IV. Result and Discussion

This section describes the results of developing the learning medium by using Viva video application. The results consisted of the material expert's assessment, media expert's assessment and questionnaire.

A. Results

The results of the material expert's assessment on the material in Viva video can be seen below.

TABLE I. THE RESULT OF MATERIAL EXPERT'S ASSESSMENT

No	Assessment Criteria	Assessment	Explanation
1	How do the researchers analyze students' characteristic?	100%	Excellent
2	How do the researchers select the medium accurately?	80%	Good
3	Does the material match the learning objectives?	100%	Excellent
4	Is it an appropriate medium?	80%	Good
5	In learning process, does the teacher utilize the material well?	80%	Good
6	How does this activity engage the students in learning process?	80%	Good
7	Have the researchers made evaluation?		Done
8	Have the researcher made revision?		Done

TABLE II. THE RESULT OF MEDIA EXPERT'S ASSESSMENT

No	Assessment Criteria	Assessment
	Visual Element	
	Presenter performances in this medium	100%
	Player performance in this medium	60%
	Shooting location based on the message	80%
	Visual lighting system in video	80%
	Sound Element	
	Visual clarity in video	80%
	Player's clarity voice in video	80%
	Utilizing music in video	80%
	Compatibility music type in video	80%

Tabel III, IV, V, and VI shows the data from product trial on seventh grade students of SMP Darul Hijrah Putra. The following data have been collected based on 4 aspects, namely display, attractiveness, language and operation.

TABLE III. THE STUDENTS' RESPONSES ON DISPLAY ASPECT OF THE MEDIUM

Qualitication	Frequency	Percentage
Very reasonable	24	80%
Reasonable	6	20%
Unreasonable	-	-
Very unreasonable	-	-
∑	30	100%

Based on the data, there were 24 students who stated the display of the learning medium was very reasonable and 6 students who stated the display was reasonable. No responses for unreasonable and very unreasonable options were found.

TABLE IV. THE STUDENTS' RESPONSES ON ATTRACTIVENESS ASPECT OF THE MEDIUM

Qualitication	Frequency	Percentage
Very attractive	21	70%
Attractive	5	16.6%
Unrattractive	4	13.3%
Very unattractive	-	-
∑	30	100%

Based on the data of learning medium attractiveness, the majority of the students regarded that the learning medium was attractive (86,6%), as indicated by 21 students and 5 students who opted very attractive and attractive options, respectively. However, there were 4 students who selected unattractive option for the medium attractiveness.

TABLE V. THE STUDENTS' RESPONSES ON LANGUAGE ASPECT OF THE MEDIUM

Qualitication	Frequency	Percentage
Very good	18	60%
Good	11	36.6%
Poor	1	3.3%
Very poor	-	-
∑	30	100%

Based on the students' response on the language aspect, 29 out of 30 students viewed the language in the medium was already good (96.6%). There was one student who considered the language poor (3.3 %).

TABLE VI. THE STUDENTS' RESPONSES ON OPERATION ASPECT OF THE MEDIUM

Qualitication	Frequency	Percentage
Very reasonable	20	66%
Reasonable	8	26.6%
Unreasonable	2	7.4%
Very unreasonable	-	-
∑	30	100%

Based on Table VI, it is known that 28 out of 30 students stated that the operation of the medium was worthy qualification with an average value of 93.4%. Moreover, there were 2 students who considered that the operation was not feasible with the average value of 7.4%.

B. *Discussions*

Viva video learning provides local knowledge-based videos to develop English language teaching for junior high school students. Viva video development covered the syllabus, lesson plan (RPP in Indonesian context), and achievement test. The learning medium was integrated with local wisdom of Cindai Alus Martapura and the development of the English language for students.

The developed learning medium has been validated by experts to assess the quality of the medium. The expert validation on the medium demonstrated positive results on the display, attractiveness, language and operation aspects. Thus, the quality of the medium was good. Major revision was not suggested, which means that images, audio, video, animation, language and operation were already appropriate.

This medium might be effective for other basic competencies that have identical characteristics. The medium might also be effective for other subjects other than English language that have similar indicator. Learning by using this medium will enable students to learn more effectively because they can learn the material individually. This is in line with the Ref [1] that instructional media will support the effectiveness of learning.

With the development of instructional media on an ongoing basis based on local wisdom are expected not only to improve students' cognitive aspects but also to develop students' character. Sustainable principle is very important because if it is done continuously through character education, students will be familiar with the local wisdom and gradually students' habit will be formed into a positive state. This is in line with ref [4] that local wisdom transforms the value system and norm.

V. Conclusion

This study has produced a local wisdom-based learning medium to develop positive character of students. Learning tools to complement the medium include the syllabus, lesson plan and achievement test. The learning medium was integrated with local wisdom at Cindai Alus area, Martapura. The medium was developed to integrate the character development of students. The learning medium has been validated by experts, so it is proper for use.

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The Development of Teaching Materials for Scientific Report Writing Based on Scientific Learning

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***Abstract*—This study aimed to describe; (1) the product feasibility of scientific report writing instructional materials science, (2) the quality of the layout and appearance of the scientific report writing teaching materials, and (3) the effectiveness of the teaching materials. The applied model of research and development was a model of Borg and Gall. To test the model, this study used effectiveness before-after experiment design and experiment design with posttest-only. The results of the study showed that the feasibility of this model, the content, the presentation, and the accuracy of the use of language use were at very good category. The conclusions of the study were as follows: (1) The model of scientific report writing teaching materials produced in this research and development is feasible to use in the course of writing, so it can be used in order to improve learning outcomes in the course of writing, especially on the topic of writing scientific reports. (2) The model of scientific report writing teaching materials was interesting in terms of the layout and appearance, so that students are motivated to use it and it could increase their creativity in writing skills. (3) The model can be effectively used by faculty and students who take courses in writing skills, in this case on the topic of writing scientific reports.**

Keywords—Development, Instructional Materials, Writing, Science Report

I. INTRODUCTION

At every level of education from elementary, junior high, high school and university, Indonesian language is used as one of the subjects that must be studied. Similarly in the field of non-formal and informal, the government is attempting to do counseling of Indonesian language through language centers and offices in every region in Indonesia. Indonesian society as a direct user of Indonesian language should realize how important the Indonesian language is. This is realized in the view of the Indonesian nation made up of various ethnic backgrounds, cultures, and languages.

To achieve all expectations, the college personnel of education institution prepare prospective Indonesian teachers. Accordingly, all public universities in Indonesia open Indonesian Language and Literature Education Study Program. In order to prepare Indonesian teachers, who of course will be expected to be professional teachers, the curriculum used in the study program is formulated by involving literature based knowledge, language skills, linguistics and the ability to write. One of language skills is writing skill, which is expected to be mastered by students as future teachers. One required writing material is the skill to write a report on observation. This material is aligned with one of the basic competencies to be studied either at the level of junior high school, or vocational. Thus, as student teachers, the candidates must be skilled in writing scientific reports.

In order to equip students on mastery of writing a report on observation, it is necessary to provide effective instructional materials, so that teachers and students do not experience obstacles in the process of understanding the material. In relation to that, this study aimed to develop and produce effective teaching materials in learning writing skill, in this case mainly on the material to write a scientific report. Therefore, the problem in this study focused on product feasibility of the teaching materials for scientific report writing, the quality of the layout and appearance of teaching materials for scientific report writing, and the effectiveness of the teaching materials.

II. THEORETICAL REVIEW

A. Essence and Characteristics of Teaching Materials

Teaching materials are sets of learning materials arranged in a systematic way, showing the figure of the whole of the competencies to be mastered by learners and used in classroom activity [1]. Noting the views of experts, it appears that the teaching materials are tools to achieve the learning objectives that contain content or material taught by teachers and learners to learn. The contents basically contain the knowledge, skills and attitudes that will be absorbed and mastered by learners according to standards of competence and the contents are systematically arranged. Thus, the nature of teaching materials will be regarded in developing the teaching materials in this study.

To prepare teaching materials that fit these characteristics some prominent steps to be done. There are three main steps to be done in preparing teaching materials, namely; (1) analyzing the need of teaching materials, (2) drawing up a map of teaching materials, and (3) creating teaching materials [1].

In carrying out a needs analysis of teaching materials, there are three steps that must be taken, i.e. (1) analysis of the curriculum, (2) analysis of learning resources, and (3) analysis of the type of teaching materials. The analysis of the curriculum is the first step of the analysis of the needs of the teaching materials. The steps in analyzing the curriculum are taken with the following procedure [1]. First, we determine the competency standards, the minimum qualification ability of learners (standards of competence) that describe the attitudes, knowledge, and skills that can be achieved at any level/ semester, consisting of a number of basic competences as a reference standard to be achieved and applied nationally. Second, we determine the basic competence, namely a number of capabilities that should possession learners in certain subjects as a reference to develop a competence indicator. Third, indicators of learning outcomes or competencies are formulated, which can be used as a reference in the assessment criteria. Thus, we can know the specific competencies, which will serve as the basis of considerations in determining appropriate teaching materials. Fourth, subject matter, knowledge, skills, or the value are determined so that learners master the competencies that have been set. After analyzing the indicators, we continue the analysis of the subject matter. The subject matter is the main reference in compiling teaching materials. Fifth, the learning experience is determined, which is an activity designed by educators that carried out by the learners to master the competencies that have been determined through the learning activities.

After completion of the first step in developing teaching materials, the curriculum analysis, the second step is the analysis of learning resources. There are three things that must be considered in the analysis of learning resources, among others; availability, suitability and convenience [1]. In more detail, [1] explains that availability criteria refers to the provision of learning resources. The learning resources that are used should be as practical as possible so that it is easy to prepare. Uniformity is whether the intention of learning resources is appropriate to the learning objectives that have been set. The main thing in determination of the criterion is to understand the suitability of learning resources that will have the competencies achieved by learners. Ease/convenience criterion refers to whether it is easy or not to provide and use the learning resources.

The third major step in the development of teaching materials is picking and choosing instructional materials. It aims to meet one of the criteria that teaching materials should be attractive and can help learners to achieve competency. In connection with the selection of teaching materials, there are three principles that can be used as guidelines, among others; the principles of relevance, consistency and adequacy [1]. The principle of relevance means that teaching materials should have relation to the achievement of standards of competence and basic competences. The principle of consistency means that teaching materials have value constancy, so the basic competencies that must be mastered by students and instructional materials provided have alignment. The principle of adequacy applies when selecting teaching materials should be done sufficiently to help students master the basic competencies.

Besides the three things, there are a few more things that are important to consider that can serve as a guide in selecting and determining the teaching materials [1]. Some of them are as follows (1) identification of the aspects contained in the basic competency standards as the reference or references in the selection of instructional materials, whether cognitive, psychomotor or affective; (2) identification to the types of teaching materials, including whether to use the cognitive aspects (facts, concepts, principles or procedures), affective or motor; (3) selection of appropriate teaching material or relevant to the basic competency standards that have been identified. To facilitate the process of selecting and determining the teaching materials, there are also two very important criteria to be considered, namely the general criteria and special criteria. The general criteria are with regard to how to use instructional materials, while the special criteria are related to the usefulness of teaching materials.

The criteria in the selection of learning resources generally include the following four things [1]: (1) economical, which means learning resources are not expensive. With affordable prices, all walks of life will be able to hold the learning resources; (2) practical and simple, which mean learning resources do not need the difficult and rare service or supply; (3) accessible, meaning that sources are close and easy to learn; (4) flexible, meaning learning resources can be used for various purposes of learning, or with other terms 'compatible'. The specific criteria consist of the following (1)learning resources to motivate students to learn; (2) learning resources for teaching purposes. Learning resources should be selected to support teaching and learning activities; (3) learning resources for research, that is the selected learning resources should be observed, analyzed, recorded accurately, and so forth; (4) learning resources to solve the problem, which is the learning resources that are selected should be able to overcome problems faced by learners in learning activities; (5) learning resources for achievement refers to the learning resources which should be able to function as a tool, method or strategy of delivering a message.

B. *Writing Scientific Report*

Scientific report writing tends to be also called as writing a report on observation. The observation report is roughly equal to scientific reports, given that the obvious observation is done with scientific procedures. The learning approach starts from the scientific ways to observe, analyze, evaluate, report and communicate. Produced text contains the observation of understanding resulted in the writing of the text that presents information about a matter as it is, which is the result of a systematic observation and analysis. It usually contains facts that can be proven scientifically and general nature. The report consists of the opening section in the form of a general definition, part of the contents of a description part, and the final section containing a description of usability.

With regard to the observation report writing, creativity and motivation factors are crucial. The motivation is a series of businesses to provide certain conditions that a person is willing and wants to do something [2]. The motivation of learners focuses on achievement is interpreted as a boost in self-learners to learn, tasks, solve problems and learn specific competencies as well as by the standards of excellence with these characteristics: (1) the success-oriented; (2) the anticipation of failure; (3) innovative; and (4) responsible [3].

Creativity is a general ability to create something new as the ability to provide new ideas is applied in problem solving, or as the ability to see the new relationships between the elements that already existed before [4]. The creative means has the creativity or the ability to create. Based on those opinions, it can be concluded that the form or manifestation of creativity is marked by the results in the form of copyright works [5].

III. METHOD

The research method applied in this study was a research and development (research and development). The source of research data was students of second semester of academic year 2015/2016 at Indonesian Language and Literature Education Study Program FKIP Universitas Jambi. The survey respondents are all students of the second semester who took a course to write scientific reports. The type of research data consisted of primary and secondary data. The primary data included data on the analysis of the students' needs of the material of writing scientific reports. The secondary data included the results of the analysis of the syllabus contents and teaching materials that are used bythe lecturer of the course of writing skills. Data were collected by observation, questionnaires, and interviews. This study used Borg and Gall's models with the following: (1) research and information collection, (2) planning, (3) development of an early form of the product, (4) the initial field testing, (5) product revision, (6) the main field testing, (7) revision of product operations, (8) field test operations, (9) revision of the final product, (10) dissemination and implementation [6].

The implementation of product testing begins with all first field test product, the conformity of syllabus content, the content of teaching materials, and the level of syllabus readability and teaching materials. Then, the step was immediately followed by validation 1 by the syllabus and teaching material experts, and ended with the revision phase 1. After analysis and a revised phase one, direct field testing was conducted to product conformity to syllabus content, the content of teaching materials, and the level of syllabus and teaching material readability. Validation 2 was then conducted by the experts and subsequently operational field test was done to determine the effectiveness of the product through proving the hypothesis by using statistical t-test.

Testing the effectiveness of readability level was done by using the Fray graph through five steps, namely: (1) setting of 100 words from the set of discourse, (2) calculating the number of sentences of 100 words, (3) counting the number of syllables of the entire 100 words, (4) multiplyingg the number of syllables than 100 words with numbers 0.6, and (5) plotting the number the number of sentences in the second step and the number of syllables in the fourth step to the Fry graph.

In these experiments, teaching materials that have been validated by the experts were tested on the students on a small scale with a technique comparing the results of observations on O1 with O2. O1 was the result of observation of the state of motivation, creativity, and learning outcomes before using teaching materials. O2 was a state of observation results about motivation, creativity, and learning outcomes after using the product of teaching materials. To determine the effectiveness of the product, if the observation of teaching material from O2 is higher than the observation of O1, the product is already effective teaching materials. To measure the state of statistical tests, paired sample t-test was performed.

In addition, re-testing was conducted to determine product quality of the teaching materials and it will be upgraded to the final product. Main product of the teaching materials that have been tested on a small scale re-did the validation experts at the second stage. After that, there was a re-testing of products on a large scale to test the product effectiveness by using the experiment with posttest-only control design.

The design had two groups selected randomly (R). The first group was treated with the experimental group (X) using the product of the teaching materials. The second group was the control group not treated using the product of teaching materials. The observation was then conducted to see the presence or absence of treatment effect and to compare the results of observations between O1 and O2. If the observation of O2 is higher than O1, the product has good quality.

IV. RESULTS AND DISCUSSION

A. *Product Model*

The product of the teaching materials can be seen in the description below. The title is Technical Report Writing Observations. Material: (1) understanding of scientific reports; (2) rule and characteristics of scientific reports; (3) structure of scientific reports; (4) objective and function of scientific reports; (6) preparation of scientific reports. Duties and Exercise: do the observation of the environment at the campus in Education and Teacher Training Faculty of Universitas Jambi and make reports on the observations that have been implemented. Evaluation: (1). cognitive: (a) describing briefly the following things; (b) understanding of scientific reports; (c) rule and characteristics of scientific reports; (d) structure of scientific reports; (e) objective and function of scientific reports step; (f) preparation of scientific reports. (2) skills: observing the learning process on the basic competence of writing on observation reports in high school. (3) attitude: the ability to work together with colleagues and reading list overview of motivation and creativity of students.

B. Validation on Feasibility Aspect

Validation of the teaching materials to write a report on the observation was conducted by subject matter experts and linguists. The results of the early product validation on the model of the teaching materials is shown in Table 1.

TABLE I. RESULTS OF THE FEASIBILITY ASPECTS of PRODUCT VALIDATION

Aspects Validation	Expert Matter	Language Category	Mean	Category
Eligibility of Contents	4.25	4.13	4.19	Very Good
Compliance of Presentation	4.02	4.18	4.10	Very Good
Accuracy of Language	4.08	4.11	4.09	Very Good
Average	**4.11**	**4.14**	**4.12**	**Very Good**

C. Validation on Appearance and Layout Aspects

The validation of the teaching materials was conducted by subject matter experts. The results of the early product validation on the model of the teaching materials is shown in Table II.

TABLE II. RESULTS OF VALIDATION ON APPEARANCE AND LAYOUT ASPECTS

Validation Aspects	Validation Matter	Expert Linguist	Mean	Category
1. Cover Design	3.98	4.06	4.02	Very Good
2. Design Content	4.03	4.12	4.07	Very Good
3. Design and Printed Letter	4.13	4.20	4.16	Very Good
4. Design Figure	4.26	4.29	4.27	Very Good
5. Quality bindings	4.31	4.42	4.36	Very Good
Mean	4.14	4.21	4.17	Very Good

D. Limited Scale Testing Results

Testing of the report scientific writing teaching materials on the observation was conducted on a limited group of 10 students. Assessment tests were carried out before and after using the teaching materials. The results be seen in Table III.

TABLE III. EFFECTIVENESS OF THE PRODUCT USED BEFORE AND AFTER

Aspects Effectiveness Instructional	Before Used	After Used
Students' motivation to learn	60 %	85 %
Creativity of students	66 %	89 %
Results of student learning	68 %	90 %
Mean	64.66 %	88 %

From the test results on a limited scale in Table III, that effect of the teaching materials on the results of observation in terms of students' learning motivation can be increased by 25%. The creativity of student can be increased by 23%, and student learning outcomes can be increased by 22%.

Table IV shows the effectiveness of the teaching materials performed on testing in a limited scale through t-test. The obtained value for motivation was 7.135, and the t-table with a level of significance of 0.05 was 2.306 (7.135 > 2.306). Likewise, the creativity of students was 7.126 > 2.306 and learning outcome was 9.368 > 2.306. The effectiveness of the teaching materials on motivation, creativity, and the results of student learning before the use of the product was significantly different from after the use of the product.

TABLE IV. TEST RESULTS ON MOTIVATION, CREATIVITY, AND STUDENT LEARNING OUTCOMES IN LIMITED SCALE TESTING

Observation Aspects	Mean	t-Observa-tion	t-Table	Description
Effectiveness of Teaching Materials on Motivation				
Before	3.78			
After	4.02	7.135	2.306	Significant
Effectiveness of Teaching Materials on Creativity				
Before	3.80			
After	4.12	7.126	2.306	Significant
Effectiveness of Subjects' Learning Outcome				
Pra-test	65.50			
Post-test	80,45	9.368	2.306	Significant

E. Wide Testing Results

Effectiveness testing of the teaching materials was widely done to ensure final product quality conducted on control group and experimental group. The results be seen in Table V.

TABLE V. RESULTS OF COMPARATIVE EFFECTIVENESS OF THE TEACHING MATERIALS BETWEEN CONTROL AND EXPERIMENTAL GROUPS

Effectiveness of The Teaching Materials	Before Used	After Used
Students' learning motivation	3.95	4.26
Students' Creativity	3.87	4.56
Students' Learning Outcomes	68.65	87.95

From the test results on the wide scale, the effect of the teaching materials from the results of observation in terms of students' learning motivation can be increased by 0.31. The creativity of student can be increased by 0.69, and students' learning outcomes can be increased by 19.30.

TABLE VI. TEST RESULTS OF EFFECTIVENESS OF DIFFERENT TEACHING MATERIALS IN WRITING REPORTS

	Learning Motivation		**Learning Creativity**		**Learning Outcomes**	
	X1	***X2***	***X1***	***X2***	***X1***	***X2***
Mean	3.95	4.26	3.87	4.56	68.65	87.95
t-Observation	52.43		89.99		79.74	
t-Table	2.021		2.021		2.021	

Table VI shows the effectiveness of the teaching materials for writing scientific reports on the observation after conducting broad-scale testing with different test statistic of t-test. The observed value for motivation was 52.43, and a t-table with a level of significance of 0.05 was 2.021, so 52.43 > 2,021. Similarly, the creativity of the students was 89.99 > 2.021 and learning outcome was 79.74 > 2.021. Thus the working hypothesis is accepted, so there was significant difference in motivation, creativity, and learning outcomes between students who used the teaching materials for writing scientific reports those who did not use the teaching materials.

F. Discussion

In the implementation of research and development to produce teaching materials for writing scientific reports based on observation, the development of research procedures was depicted on the methodology of the study. This study is in line with the implementation of the development through phase-by-phase and aimed to produce teaching materials for writing scientific reports.

The benefits of this product are as follows. These teaching materials were designed based on the analysis of the needs of students. The teaching materials were drawn up by the steps of development were are designed with the appealing appearance. Furthermore, the teaching materials have described the purpose of learning from the knowledge, attitudes, and skills, consisting of materials, exercises and assignments, as well as evaluation. This product can also be used independently. However, there are still weaknesses of the teaching materials written. That is because of time constraints and the implementation of development research. Some of these shortcomings are that the product has not yet outlined the steps the learning process and has not described the utilization of instructional media.

Based on the results of this study, the teaching materials for writing scientific reports is feasible to use in the course of writing. It is because the study has been in accordance with the steps that have been developed by Borg and Gall model [6]. The teaching materials can also increase motivation and creativity in writing. It is because the study has been in accordance with the criteria in the selection of learning resources [1].

V. CONCLUSIONS

The conclusions of this study are as follows: (1) The teaching materials for writing scientific reports produced in this research and development is feasible to use in the course of writing, so it can be used in order to improve learning outcomes in the course of writing, especially on the topic of writing scientific reports; (2) The teaching materials are interesting in terms of the layout and appearance, so students are motivated to use them and increase their creativity in writing skills; (3) The teaching materials are effective teaching materials used by faculty and students who take courses in writing skills, in this case on a topic to write a scientific report.

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Misconceptions of the Students with High Mathematical Creative Thinking Level in Solving the Geometric Shapes Problems

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***Abstract*—Students are frequently wrong in understanding a certain concept or material in learning mathematics or termed as misconceptions. Misconceptions do not occur only at students with low mathematics skills or low levels of mathematical creative thinking, but also for students with high mathematical creative thinking. Therefore, it is important to describe the misconception of students' high mathematical creative thinking in solving the problems, especially geometric shapes problems because that is often overlooked. This research employed a qualitative approach and the data were presented descriptively. The study was conducted in SDI Surya Buana Malang in academic year 2015/2016. Four students from Class VI who fulfilled high mathematical creative thinking level were selected as the research subjects. Students with high mathematical creative thinking is students who have the problem solving skills in fluency, flexibility, and originality. The findings showed that the students with high mathematical creative thinking level had misconceptions in determining of the size of the parallelogram, determining of the perimeter of the combined shapes, and understanding the concept of square and rhombus.**

Keywords: Misconception, Mathematical Creative Thinking, Geometric Shapes Problems

I. INTRODUCTION

Mathematics has an abstract study object in the form of facts, concepts, operations, and principles [1]. Due to its abstract concepts and deductive mindset, high-order thinking skill is needed to understand mathematics. This is why students have the perception that mathematics is a difficult and scary lesson. In fact, students encounter a lot of difficulties in learning mathematics [2]. In fact, students are frequently wrong in understanding a certain concept or material in learning mathematics.

Errors in understanding or perceiving a concept are called misconception. According to [3], misconception is conceptually based error. If it refers to [4], the term misconception can be understood as an "alternative concept", that is, the concept of science possessed by students, but different from the existing concepts of science. It means that the concept does not actually exist or wrong.

Misconception is different from errors although each gives incorrect results. Errors can occur due to student inaccuracy [5], [6]. This errors can also take the form of an error in understanding the concept or forgetting the settlement procedure, [6]. Thus, errors can occur because of misconceptions.

The emergence of misconceptions among students can be caused by two factors [7]. The first factor is because students interpret new experiences or concepts. The second factor is due to the emotional and intellectual misunderstanding that has been attached to students, so students find it difficult to accept new concepts that are different from their understanding [8] [7].

There are several causes of misconceptions in mathematics learning presented by [9], as follows. (1) Students are not ready to accept mathematics materials; (2) Mathematics is only for gifted children in mathematics; (3) Simply learn simple numbers and shapes; (4) Learning languages and literacy are more important than learning mathematics; (5) Teachers must provide a quality learning environment; (6) Mathematics should not be taught as an independent subject; (7) Mathematics assessment is not relevant to children; (8) Children learn mathematics only with concrete objects; (9) Computer cannot be used in learning mathematics.

Misconceptions do not occur only at students with low mathematics skills or low levels of mathematical creative thinking. The results of [10] study show that students with high levels of mathematical creative thinking have wrong understanding on the concept of perimeter and the extent of a plane figure. This discovery is not only found at one creative student, but there are some students who mathematically fall into the creative category indicate the same thing.

II. METHODS

This study is a descriptive study with qualitative approach. In this study, the researchers act as the main instrument. Researchers went directly to the field to dig and collect the necessary information.

This study was conducted in SDI Surya Buana Malang in the academic year 2015/2016. The research subjects selected in this study were four students of class VI who met the level of high mathematical creative thinking, but experiencing misconceptions in solving the problem of plane figure geometry. The level of mathematical creative thinking was determined based on the results of problem solving done by the students, namely fulfilling the aspect of fluency, flexibility, and originality [11] [10].

The researchers employed protocols that served as a tool for collecting data. The protocols were in the form of problem solving sheets and interview guides. The problem-solving sheet contained the tasks associated with a plane figure geometry as shown in Figure 1. The second procoler, the interview guide contained several questions that became the reference to the interview process. Questions on the interview could evolve according to the response given by the research subjects.

The data collection procedure was started by conducting interviews with four research subjects in turn. Each subject was asked to explain the problem solving previously given. Furthermore, task-based interviews were conducted to explore the misconceptions that occurred among the research subjects. Task-based interviewes done by giving some geometric problems to the subject of research related to the misconception that occurs on the subject. So, each subject can be given a different problems. It be functioning as source of triangulation.

III. Findings and Discussion

Based on the aspects of mathematical creative thinking that arose in problem solving, namely fluency, flexibility, and originality, some students met high mathematical creative thinking categories. However, there were some students who met the level of high mathematical creative thinking had misconception in understanding and solving geometry problems. The misconceptions occured on some issues related to two demensional shapes. A detailed explanation is described in the next paragraph.

The first misconception was found in some students with high mathematically creative thinking, namely misunderstanding the concept of long sides on a parallelogram. According to the first subject and second subject, the oblique sides of the parallelogram was equal to the height. Thus, to determine the length of the hypotenuse of the parallelogram shown in Figure 1, the step was to calculate the square plot of the uppermost square plot to the bottom square plot vertically. This misconception raises an error in measuring the length of the hypotenuse that should be 10 cm becoming 8 cm.

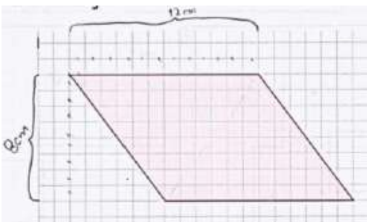

Fig 1. The oblique side is equal to the height of parallelogram

When asked to describe another parallelogram and its size, they still provided the same size between the height of the parallelogram and the length of the hypotenuse of the parallelogram. Figure 2 below is an example of an answer given by the second research subject.

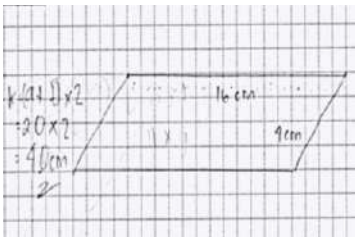

Fig 2. The new parallelogram made by the second subject

The third subject also understood that the height of parallelogram is equal to the hypotenuse of the parallelogram. According to him, if the oblique side of the parallelogram in Figure 2 is drawn straight, it would form a rectangle that has a size of 12 x 8. In fact, if the hypotenuse on the parallelogram is pulled straight to form the shape of the rectangle, then the correct size was 10 cm, not 8 cm. It also indicates that the third subject also had misconception in understanding the size of the hypotenuse of the parallelogram.

On the other hand, the fourth subject could determine the size of the parallelogram's oblique side correctly, but was mistaken in the process of determining its size. This happened because the fourth subject counted the hypotenuse of the parallelogram by calculating the square plots that according to the fourth subject was large. Since the parallelogram was drawn on the paper, the hypotenuse of the parallelogram cut several square plots so that the plots were not full. Some of the non-full plots were large and some were small. The non-full large square plots were called by the fourth subject as a plot representing one cm^2 to calculate the size of the hypotenuse of the parallelogram.

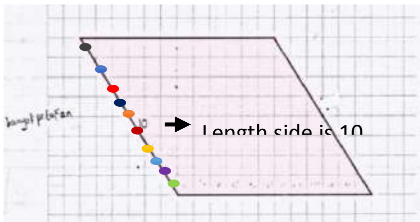

Fig 3. The length of oblique side based on the unit of millimeter block which was considered large by the fourth subject

The second misconception which was found in students with high mathematical creative thinking was misunderstanding in determining the perimeter of the combined shapes. When the third subject was asked to make some shapes with about 40 cm in perimeter, Figure 3 below shows the answer given by the third subject.

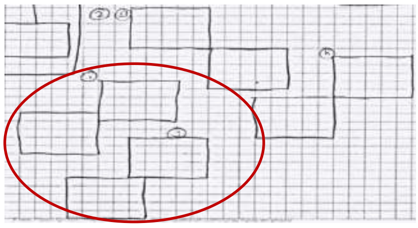

Fig 4. Combined shapes made by the third subject

According to Figure 4, two combined shapes which were given red mark did not have a perimeter of 40 cm, while the other two had a perimeter of 40 cm. The result of the interview with the third subject showed that the four combined shapes that he made each consisted of two rectangles having a perimeter of 20 cm. The third subject counted only the perimeter of the combined figure he first made. Three other combined figures were created simply by changing the position of the first two rectangles. The reason the third subject did so was to get some shapes with perimeter of 40 cm in a short time. However, due to the mosconception of a combined shapes' perimeter, the third subject made random position different from the two squares.

The third misconception emerged was the error in understanding the concept of square and rhombus. Based on the results of the interview, the fourth subject understood that the square is a long plane figure with equal sides and similar shape as in Figure 5a. If the square is rotated as far as 45˚ as in Figure 5b, the fourth subject considered that the shapes is no longer a square, but becomes a rhombus.

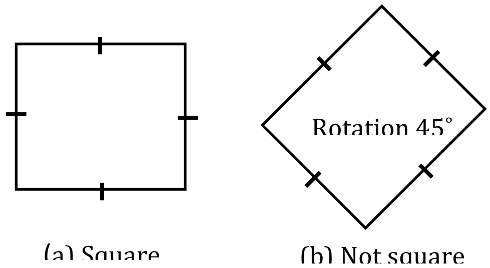

Fig 5. Misconception from the fourth subject

The causes of misconceptions that occur in students with high mathematical creative thinking ability can be influenced by various factors. These factors can come from internal or external factors. Internal factors can be viewed from the students themselves, such as readiness or maturity to accept mathematics, student learning styles, students' perceptions of mathematics or the inability to capture material resulting from learning disabilities. Meanwhile, external factors can be seen from the learning environment or other environment outside the students themselves.

The emergence of misconceptions in understanding the length of the oblique side on a parallelogram and the perimeter of the combined shapes can be caused by the students’ error in constructing the knowledge of the plane figure geometry they have learned. On the problem-solving sheet, only plane figure was drawn on the millimeter block paper, without the size of each side of the parallelogram. This makes it difficult for students to determine the exact length of the oblique sides of the parallelogram because the sides are not on the vertical or horizontal axis of the paper. As a result, students equate the size of the sides with the height. This case also applies to the perimeter of the combined shapes. Combined shapes consisting of multiple equal or different shapes will have the same perimeter even if their position is changed.

The students’ error in understanding that a square that is rotated to the extent of any degree will remain square-shaped can be the students’ error in constructing the knowledge of the plane figure geometry they have learned. However, based on the results of classroom observation and student book analysis, teachers or books tend to make a square like in Figure 5a, while the rhombus figure is also always introduced as in Figure 5b. This will build a misconception on the students. This will interfere with the development of further side conceptual understanding [12] [13].

IV. CONCLUSIONS AND SUGGESTIONS

The results of this study showed that students with high mathematical creative thinking also experienced misconception in solving mathematical problems, especially plane figure goemetry. There were three misconceptions found as follows. (1) The students experienced misconception in understanding the length of the parallelogram sides, especially the oblique sides. The students asserted that if the size of the oblique sides of the parallelogram is equal to the height; (2) The students had incorrect understanding on the size of one unit on the millimeter block paper (strimin); (3) The students experienced misconception in understanding the concept of square and rhombus. If the square figure is rotated a few egrees resembling the shape of a rhombus, then the square figure is turned into a rhombic figure.

In order to avoid misconceptions in mathematics learning, teachers are expected to recognize misconceptions occuring among students as early as possible. Teachers must have knowledge about misconceptions, difficulties or errors made by students in understanding a certain concept or rules in learning mathematics. It means that a teacher should be sensitive and caring if there are students who may have misconceptions in their classes.

Effective learning will certainly have a positive impact on students. Teachers must plan and prepare learning that enables students to achieve basic competencies as well as enjoyment. Improper planning will lead to failure of classroom learning, especially if it leads to misconceptions among students. In other words, teachers are required to be good planners and managers of learning so as not to be one of the causes of misconceptions that occur among students.

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Teachers' Concern about Implementation of Realistic Mathematics Education

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***Abstract*— Innovation is required in mathematics teaching in order to improve students' mathematics literacy. This means that students learn mathematics with the emphasis of common sense and application of knowledge in their daily life. Innovation can be conducted by employing the Mathematics Education (RME) approach. This is a developmental research which followed reference [1] model to measure the quality of learning using RME approach. The developed learning materials consisted of lesson plan, student's worksheet, observation sheet, achievement test, students' response, validation sheet, and video lessons. The quality criteria of the learning materials refer to validity, practicality, and effectiveness. This paper only discusses the effectiveness of innovation in terms of teachers' concern. The people who are impacted by the innovation may react differently. Ten primary school teachers were involved in the implementation of RME. They completed the questionnaire of teachers' concern after the implementation of RME in their own class. The results revealed that teacher are highly concern of the implementation of RME to develop students' character. Teachers are willing to review more of the approach including the change they should do related to the implementation of RME. Teachers are not concerned of the time constraint and more responsibility.**

Keywords*— *Realistic Mathematics Education, Stages of Concern, Innovation

I. INTRODUCTION

Nowadays, education should focus on fostering innovation by emphasizing curiosity, critical thinking, and deep understanding as well as the rules and tools of inquiry, and creative brainstorming as the center of the curriculum. This is why Indonesian curriculum has been changed from *Kurikulum Tingkat Satuan Pendidikan* to *Kurikulum 2013*. Government have trained teachers and published textbooks. However, some mathematics materials in the primary school textbooks are presented with lack of demands for students to conduct the investigation using their common sense. Some of the mathematical activities also reach the abstract ideas too early. This is also found in junior high school textbook. Research by [2] have conducted analysis of several junior high school textbooks and conclude that the chapter are mostly started with explanation by demonstrating mathematics procedure to solve problems with lack of support for students to discover their own strategies. In addition, the Indonesian textbooks usually provide word problems after the explanation of mathematical procedures without providing context to build students' modeling in solving problems. They concluded that Indonesian' students mainly have difficulty in comprehending a context-based problems and in transforming them into a mathematical problem.

Indonesian students tend to use standard strategies provided in the textbook or being taught by their teachers and therefore their answers are lack of variation when they are asked to solve the problem using their own way [3]. Furthermore, when students are asked to explain why they use the strategy, most of them admit that they do not know. The teacher did that. I think I should follow her, and it works. I got the answer" [4]. Therefore, innovation is required in mathematics for students to have meaningful mathematics learning by taking into account of the children and current development. One of the innovations is the implementation of Realistic Mathematics Education (RME) approach

The RME idea was inspired by Freudenthal who argued that mathematics as a human activity, where students are guided by teacher through a meaningful and useful activity so that they learn as if they discover mathematics by themselves [5]. Students start the lesson by solving a rich context to develop their understanding and their own strategies [6][7] while teacher help to improve students' strategies to a more advance level or more [8]. Therefore, the role of students and teachers should be changed to implement RME in Indonesia. Teachers need to design challenging contextual problems, students should be confident in expressing their opinion in solving the problems without being scared of making mistakes and teachers should not be in hurry in providing the students direct answers [9] [10].

In Indonesia, RME is known as *Pendidikan Matematika Realistik Indonesia (PMRI)* and has been handled by 17 Teacher Training Institutions (LPTK) since 2001. Each LPTK has a study center called P4MRI, such as the P4MRI of Syiah Kuala University (UNSYIAH) which program including conducting workshop for teacher, coaching teachers in teaching mathematics, conducting research and organizing conferences [10] [11].

From 2014 to 2016, authors have been intensively developed learning materials including lesson plans, students' worksheets, and video lessons of model teachers in implementing RME. Teachers from the pilot school of P4MRI Unsyiah are invited to join workshop to discuss learning materials and watch video lessons of RME implementation to be applied in their own classrooms [12]. According to [13], the role of lecturers as the member of P4MRI Unsyiah is considered as a trainer of consultant as well as the agent of change in any process of educational innovations. On the other hand, teachers are the one who are influenced by the learning innovation using RME. Furthermore, teachers are also the agent of change in facilitating students to be independent learners that play important role in the learning innovation. This indicates that everyone is an agent of change [14].

The change due to an innovation is not an instant process and should not be forced, it is rather a journey requires mentoring and peer coaching [14]. Change is a dynamic and non-linier process that cannot be predicted or assisted the process accurately [15]. Therefore, great collaboration between lecturers and teachers in planning, conducting and evaluating the innovation is required.

The people who are impacted by the innovation may react differently [16][17]. The innovation may be in line with the beliefs for some people but contradicts with some others' personal goal and educational view [18].

The teacher's level of acceptance of the innovation is influenced by the conformity with their daily task at schools [14], relative advantage, complexity, compability, observability (Rogers in [19]), teachers' experience, attitude, and perception [19]. Studies found that individual concerns in the process of adopting educational innovation is a developmental in nature that begin with focusing on self (such as do I understand this innovation), task (such as how will I do this innovation) and the impact (how the innovation will influence my students) [20].

In [21] investigated how educational fails to reach extensive adoption. Among the factors contributing the failure is that there was lack of attention to the concerns individual adopters and the importance of this concern in relation to the organizational structure and support were not properly acknowledged. They discovered that the major factor is the sophistication of the educational education combined with the individual differences in each organization, classroom and teaching style. In [21] also developed the change process known as the Concerns-Based Adoption Model (CBAM) based on Fullers' original research at 1969. The model comprises of three stages including Stages of Concern, Levels of Use, and Innovation Configuration. Stages of Concern are more commonly used than the other stages [16].

Stages of concerns focuses on the expressed adopter concerns and problems related to his or her experience of the innovation. User feelings, feelings, observations, problems, successes, and failures in the process of innovation adoption are analyzed. The results of the analysis can inform the change facilitators and innovation sponsors the readiness of the adopters to accept the innovation. There are seven levels of stages of conecrn, including awareness, informational, personal, management, consequence, collaboration, and refocusing [21]. One of the benefits of the investigation of stages of concerns of the adopter is that additional preparation and support can be given to the teacher who is highly concerned about how to use the innovation in the classroom [16].

This paper focus on studying the *Stages of Concern* of teachers in implementing RME for teaching mathematics at primary schools after the intervention of P4MRI Unsyiah team. The research question is 'what is indicated in each level of teachers concerns in implementing RME for teaching mathematics at their classess?

II. METHODS

This study is a part of developmental research which followed [1] model. The developed learning materials consisted of lesson plan, student worksheet, observation sheet, achievement test, students' response, validation sheet, and video lessons. The quality criteria of the learning materials refer to validity, practicality, and affectivity. This paper is only discussed the affectivity of innovation in terms of teachers' concern. Ten primary school teachers in Banda Aceh, Indonesia, from a partner schools were involved in the implementation. Only 2 out of 10 teachers have joined RME workshop of RME handled by P4MRI of Syiah Kuala University, 2 other known about RME from their lecturer at Syiah Kuala University, 2 others just know about the name of RME, others never heard about RME

Before the implementation of RME for teaching decimal number for grade 4 of primary school students, P4MRI Unsyiah conducted two days workshop about the characteristics of RME, modelling for teaching decimal, discussing about teaching materials, as well as showing video for teaching decimal number. Then, all of teachers implemented them in their own classes for the first lesson. Researchers observed and recorded their lessons and provide feedbacks. The teachers were then invited again to the workshop to share their experience and discuss the challenge they faced with their peers. Furthermore, the preparation for the second lesson of decimal number was also discussed. They were also invited again to the workshop after the second lesson to compare the issues they have encountered during the implementation. At the end of the workshop (on 8 September 2016), the questionnaire of Stage of Concern (SoC) adopted from [22] is administered to the teachers.

The questionnaire of teachers' concern consists of 35 items. The items are divided into seven categories including awareness, informational, personal, management, consequence, collaboration and refocusing [22]. Each category consists of five statements. The responses are "strongly agree,", "agree", "disagree" and "strongly disagree". The descriptive analysis is carried out to investigate the percentage of teachers' responses related to their concerns of the implementation of RME.

III. RESULTS AND DISCUSSION

Table 1 shows teachers' responses on the statements provided.

TABLE I. TEACHER'S CONCERN DATA OF THE IMPLEMENTATION OF RME

Kategori	Awareness					Information					Personal					Management					Consequence					Collaboration					Refocusing				
	3	12	21	23	30	6	14	15	26	35	7	13	17	28	33	4	8	16	25	34	1	11	19	24	32	5	10	18	27	29	2	9	20	22	31
STS	5	5	4	0	3	1	0	0	0	0	0	0	0	0	0	1	2	1	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0
TS	3	4	6	0	7	5	0	0	0	0	0	0	0	0	1	7	5	6	1	6	1	0	0	0	1	1	1	1	1	0	0	0	1	1	1
S	2	1	0	5	0	4	9	6	7	5	8	5	7	5	6	2	3	3	6	3	4	7	7	7	5	9	4	8	5	10	9	10	8	4	7
SS	0	0	0	5	0	0	1	4	3	5	2	5	3	5	3	0	0	0	3	0	5	3	2	3	4	0	4	0	4	0	1	0	1	4	2

Based on teacher's responses on the category of awareness, it is shown that most teachers disagree or strongly disagree with the statement of 'I do not have any idea of this innovation' (80%) and 'I am not interested in this innovation' (90%). Furthermore, all teachers disagree or strongly disagree with the statement of 'Even though I do not have any idea of this innovation, I am interested in the things related to this innovation'. In addition, all teachers also strongly disagree or disagree with the statement of 'Currently I am not interested in learning this innovation"

For the category of informational, most teachers (60%) strongly disagree or disagree with the statement of 'I have a limited knowledge about this innovation'. Furthermore, all teachers agree or strongly agree with the statement of 'I want to review the possibility of implementing this innovation, I want to know the resources used to implement this innovation, I want to know the preparation needed to implement this innovation in the near future, and I want to know the advantages of this innovation compared to the teaching strategy I have used so far'.

For the category of Personal, most teachers (60%) strongly agree or agree with the statement of 'I want to know the impact of this innovation on the my professional improvement, I wonder whether this innovation is in line with the current curriculum, I want to know what change needed in term of the teaching strategy and preparation to implement this innovation, I want more information related to time and effort required to implement this innovation'. Furthermore, most teachers (60%) agree or strongly agree with the statement of 'I want to know how my roles change when I implement this innovation'.

For the management category, the majority of teachers disagrees or strongly disagrees with the statements of 'I am concerned that I do not have enough time to prepare the lesson each day if I implement this innovation (80%), I am interested in this innovation but I am concerned that it will increase my responsibility (70%), I am concerned of my inability to prepare everything needed in this innovation (70%)'. Preparing the task and coordinating with people take too much of my time (70%). On the other hand, most teachers (90%) agree or strongly agree with the statement of 'I am concerned of the time spent for non academic activities related to this innovation'

For the category of consequence, the majority of teachers agrees or strongly agrees with the statements of 'I am concerned of the impacts of this innovation on students' behavior, I am concerned of how my teaching ability impacting on the students, and I want to use feedbacks from students to improve this innovation. While for the statement of 'I am concerned of the impacts of this innovation on students' achievement and I want to motivate students for their roles in this innovation', all teachers agree or strongly agree.

For the category of collaboration, the majority of teachers agrees or strongly agrees with the statements of 'I want to help other teachers in implementing this innovation (90%), I want to develop cooperative relationship with teachers in my school or other schools about this innovation' (80%), I want to socialize this innovation to the other teachers of party (80%), I will work together with the other party to maximize the impacts of this innovation (90%). Furthermore, all teachers agree or strongly agree of the statement of 'I want to know what other teachers do in relation to this innovation'.

For the category of refocusing, all teachers agree with the statement of 'Now I know better strategies to use with this innovation and I care to revise my implementation of this innovation'. In addition, most teachers agree or strongly agree with the statements of 'I want to revise the learning approach used in this innovation (90%), I want to modify the implementation of this innovation based on students' experience (80%), and I want to determine how to perfect, improve and revise the innovation (90%).

The responses of the teachers of the awareness category show that all teachers state that they are familiar with RME approach, even though some teachers joined the RME workshop for the first time because of their recent employment in the partner school. This indicates that teachers obtain information related to RME not only from the workshop for RME teacher but also from other resources. This in line with[23] who found that teachers obtain information about RME not only from the workshop for RME teacher but also from other resources such as educational seminars and reading resources and material obtained in the course. Furthermore, most teachers say that they are interested in RME approach. This is in line with [24] who discovered that teachers are interested in implementing RME approach.

Similar trends occur for the category of informational and personal. All teachers state that they are willing to review more of RME. This is related to the resources used, the preparation needed for the implementation of RME and the impact of the implementation of RME on their professional improvement and the conformity of RME to the current curriculum. All teachers also want to know the change required related to the implementation of RME in term of teaching strategy and preparation, time, efforts and role. This is in line with [25], [26], and [27] who argued that the implementation of RME requires teachers' understanding on students' involvement, the importance of discussion to get information related to RME and the situation required to implement and sustain the implementation of RME. Teachers are required to follow the RME principles while adapting with the students. The implementation of RME should provide teachers opportunities to be an active participant instead of a passive receiver. This is in line with [28] who emphasized that teacher should know and understand the change to do. Teachers also require understanding that some of the current activities may be useless with the implementation of RME. According to [29] and [30], the implementation of RME will be rejected if there is a big change which is not considered as an improvement.

For the category of management, most teachers state that they are not concerned of not having enough time to prepare the lesson each day if they implement RME approach. Most teachers are also interested and not concerned that it will add more responsibility. Furthermore, they are not concerned about not being able to prepare everything needed for the innovation. Most teachers are not concerned about spending too much time to prepare the task and working with other people. There are only a small number of teachers who state that they are not concerned about spending much time for non academic activities related to the implementation of RME. These are an significant finding as [31] argued that the change such as the implementation of RME are often seen by teachers as the addition of workload on top of the high workload they have already had. The benefits of the implementation of RME should be received by teachers to avoid their rejection.

For the category of consequence, nearly all teachers agree respond that they care of the impacts of the implementation of RME on students' behavior and achievement as well as their teaching ability. All teachers are willing to motivate students of their role in the lesson with RME approach. Nearly all teachers are willing to use feedbacks from students to improve the implementation of RME. This is relevant to [32] and [33], and [28] who explained that students should be involved in implementing a change based on their maturity and the sophistication of the change done. This is supported by [34] who found that the success of a change is determined by the interaction between teachers and students. Therefore, teachers should work as a team with the students. Furthermore, [31] argued that it is crucial for teachers to know the impacts of the change on the students. According to [35] and [36] among the challenges are students with different background, ability, interest and talent. Therefore, teachers need to be certain that the RME learning can accommodate all students.

IV. CONCLUSION

Based on the responses of teachers on the questionnaire related to the implementation of RME, it can be concluded that the teachers are having a great concern about the implementation of RME. Teachers are willing to learn more about RME and its impacts for both their professionalism and students. Teachers are also willing to know the change required related to the implementation of RME. Furthermore, teachers are not concerned about not having enough time or adding more responsibility.

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Building Up Pre-Service Mathematics Education Students' Geometry Competency Based On Visual

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***Abstract*—The researcher presents data from teaching and learning series by a group of pre-service Mathematics education students from 2012 to 2014. The question addressed is: How do students of geometry come to think visually? The researcher gave students a written test to ascertain their visual levels and acquisition degree of spatial abilities. Some students volunteered to work in small groups, whose task was to determine the nature of the object by asking questions about it. The purpose of the instruction was to investigate information on students' visual thinking and geometry competencies in solving some geometric problems in class. The purpose of the group discussions was to elicit information on the students' visual perception and image formation in describing several geometric figures. Visual representations in the identification of the general view of geometric figures and to be manipulated figures. A common scheme used by students was identified and the identification consisted of describing and imagining simple geometric forms in terms of simpler geometric parts. All students were given a written test to ascertain their categories of spatial abilities. Whilst the visual pattern generally reflects the Geometric Thinking Models, an exploration at each levels compared to the written tests indicated that those levels are not hierarchical. Generally, visual perception correlates with a spatial, but the image formation seems to require a different sort of ability.**

Keywords—Geometric Figures, Visual Thinking, Visual Representation, Visual Perception, Image Formation, Spatial Ability

I. INTRODUCTION

Mathematics in teaching and learning until now is mainly analytics with their vivid contents, i.e. symbolic, mechanistic and handling only for proving without meaning which makes students feel confused. According to this state of the art, some difficulties are discovered, namely: (1) in applying procedures, concepts, and principles, (2) in making deductive reasoning, (3) in manipulating algebraic expression, (4) in formulating languages and logic, (5) in understanding analytic forms, and (6) in constructing mathematics formally [1][2][3][4][5]. Those conditions must be anticipated, the power of problem solving primarily starts from visual intuitive level to generate thinking process and better for analytic levels [6]. After visual thinking pattern is constructed, ability to develop geometric principles will be pointed up. Doing maths from visual brings out more believed system than others [7]. Students who tend to use analytic style do not show good understanding, but only for routinity and fun. The results are also explained by [8] learning maths analytically which is critical and cannot become powerfull indicator for problem solving [8].

This research was to show the strength of visual for building up geometry competencies, especially in solving problem. Visual is used to enhance students' performance in maths cognitive process (*metacognitive*). This research used a developed model called Rive's Model based on thinking activities in visual [3]. The model gradually generates geometry competencies according to thinking levels in and from visual manner that bring out a process of how to know and develop visual information in stablity and application.

The adequate visual representation is not just as a representation, but for ability in studying maths generally. The solution method used by students is based on assignments reflecting visual orientation [9]. The results of research in cognitive psychology also show the core of visual ability which has significant role in solving geometry problems. For instance, some research results according to visual thinking as follows: (a) visual imagery could be used in developing mathematics teaching and learning, (b) visual amplifies mathematics power and reasoning, and (c) visual stimuli can be reexamined easily when students want to generate and develop analytic concepts based on their perceptual [10][11].

II. RESEARCH QUESTIONS

Mathematics visualization is still used as a discrete tool to mathematical thinking when observed in a holistic needs of learning. Visual aspects are often not deduced from figure or not manipulated, but are always back to algebra manipulation due to the figure. The performance calls an analytics solution [12][13] or symbolic representation [3].

The question to be addressed is: How do students come to understand geometry problems based on visual representation and visual thinking? Which means do students themselves use to describe, relate, explain, construct and understand, to the properties of geometric figures, as distinct from being taught those properties?

This research focused on the two processes of visual thinking and visual representations. In the mathematics education literature, these two processes are often taken to be synonymous, but in this research visual representations are different from visual thinking. An excellent discussion of the different ways visualization and thinking power have is used by various people in mathematics education. The researcher investigated the two terminologies to be used in this research that they are sharing the meaning for different competencies. On the other hand, a single term, "visual representation", may have different meanings due to ability for solving problems.

There is evidence [3] that students can build visual representation from verbal descriptions and that patterns formed as a result of these descriptions use visual sequences. Deduction based on analytics reduces mathematical understanding, and also show many missconceptions or far from accuracy. Students count an integral without visual thinking showing substansial error [3][14].

The error in making conclusion from visual representation is called oblique effect, i.e. caused by perceptual effect due to visual process and activity [10]. The main problems are: (1) figure setting considered by constant object, (2) information on visual objects assumed by students, (3) students still come to make analytic solution from geometric figure, and (4) most students need formula rather than contructing other visual pattern in solving problem [3].

In this research, a series of learning activity was done to explore and overcome any obstacles in using figures for solving visual problems without ’suddently’ translate to analytics representation. We call that learning is based on visual thinking ability.

III. Theoretical Framework

The concepts of geometry and visual pattern are relatively illustrative: What is said might be a constructed feature for someone else. Seeing some features of objects are inherently deep features [15]. Unfortunately, geometry representation in problems are just as an aid tool, still far from doing maths [3]. To hypothesize, when a person examines geometric object and attempts to describe those analytically, two things alternate: (a) algebraic and (b) a belief of their visual perception. It is just this alternation, in my view, that produces visual representation. For example, consider the following test. Consider a rectangular triangle with sides of 30 and 40. If we draw the median and the bisector from the largest acute angle, we obtain a new triangle. The next task is to determine the shading area of the triangle.

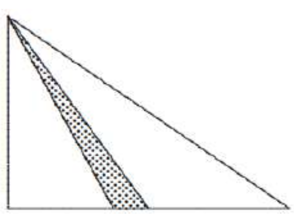

Fig. 1. Shading area of triangle

The test item actually, in my point of view is not so good for building up mathematics ability, especially from geometry. It is more for algebraic with full mathematics content, or analytical solution. The item also comes to disequilibration in students’ belief system because of the representation. Therefore, fluency of mathematical expression is not necessarily connected to the adequately visual thinking. In the example is : (1) area (2) bisector, (3) median, and (4) accuration of position.

The results of the test show that 20.97% students gave wrong answer and 53.53% did not give an answer at all (blank), or only 25.50% gave right answer. They tend to do maths with analytics representation, influenced by their perception come to wrong solution. Other students construct their belief that, in that case, the median dan bisector cross base segment as close as possible. The visual thinking convinces them that both areas are not so much different and bring them to the right answer. The students’ perception is the same when they face with similar problem, for example, to count the percentage of the shaded area in the rectangle below. For that test item, 27.73% students gave wrong answer, and 20.25% left it blank.

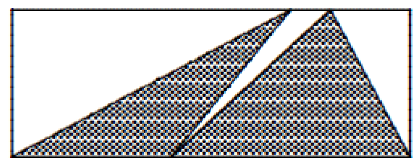

Fig. 2. Shaded area in the rectangle

In the mathematics education literature, a significant distinction is drawn between visual thinking and visual representations. The problem of what a visual representation is has been a question that has engendered much debate. Visual formation is dependent on high level visual thinking. This research was concerned with identifying mental processes – conscious and especially unconscious– that underlie expert learning, thinking and performance in geometry. This research method was based on Algo Heuristic Theory that represents a system of techniques for getting inside the mind of expert learners and performers which enable one to uncover the processes involved. Once uncovered, they are broken down into their relative elementary components, namely mental operations and knowledge units, which can be viewed as a kind of psychological units. Performing a task or solving a problem always requires a certain system of elementary knowledge units and operations.

The other theoretical frameworks are cognitive flexibility and Ausubel's theory. The first one focuses on the nature of learning in complex and ill-structured domains. Ausubel's theory is concerned with how individuals learn large amounts of meaningful material from textual presentations in a school setting (in contrast to theories developed in the context of laboratory experiments). A primary process in learning is subsumption in which new material is related to relevant ideas in the existing cognitive structure on a substantive, non-verbatim basis. Cognitive structures represent the residue of all learning experiences; forgetting occurs because certain details get integrated and lose their individual identity.

The theory is largely concerned with transfer of knowledge and skills beyond their initial learning situation. For this reason, emphasis is placed upon the presentation of information from multiple perspectives and use of many case studies that present diverse examples. The theory also asserts that effective learning is context-dependent, so instruction needs to be very specific. In addition, the theory stresses the importance of constructed knowledge; learners must be given an opportunity to develop their own of information in order to properly learn.

There are classes of problems for which it is necessary to execute operations in a well structured, predefined sequence (visual problems). For such problem classes, it is possible to formulate a set of precise unambiguous instructions as to what one should do mentally in order to successfully solve any problem belonging to that class. There are also classes of problems (creative or heuristic problems) for which precise and unambiguous sets of instructions cannot be formulated. For such classes of problems, it is possible to formulate instructions that contain a certain degree of uncertainty (heuristics).

The theory suggests that all cognitive activities can be analyzed into operations of an abstract, semi-abstract, visual heuristic, or semi-visual heuristic nature. Once discovered, these operations and their systems can serve as the basis for instructional strategies and methods. The theory specifies that students ought to be taught not only knowledge but the image and visual thinking heuristics of experts as well. They also have to be taught how to discover perception and heuristics on their own. Special emphasis is placed on teaching students mental operations and heuristics which make up general methods of thinking.

With respect to sequencing of instruction, the researcher proposed a number of strategies, the most important of which is a thinking process method. This method applied to teaching a system of cognitive mental operations by teaching the first representation and operation, then the second which is practiced with the first, and so on. From an educational perspective we wish to make a clear distinction between these two interrelated processes. This is because whilst visual formation is indeed dependent on visual thinking. Its development is not simply a corollary of the development of visual representation. Something different seems to be involved. In the context of geometry, it is an ability to integrate local and global features of a geometric object.

Visual thinking and patterns are strongly linked in that they utilize similar brain mechanisms, and are highly dependent on visual perception [16][3]. However the development of image representations of objects seems to require something else, different from visual perception. Perception of objects such is a complicated process of making sense of visual and tactile data. In forming perceptual representations students actively manipulate objects seeking relevant data such as the types of faces, the number of faces, and how the faces fit together to form the global object for solving problem.

The literature on transformation of mental images makes clear that motor subsystems of the brain are involved [16]. However, as far as we can ascertain there is no substantial evidence that motor subsystems are involved in image formation. It was as if the hands, in particular, were reflecting an internal attempt to build the image in the mind.

Perception is usually thought of as an individual matter. From a mathematical point of view, information is for solving problem and could come (almost all) in pre-formed categories or representations [3]. Thus, flexibility of mathematical expression is not necessarily connected to abstraction of thought. It's true that clear, construct visual pattern can be, and often is, an important aid to understanding. However, visual and thinking visual representations can also get in the way of mathematical understanding.

IV. Research Method

The researcher administered 100 pre-service Mathematics education students a written test to ascertain their visual levels and degree of acquisition of visual representations [3]. The written test contained 5 questions described below. Table 1 shows Inter-rater reliability. The estimation was based on the correlation of scores between/among raters who rate the same item. The Kuder-Richardson inter-term reliability was used for each question.

TABLE I. KUDER-RICHARDSON INTER-TERM RELIABILITY COEFFICIENTS

Question	Reliability
1	0.64
2	0.87
3	0.66
4	0.91
5	0.72
Overall	0.76

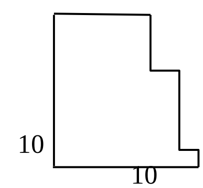

Fig. 3. Question 1: Asking students to count the perimeter

This question explored conceptualization visual process. It was associated with constancy of objects in space, level 1 of mathematics ability. The students recognised that the figure had variant position. These properties were compared between figures which represent the square.

On question 2 (comprehention of visual methods), the students were asked to count diameter from figure presented. The diameter of a circle with center m is 110 cm. A point p lying on a chord divides the chord in pieces of 30 and 60 cm. Then $|pm|$ equals ….

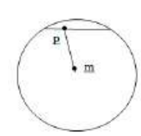

Fig. 4. Question 2: Comprehention of visual methods

This question was related to level 2 of visual representation and method grounded by a comprehension. It explored students' ability to understand the representation, figure completion, and figure assembly. This involved organizing two dimensional figures to obtain a new figure in solving the problem.

On question 3 (selecting correct visual processes), the students were required to select correct visual processes by their appearance and link with position-in-space perception, namely, that students can determine the relationship of one shape to another. The students were requested to recognize the equivalence of different views to successfully complete the figure and then to count the cosine of the top angle α of the one of the lateral faces.

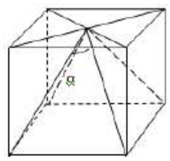

Fig. 5. Question 3: Selecting correct visual processes

On question 4 (application of visual facts), the researcher investigated the ability to apply visual facts for solving problem as follow. In Fig. 6, a square, a quarter of a circle, a diagonal of the square and a line segment that joins a vertex to the midpoint of a side exist. The students needed to compare the areas of A, B, and C of the indicated parts.

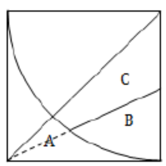

Fig. 6. Question 4: Application of visual facts

The objective of this question was for the students to apply and describe the figures' properties by the shape and differences, recognize the certainity of the shapes. This question was related to visual facts and explores the ability to relate the features of one shape to the others.

On question 5 (visual sequencing), the researcher explored the visual sequencing by a common set of shapes and properties. This question was linked with five visual representations and Rive's Model ground perception, the ability to sequence a specific figure by their shapes. The students were asked to count the shortest path along the surface from a sequence of similar and/or non similar figures, i.e. : two ants are situated on opposite vertices A and B of an object shaped like a regular icosahedrons, with edge 1 (as shown in the figure below).

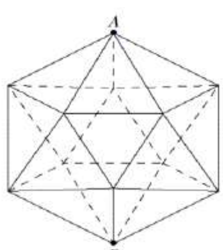

Fig. 7. Question 5: Visual sequencing

By asking the students their argument they were stimulated in thinking analytically about shapes needed. They also were asked their argument if there was only one such path or to give the different properties if there was more than one path.

V. Results and Implications

A model of Rive's visual thinking was used to assign the students to a specific level of visual within each level of visual thinking [17]. The results together were also assigned to mathematics abilities and partly are shown below. Note that a level of Conceptualizing Visual Processes, for example, means a student who has attained the level and is in building to a level of visual thinking.

TABLE II. Intercepts of Visual Representation and Visual Thinking

Visual Representation	**Visual Thinking**			
	Visual Reasoning	***Inferential Reasoning***	***Deductive Reasoning***	***Decision Making***
Conceptualizing Visual Process	Precise	Adequate	Precise	Precise
Comprehension of Visual Methods	Adequate	Insufficient	Insufficient	Inappropriate
Selecting Visual Processes	Precise	Adequate	Precise	Precise
Aplication of Visual Facts	Adequate	Insufficient	Precise	Adequate
Visual Sequencing	Insufficient	Inappropriate	Precise	Precise

This research had assigned each levels of visual representation to stage of visual thinking respectively. I actually had difficulties with a clear determination of any level for students, for the following reasons. A student is in transition between levels Conceptualizing Visual Process and Comprehension of Visual Methods. However, another student also showed aspects of attainment of Selecting Visual Processes. The first student showed evidence of transition between levels two and three. However the student was not accurate on question 3, and did not show complete attainment of Comprehension of Visual Methods, i.e. determining the relationship of one shape to another. The students successfully completed the figure and then counted the cosine of the top angle α of the one of the lateral faces, but were not accurate in distinguishing visual facts when constructing shapes.

Visual representation is dependent on, but different from visual thinking. Although representation and thinking rely on building up geometry competencies, those together as a whole linked to mathematics abilities are not used identically in mathematics problems. In particular, or representations contain information that are already organized into analytics that have been previously interpreted. In contrast, in visual thinking one must organize the input from scratch and match it to stored; one does not know in advance what the object is likely to be.

Visual thinking of geometry objects is often accompanied by tactile representation. These two forms of visual or spatial ability integrate to allow a student a visual-tactile pattern of an object. A need to describe this perception can crystallise perception in striking ways. Students with a very good visual thinking had been answering questions about selecting correct visual processes and trying to describe it just by visual. However, other students had particular difficulty in forming an image of the object, so they tried to describe it differently. They began the description and suddenly perceived the object using cosines rule, something that had not seen visual process.

In exercising their ability to form images, the students utilized perceptual units that have been previously interpreted. These perceptual units were triangles, rectangle triangle and piramid. Without such pre-digested perceptual units the students would not be able to form such complicated images at all as Kosslyn (1996) [16] indicates.

According to Rive's Model in visual thinking, four elements of those due to mathematics abilities in visual manners were also observed, i.e. constancy of objects in space, spatial conservation, comprehension of visual relations, inferential memory, and visual reasoning and logic. Schematically, interrelationship among those are as follows.

TABLE III. RIVE'S MODEL OF VISUAL THINKING IN VISUAL MANNERS

Visual Thinking	**Mathematics Abilities: Building up Geometry Competencies**				
	Constancy of objects in space	***Spatial conserv ation***	***Comprehensio n of visual relations***	***Inferentia l memory***	***Visual reasoni ng and logic***
Visual Reasoning	Insufficient	Insuffi-cient	Insufficient	Insuffi-cient	Insuffi-cient
Inferential Reasoning	Adequate	Insuffi-cient	Inappropriate	Inappro-priate	Inappro priate
Deductive Reasoning	Precise	Inappro priate	Insufficient	Insuffi-cient	Insuffi-cient
Decision Making	Insufficient	Insuffi-cient	Precise	Adequate	Inappro priate

Most of the students tend to solve problems without considering elements of visual thinking. The student with good mathematics abilities, but difficulties with visual thinking demonstrated obstacles in solving of complex geometry forms. She described the two-dimensional faces, and perceived that this figure was constructed in a sequencial process. Another student showed no evidence of visual thinking of the 2-dimensional figure to a formed triangle. Their visual perception appeared to be stimulated by distance concept, and not by enough investigation. The student speculated that the visual representation was really trace edges of part of icosahedrons. A difficulty with visual thinking will generaly caused a difficulty with mathematics abilities. However, it is quite possible to have good mathematics abilities, yet still have relatively difficulty in visual thinking. The problem seems one that besets all students of mathematics, and it is the problem of establishing repeatable units: in this case, repeatable visual.

Given that image formation is dependent on visual, it is difficult to reconcile this question about cosines of alpha that was constructed but a moment ago. This might indicate a problem with inferential memory, but even so, it still indicates that the image was far from permanent. However, one of the students was clearly capable of visual reasoning and logic. The student explains that if one puts a triangle in a fixed position, the required shape would be formed. The student did not take into account that just the lateral faces of a square would change from cube to a pyramid. This was clear however to the student, who was determined on the written test to be at the level. She demonstrated an ability to understand the logic of the situation which, infered that, came from a mental image of a cube being pushed laterally.

Those seem to indicate that visual thinking, whilst highly dependent on good visual, develops in different ways. As we have mentioned earlier, the problem of visual thinking of an object such as a icosahedrons is one of integrating local and global features, whilst the problem of high visual level sufficient to describe it to mathematics abilities, is that of misappropriating and manipulating objects. It seems that students' analytic skills were at high order but the corresponding visual thinking skills were not so well developed.

There are two ways in which students could have mentally constructed a representation of an object. One is by generating a perception of a seen physical object being sheared. The other is by manipulating the mental image in a novel perception. According to Rif'at (2001, p. 67) [3] such transformations are often carried out by instructions from the imaging of the brain. Generally the ability to form multiple part of an object, without co-ordinate spatial relations, is dependent on the visual representations of previous experiences.

In this study we also observed numerous instances of students imaging and constructing a triangle to count $|pm|$ (question 2) from different view points. For example, the students inspected the line segment as long as line from *m* to a point in the circle like radius. The literature on transformation of mental images makes clear that image perceptions (visual patterns) are involved. However, as far as we can ascertain there is no substantial evidence that inferential reasoning was involved in image formation. We observed many instances of inferential reasoning associated with image pattern. This inferential reasoning ability did not seem peripheral to the formation of visual images, but appeared, to us, to be a natural result of a student trying to 'push' mentally construct an image. About 57.84% of students did not have any answer (or blank), 14.24% had wrong answer, and only 27.93% gave right answer.

According to question 5, 73.53% of students gave wrong answer. Only 2.35% gave rightright, and 24.12% did not give any answer (blank). The distribution of the answer was also good to be known, i.e. 64.45% of students had the answer $\sqrt{3}+1$, 3.53% had 3, 1.93% had $\frac{3\sqrt{2}}{2}$, and 3.63% gave the answer $\frac{3\sqrt{3}}{2}$. The distribution show students' perception about an icosahedron away from the body of the geometry form (decision making). They appeared to count the shortest path along the surface without a visual thinking understanding (or deductive reasoning) from visual.

The cases also gave confirmation as the students were trying to describe the formation of mental images. This activity was quite different to mathematics activity we observed in visual representation and thinking, and seems to be a significant aid to students in their attempts to construct a coherent mental image. Its origin was unclear, however our hypothesis was that it was a significant, but not necessary, component in the integration of features of an unseen 3-

dimensional object. For instance, their visual representations were related to making a way just what they see (answers for 3 and $\sqrt{3}+1$). The students who counted the shortest way that equal to $\frac{3\sqrt{3}}{2}$ indicated how they were thinking of the same altitude in equidistance triangle. Or, the students seeing a shape appears to relate to the appearance of part of a 2-dimensional face of the object.

Thus, the visual representation appear to be related to dimensionality and spatial positioning, as well as to the integration of the object. Perception is usually thought of as an individual matter: a question of an active intelligence, paying attention, and gaining information through the senses. So what is it that stimulates a person to act, and to begin to order their inferential memory. Another student (who gave the answer $\frac{3\sqrt{2}}{2}$) responded with lack accuracy in visual reasoning and logic (spatial reasoning) which affected their perception. For example, the student showed an understanding that the distance was straight line from point to point.

Question 3 showed the evidence that the students perceived and described the constructed of the shape in many variations. About 26.19% of students gave wrong answer and 39.20% did not give any answer (blank). They perceived the cube in various ways apparently looking for pyramid. However, students' perception was still relatively insufficient. In answering the question, the students placed pyramid to leave the cube band. We inferred that was precisely at this point that the students obtained a perception of the lateral faces as equidistance triangle. This perception was prompted by the other students trying to reconcile their images of the pyramid with the same length for cube's side and side of lateral faces. In this sense,

Based on question 4 (application of visual facts), we investigated the ability to apply visual facts for solving problem, i.e. students could compare the areas of A, B, and C of the indicated parts. The results were that 24.54% of students gave wrong answer, 32.35 gave right answers, and 43.10% with blank sheets. The students with the answer of C<A<B indicated a permanent image due to the representation, so did others who gave A<C<B. Where were their visual thinking? and how did they build their mathematics abilities? According to its shape, actually the parts of the figure look different, but student's perception make difficulties. Their visual thinking based on visual image in term of optical illutive.

We expected that attainment in Rive's Model levels would correlate each of visual representation and/or visual thinking to mathematics abilities in geometry. Whilst there does seem to be a general correlation between visual thinking and mathematics abilities, the same does not seem to be the case with regard to visual representation. The evidence we have presented suggests that students with high conceptual levels can have difficulties with visual representation (or in represent visual formation), whilst students with low conceptual levels can successfully form complex geometric problems. For example, a student was determined to be operating at deductive reasoning, with in appropriate comprehension of visual relations. This student also had good comprehension of visual methods yet encountered considerable difficulties in the formation of images of icosahedrons. Another student was at constancy of objects in space competencies yet this student successfully formed a visual sequencing of a triangle faces of icosahedrons.

In Table IV, we provide some evidence that there is a general correlation between visual representation and visual thinking toward mathematics abilities.

TABLE IV. CORRELATION BETWEEN VISUAL RERESENTATION AND VISUAL THINKING

Table Head	Visual Thinking Level	Mathematics Abilities	Evidence
Conceptualizing Visual Process	1	Very good	Students recognize the figure has variant position.
Comprehension of Visual Methods	1→2	Good	Students perception grounded by a less comprehension.
Selecting Visual Processes	2→3	Enough	In general, students can determine the relationship of one shape to another, but still have difficulties to successfully complete the figure and to count.
Aplication of Visual Facts	3→4	Good	Students could to apply and describe the figures' properties by the shape and differences, recognize the certainty of the shapes.
Visual Sequencing	4	Adequate	Students' argumentations were stimulated in thinking analytically about shapes needed.

This correlation is suggestive only because we did not have identical information for each student. Nevertheless, we know about different types of visual representation, visual thinking and mathematics abilities of geometry problems, and the development of these types. In this research, the students (all of who had completed mathematics degrees) exhibited geometry abilities, as in Table V.

TABLE V. CORRELATION BETWEEN VISUAL RERESENTATION AND VISUAL THINKING

Indicators for mathematics competencies	Visual Representation	Visual Thinking
Symbolization : simplification and generating	*	*
Inferential Process	*	*
Consistency		+
Completing		+
Potencial and perceptual		-

Indicators for mathematics competencies	Visual Representation	Visual Thinking
Belief		+
Deductive logic and logical processes	*	*
Mathematical insight and mathematical precision	*	*
Structural and conceptual understanding	*	*
Visualization	*	*
Algebraic skills		+
Creativity		+
Making and testing conjectures		+
Building visual concepts		+
Concepts visualization		-
Analytics abilities		+

Note:
1. * means that there is no significant correlation between ability in visual representation and levels of visual thinking observed from mathematics competencies;
2. + means that the competency is better than……;
   – means that no better one from other

The correlation between visual representation and visual thinking within and between mathematics abilities based on analytic assumption could become an ability or competency measure in geometry especially for setting learning activity. For example, there is a belief system when students have good performance in visual thinking, their mathematics competencies are better than those who work based on visual representation. However, for analytic abilities, there is difference between students who are still in visual representation oriented and those who have higher visual thinking level.

VI. Discussion

On the basis of the written tests, we conjecture that visual representation competencies are good predictors of visual thinking. Rive's model of visual representations is good predictors of both visual representation and visual thinking. In response to students who gave different answers (not right), they tried to seek higher level integration of mathematics abilities in understanding mathematics problems. Heightened visual thinking is possible, and common, as a result of questions about an object to be manipulated.

Visual thinking of geometry objects is a different process with students having to integrate the elements for solving problems. Visual production is often accompanied by perception or constructed representations which appear to closely resemble features of the image being formed. Repeatable unit items such as triangles, squares, and other polygons, cubes, pyramids, and icosahedrons played a major part in students' integration of data into perception, and a coherent image, of a geometry object. Generally, much of mathematics competencies involve the construction of analytic units, whether it is in term of formula, or symbol manipulating.

Students' talk in explaining and questioning is often hesitant. We hypothesize this because students are thinking and explaining alternately. In the questions we have given, the thinking involves searching for complete features of geometric objects or algebraic representations, and it seems to be just this focus of attention that inhibits solution at that moment.

It is difficult - perhaps impossible - to both talk about an object and inspect deeply an image of it, or look deeply at it for visual information, at the same time. We have found no evidence for this in the psychological literature. However, there is currently a debate about the independence of auditory and visual codes [18][19][20][21][22][23] that suggest the likelihood of such difficulty. Evidence from mathematically advanced students with varying levels of attainment shows that such difficulties occur in practice and are probably common.

The students in this research had difficulty in speaking fluently as they examined deep features of objects or images. To us, it indicates that such fluent verbal descriptions do not involve inspection or perception of deep features of images or objects. In other words, fluency of verbal description is generally incompatible with concurrent deep perception or imagery. Someone who describes such deep features fluently may have previously examined them deeply. However, they are not examining deep features at the same time as they talk fluently.

If we, as teachers, explain mathematics in a clear, fluent manner, the chances are we are not thinking about deep visual features of the mathematics at the same time. We suspect that in the process of organizing and delivering a classroom lesson, many - perhaps most - mathematics teachers' focus of attention is on the way in which the lesson is proceeding and not on deeper features of mathematical thought. Put simply, we can prepare a lesson on polyhedra, for example, and talk fluently about the properties of polyhedra because of our preparation. What we claim, is that at that moment of fluent delivery, we - the teacher - are not inspecting deep properties of the polyhedra. In other words, we are concentrating on our delivery and not on our thought processes.

Students' hesitancy in explanation or questioning exists and is probably common. The reasons for this deal with the extreme difficulty that students have in talking about deeper features of objects or images at the exact same time. As a result, we, as teachers, should not try to prevent students being hesitant, but rather recognize this hesitancy for what it is - prolonged deep perception or imagination. Most student have far more mental ability than their words, or their math homework. It is important to keep a good measure of humility, and not to assume we know what is going on in their minds. Forcing them to talk in ways that are not natural for them 'can' help them think clearly, but it 'can' and often have the effect of blocking them from thinking for themselves [24].

Interaction between students, through asking questions and receiving answers, and in arguing about different images, is a strong stimulus to the formation of a satisfactory and stable mental image. In the group discussions, there were many instances of students, through group interactions, achieving image formation and perception that were at a higher level than indicated on written tests, and at a higher level than indicated by their determined levels. We conclude that such group discussions can form a significant tool for assisting student to gain heightened geometric perception and imagery of polyhedra in a relatively short time span.

When students are inspecting concrete objects and reporting on their perceptions, or asking questions about hidden objects and reporting on their imagery, they spend a lot of time going back and forth between global and local points of view: between trying to describe the object as a whole, and trying to describe its parts. The question of what one processes first - global or local information, the whole or the parts - has been addressed systematically [25]. Their basic finding can be summarized as follows: there are specific areas of the brain involved in co-ordinating visual data about global features of systems of objects, areas involved in co-ordinating data about local features, and a mechanism for changing the rate at which data arriving at each of these areas is analyzed. Their discussion centers around four basic questions:

First, what is processed first, features of parts (more local forms) or features of their wholes (more global forms)? Second, to what degree can known properties of the visual sensory system account for the perceptual organization of parts and their wholes? Third, to what degree can differences in performance between parts and their wholes be attributed to attentional versus perceptual processes? Fourth, what determines the interaction between parts and their wholes that eventually produces a coherent perceptual scene? (p. 301)

The problem for visual perception of 3-dimensional objects such as polyhedra is what one takes as a whole and what as a part. It is fairly straightforward for anyone to perceive the triangular faces of an icosahedron, for example, as parts of the overall object: they are clearly delineated by well-marked edges. But what about a pentagonal pyramid? Even if one does see a pentagonal pyramid as a part of an icosahedron, a slight rotation of the icosahedron seems to bring a new pyramid into view and make the first disappear. So much for visual perception! Is the pyramid there or isn't it? The point is that for a relatively complex object like an icosahedron it is possible to see various "parts", but these parts are not always self-evident, and time and patience may be required for their perception.

In the visual perception of differing parts of an icosahedron there does not seem to be just a simple co-ordination of global and local data: rather there seems to be a constructive process, by which an individual makes sense of data - both global and local - to construct a global perception of the object as a sum of relatively local parts. At the simplest perceptual level the icosahedron is a non-overlapping sum of congruent triangles. But that does not describe it easily because we do not have global information on how the triangles fit together. At a higher perceptual level the icosahedron is a non-overlapping sum of two pentagonal pyramids, rotated with respect to each other, and a polygonal band of alternating triangles. This latter description is also a local-global description, but it utilizes higher level parts and a simpler connection of those parts. This seems to be the preferred way for students to describe such polyhedra in order to form a mental image.

Strictly speaking, the visual perception of a pentagonal pyramid as a part of an icosahedron does not seem simply to be a question of perception alone, but also one of imagery. We hypothesize that a student has to form a pre-image of the pyramid and then see it in the physical object. It as if, upon being asked if there are pyramids in the icosahedron one forms a vague template - not quite a detailed, inspectable image - of a general pyramid, without assumptions as to the nature of its base, and then "sees" the pentagonal pyramid upon closer inspection. In looking for a pyramid in an icosahedron we postulate that a student has a similar vague image of a paradigmatic pyramid - as a cone over a polygon - and then finds perceptual data to sharpen the image template into something with fine, detailed features.

What was striking about the student's questions was their concentration on faces of polyhedra, and the ways in which faces might fit together to form identifiable sub-objects of a polyhedra. There were almost no questions on vertices and very few on edges. There were no questions asked, or information offered, on the number of edges meeting at a vertex. This is in marked contrast to an analytic description of a polyhedron: see for example, Maeder's description of the Wythoff symbol [26].

Both in visual perception and image formation, the students seem to favour a plan of seeking information about relatively regular sub-objects such as cubes and pyramids that might fit together in certain ways to give the entire polyhedron. In image formation, this is a sort of mental "chunking" procedure in which mentally manageable sub-units of the polyhedra are built up, so allowing missing bits of the image to be filled in. We hypothesize that the students do this, rather than focus on analytic information about vertex structure, so as to reduce the cognitive load of image formation. This is not surprising when we remember that, that images are formed from pre-conceived perceptual units [16].

We conjecture that the analytical abilities associated with increasing levels are correlated with increasing abilities in visual perception of objects such as polyhedra. However, ability in image formation in 3-dimensional geometry appears to be associated with a holistic approach of building a mental picture through the process of forming mentally identifiable sub-units of an object, relating them one to another in space, and filling in missing bits. It seems to be more a synthetic than analytic process.

We suggest that the requirement to substantiate the correlation between visual levels and visual is a reliable, valid test of visual perception that can be administered to a larger number of students, at differing stages of geometric development. Further, the process of attainment of ability in image formation seems best addressed by longer term developmental studies with individual students.

VII. Sample Result From the Discussion Groups

This part of the experiment was carried out using concrete three dimensional shapes. Pen and paper were available to the students who were encouraged to draw the shapes during their description. After considering each object, the students stopped only when they believed they had successfully completed their oral description. Throughout the discussion the student with the shape provided information, on request, to the rest of the group. Table 4 shows the visual thinking levels and degrees of acquisition of spatial abilities of the 7 students who participated in the discussion groups. Note that although student is assigned level 2 in transition to level 3, in fact in was not possible for us to assign a clear visual representation level since there was no evidence of a clear attainment of level 2. Similarly, student is assigned level 1 in transition to level 2, but this student exhibited evidence of level 3 thought.

Student (level 2) manipulated a shape behind a screen, out of sight of students (level 3 -> 4), (level 3) and (level 4). One of the students with level 2 began with a quantitative and relevant question, but used the word "sides" rather than "faces": The student explained that if one put a cube on the ground, such that it kept its face on the ground in a fixed position, and in addition pushed the top, the required shape would be formed. This student did not take into account that just the lateral faces of a cube would change from a square to a rhombus, with the top and bottom remaining the same shape: a square. This was clear to student of level 3, who was functioning at level 4. She demonstrated an ability to understand the logic of the situation:

The students (no assigned level: level 1 -> 2 generally, but shows evidence of level 3 thought) manipulated a shape behind a screen, out of sight of students (no assigned level: level 2 -> 3, but lacks some aspects of level 2 thought) and student (level 3). A student of level 3 began with a question he asked several times in group discussions. This question, which was more or less subjective, did not focus on properties of the object, and was in keeping with students' lacking some aspects of level 2 thought. A student of level 2 again asked a series of more analytical questions which indicated a functioning visual level of 2. They also involved visual discrimination in which this student tested poorly. A student of level 3 made an attempt at identification. After being unable to draw the object, the student asked a question involving symmetry, which one would expect at level 4. This student has good spatial abilities in all areas and very good position-in-space abilities: We found that the interchange of knowledge that took place during the discussions contributed to the development of the students. This led some of them to a higher spatial level than that observed in the written test. For example, in the written test a student of level 2 presented very poor responses related to properties of shapes. This student also showed problems associated with position in space perception. On question three the student regarded tetrahedrons and square based pyramids as identical. The discussion above indicates a relatively higher achievement for this student in relation to the written test.

Observing the previous explanation, it becomes clear that group 1 used a better mathematical language than group 2. They were able to make clear understanding when the discussion was about two-dimensional shapes (a face of the solid) or three dimensional objects. In the beginning of the discussion, without consistent information, group 2 tried to determine the shape. Also, this group used the word "side" without explaining carefully, or negotiating, what they meant.

Spatial thinking involves synthesis, an intuitive grasp of complex systems, (often missing the steps) simultaneous processing of concepts, inductive reasoning (from the whole to the parts), use of imagination and generation of ideas by combining existing facts in new ways (creative thinking). It is influenced by visualization and images and an awareness of space. Spatial, holistic and synthetic functions are thought to be associated with the right hemisphere of the brain [27]. Whereas left brain thinking is step by step linear thinking over time, right brain thinking is a holistic system where all knowledge is interconnected in space.

When left brain thinkers are asked the answer to a question, they will look for the right answer based on the facts at their disposal. When right brain thinkers are asked a question, they usually respond with some form of "Tell me more/it depends". As all their knowledge is connected, they can see many paths to differing answers and they want more information to help them decide which path to take to the required answer.

This divergent thinking is the hallmark of creativity but may not be understood in school where achievement is often seen as having the right answer. "Because one of the attributes of right brained thinking is a non-sequential divergent form of thinking, their minds often veer into unusual and different territory. This can result in illogical or often unsubstantiated conclusions. On the other hand, they may view a problem from an entirely different angle, leading to new breakthroughs and discoveries" [28].

Visual spatial learners frequently have difficulty with language. In order to communicate their thoughts, first they have to grab particular images in their heads and place them in order. Then they have to hold them in memory. Then they have to find the words to describe their images. Then they have to hold the images of the words in order long enough to speak them aloud.

Visual spatial learners thrive on complexity and often fail at simple tasks e.g. math concepts versus times tables. Because they focus on the larger picture, they often do not know how they have arrived at a conclusion or solved a problem. They do poorly on timed tests. Also, they tend to be disorganised and have difficulty meeting time limits. This is not a behavioural issue but a significant difficulty for which they need assistance to develop appropriate strategies and skills. They need structure and predictability, clear limits and time frames and assistance with project planning. It is important that they are praised for their effort rather than concentration on achievement as it takes considerable time for them to develop organisational strategies and skills.

VIII. CONCLUSION

We must respect the differences in students and act on them positively. There are both hope and help for the right-brained visual spatial gifted students. Earlier identification and more understanding will result in less ostracism and shaming. Society will benefit from their formidable brain power as well, as we better tap into their abilities to see, take on and solve problems in fresh and creative ways [28].

Visual spatial learners are more attentive if they understand the goals of instruction. They are more cooperative at home and at school if they are allowed to give some input into decision making processes and some legitimate choices. Discipline must be private as these children are highly sensitive and easily humiliated. If they are respected they will learn to treat others with respect. These children thrive on complex, abstract ideas; they are natural pattern finders and problem solvers. Therefore, they ideally suit the types of experiences in gifted programs and activities. When they are placed in the right learning environment, where there is a good match between their learning style and the way they are taught, visual spatial learners can actualize their potential to become innovative leaders in our society [29].

The students' oral description of a certain shape depends on a combination of the students' general geometric level, their spatial ability, and their ability to express the properties of the shape using language. The results from the discussion groups show the importance of both spatial ability and language use in the on-going development of geometric thought. The assessment of spatial levels of thinking and spatial perception applied to three dimensional geometry confirmed the hierarchical nature of the geometric levels [30][31][32]. However the assessment of spatial perception is not hierarchical. This research shows that it is possible for a student to acquire the abilities pointed out by those levels without any regular sequence.

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The Development of Chemical Bonding Module Based on Science Generic Skill

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Abstract*—General chemistry is needed as a foundation for further understanding. One of the general chemistry concepts is the chemical bonding. Subtopics of chemical bonding selected in this study were: (1) electronegativity, (2) the Lewis' structure, (3) formal charge, (4) resonance concept, (5) octet rule, (6) bond energy, (7) geometry molecule, (8) dipole, (9) valence bond theory, (10) hybridization, and (11) molecular orbital theory. Based on the characteristics, learning the chemical bonding concepts needs an understanding of the scale, symbolic language, framework of logic, consistency of logic, inference of logic, causal, and modeling, so the development of learning materials based on Science Generic Skills (SGS) is really important. In this research, material development model adopted 4-D Thiagarajan, which consisted of define, design, developed, and disseminate. The draft was validated by two content experts and one media expert using the questionnaires. The phase of legibility test was carried out by individual and group of students who had taken courses on General Chemistry I. The developed product was Chemical Bonding Module Based on Science Generic Skill. The results showed that the feasibility test of the content was 81.5%. Based on empirical tests in Chemistry Education Study Program at the Universitas Palangka Raya, the legibility of the individual and group were respectively 80.0% and 79.4%. The results showed that the developed module can be used as an alternative learning material.

Keywords—Chemical Bonding, Module, Science Generic Skill

I. INTRODUCTION

Basic chemistry is prerequisite and a center of science, in particular to the field of chemistry [1] [2] [3] [4]. The basic chemistry concept is very important to understand as a whole [5]. Basic chemistry is the interpretation of a general principle based on data analysis of experimental results and it requires logical approaches and understanding of mathematics [6][7]. Logical approach is used to explain the pattern of consistency, inference, logical framework, and causality of empirical data while mathematical comprehension is used as the support of mathematical concepts such as the balance or scale formula. Visualization of logic and mathematics in basic chemical form of symbolic representation [8]. Basic chemistry also represents the characteristic of the material in the form of microscopic modeling [9].

Based on the characteristics described by the experts, studying the basic chemistry requires logical consistency skill, logical inference, causality, logical framework, understanding scale, modeling, and the symbolic language. Those skills are included in the skill of science generic (KGS) component [10].

KGS skill is still a weakness from the side of the students in which 56.3% of second semester students of Chemistry Department Malang Univeristy assumed that voltaic cells will still produce electricity when the salt bridge is replaced with a Pt wire. Students conclude that electricity will still occur because the Pt wire is the conductor. Their conclusions indicate that the skills to understand the causality has not been right [11].

The results of another study showed 50.0% fifth semester students of the Department of Chemical Education PMIPA FKIP Universitas Lambung Mangkurat, Banjarmasin, stated that strong acid does not dissociate in water. That answer was not appropriate because strong acid always dissociates in water solvent. Strong acid characteristic which is always dissolve in water is consistent based on the experiment facts. According to Arrhenius, strong acid dissociates in water produces H^+ ions. Therefore, understanding the logical consistency of the students is still weak [12].

The observation results at the Department of Chemistry Education PMIPA FKIP Universitas Palangka Raya, Central Kalimantan were as follows: (1) 46,7% of students' answers in the test of acid-base was still incorrect in writing the notation of equation reaction of HCI gas dissolving process in water based on acid-base concept of Arrhenius. The students wrote the reaction equation without including the phase symbol (g), (aq), (l) and (s). This fact suggests that the symbolic language of students is still low, and (2) the lecturers explained that there were still many students who did not yet understand well the material of Basic Chemistry I and II. Empirical facts showed learning results from middle test and final test are still low for the Basic Chemistry I and II course [13].

The data of the last four years, middle test and final test result of class offering 2011 to 2014 in course of Basic Chemistry I and II showed that there were still many students who have not reached the minimum value of 55.5 or did not pass. The average percentages of students who did not pass were as follows: (1) 25.7 for class of 2011; (2) 41.1 for class of 2012; (3) 23.1 class of 2013; and (4) 26.8 for class of 2014. The low learning results for the Basic Chemistry I and II course can obstruct the students to study chemistry in further level. Therefore, the basic chemistry instructional design needs to be developed in accordance with the basic chemical characteristics oriented with KGS.

KGS is a basic ability with general characteristic, flexible, and orientation as a preparation to study a higher level of science [14]. Students with good generic skills are expected to be more adaptable and achieve learning success [15]. KGS is the basic thing that helps the process of creative and critical thinking, decision making, and problem solving in daily life [16]. The learning which is training generic skill can improve learning outcomes [15][17][18]. Based on the experts, instructional design which is KGS oriented in basic chemistry can improve student learning achevement.

The instructional design should train the generic skills [19, 20]. Teaching chemistry concept should be designed with the orientation of KGS. Students are trained to think based on data to find the concept. The data are obtained from the results of experiments and analyzed. Analysis requires reasoning abilities of students. Reasoning train students to find consistency logic, logic framework, logical inference, causality, scale, and symbolic language based on the data. The activities of reasoning are steps to guide students to arrange the concept independently. Studying chemistry also requires modeling capabilities. Modeling capabilities is very necessary to present abstract concepts into more tangible form. Therefore, KGS needs to be designed in the learning process.

The learning process will occur if there is a communication between the receiver and the source of the message [21]. Between the receiver and the source of the message, there is an instructional media. Instructional media has a function as an intermediary. Instructional media is expected to serve as a messenger for good learning. Messages are learning objectives to be achieved. Instructional media messages are sources of learning.

The main source of learning for students of Chemistry Education Department PMIPA FKIP Universitas Palangka Raya, Central Kalimantan, which is following the Basic Chemistry I course is a book with informative material [13]. Delivery of basic chemistry concepts has not been trained with KGS. The concept is directly supplied without a guidance to analyze the data first. For example, Lewis structural modeling to represent a compound covalently bonded is directly written. The students are not guided to analyze the data as the basis for the appearance of the concept of a covalent bond. Also, the learning materials are displayed through PowerPoint presentation and handout has not served to train the students to think inductively. The concept is directly provided and is not arranged to guide the students to process the data as the basis for drawing conclusions independently. The students tend to be passive and do not treat the lecturers as a facilitator. The lecturers directly explain the data, issues, and conclusions. The students tend to memorize the material and do not practice to increasing KGS.

Based on observations, the source of student learning in Basic Chemistry I course still has some deficiencies as follows. (1) It does not guide students to learn independently. (2) There is no feedback so that the level of student understanding is not yet known. (3) It does not accommodate students who require a longer learning time. (4) The formulation of learning objectives have not given explicitly, so that the students do not know the learning objectives have been achieved. (5) It is informative, yet it is not inductive which means the concept is directly awarded without guiding students to analyze and to process the data as the basis for drawing conclusions. (6) The material is not oriented to practice symbolic language skills, consistency, inference, framework, causality, scale, and modeling. Therefore, the characteristics of instructional media that needs to be developed is to accommodate independent learning, feedback, individual differences, the formulation of learning objectives, inductive, and improve KGS.

The module is an instructional media [22]. The module allows students to learn independently [23][24]. Learning using the module also provides a more flexible learning time [17]. KGS orientation is arranged in modules to train students to make observations, comprehension, reasoning, and independent modeling with more flexible time study. Opportunities to learn independently and more flexible learning time are necessary because each student has different characteristics. Self-learning method allows students to learn in accordance with the time and speed required [25]. Module should be developed because it is relevant to the students' characteristics.

The module can also be used in a large class. According to [26], if a class exceeds 40 students, it can be classified as a large classroom. One of instructional media that is suitable for a large class is module. Chemistry Education Department PMIPA FKIP Universitas Palangkaraya, Central Kalimantan, has one Basic Chemistry class. The number of students who will take Chemistry I course is more than 40 people in one class. Based on the condition of the class, the module is one of the instructional media that should be used in Basic Chemistry course.

One example of empirical studies is conducted by [27]. Her study proved that the use of the modules on the electrochemical material with multimedia models for applied courses can improve learning outcomes of students on refrigeration and air conditioning in the Engineering Department of Mechanical Engineering Polytechnic of Bali by 42.8%. Students' learning outcomes were improved significantly after the module was given as an instructional media. Another study also demonstrated the use of the module and CD for Organic Chemistry I course audio-visual based to enhance understanding of 93.0% in the students from class of 2012 of Chemistry Department PMIPA IAIN Walisongo, Semarang [28]. Research on the use of the modules was conducted by [23]. The results showed that the use of the modules in the course of optical waves proved a positive influence learning outcomes. Students from class of 2008 in Physics Education Department FMIPA University of Surabaya passed as much as 80.0%. Several studies have shown that the use of the module as an instructional media for students has a positive effect on learning results. Therefore, modules can be developed as a source of learning in basic chemistry course.

Basic chemistry course is divided into two parts: Basic Chemistry I and II. One of the basic chemistry materials is chemical bond. The ability to interpret the electronegativity value is based on Pauling scale which requires comprehension skills scale. Identifying the chemical compounds polar and non-polar require symbolic language skills are necessary in this case. Logical reasoning is also necessary to understand the chemical bond and to explain the relationship electronegativity, dipole moment, and the polarity of a molecular logic skills framework. Students are expected to show inference data as the basis emergence of the concept of covalent bonds. Skills of describing causality are needed when explaining differences in polarity of a species. Modeling skills are also required to interpret the shape of the molecule. Based on these characteristics, chemical bonding requires KGS-oriented learning activities. Therefore, KGS-oriented modules need to be developed on the material of chemical bonds of Chemistry I course.

Research on the development which of learning design is KGS-oriented empirically is proven to have a positive impact. Research conducted by [16] showed that the design of KGS integrated learning produce n-gain score students of Chemistry Education Department, University of Semarang about 0,39. The use of KGS-oriented module provides the average value of n-gain score that is 0.36 on the students of Chemistry Education Department, University of Makassar [29]. Other research also concluded that the acid-base concept module KGS oriented empirically proven to be improved the average n-gain score KGS about 0.58 [13].

Based on the previous explanation about the use of KGS-oriented module in learning, students are expected to practice the skills of understanding scale, symbolic language, logic framework, the consistency of logic, causality, and modeling students. Modules for chemical bonding material which is KGS oriented has never been developed. Therefore, it is necessary to do research and development of chemical bonding module which is KGS oriented at Chemistry Education Department PMIPA Universitas Palangka Raya, Central Kalimantan.

II. METHOD

The development of module for chemical bonding material adopted the 4-D development model [30]. 4-D Model of Thiagarajan was selected because it contained measures in accordance with the purposes of research and development base module. The study was designed to modify the procedure of Thiagarajan's model.

The research was focused on the definition, design, and development, while the development stage of deployment was not done. Figure 1 shows fishbone diagram of development research steps module.

Instrument used in the study was a questionnaire. Questionnaire compiled by referring to [31]. Questionnaire contains a series of questions and the response by the respondent. The questionnaire consisted of expert assessment and student questionnaires compiled based on the Likert scale with category selection. It can be seen in Table 1.

TABLE I. ASSESSMENT SCALE AND CATEGORIES IN THE QUESTIONAIRE

Score			
1	*2*	*3*	*4*
Fair/decent/ clear/easy/ proper/ appropriate	Good/decent/ clear/easy/ proper/ appropriate	Very good/decent/clear/ easy/proper/ appropriate	Excellent/ decent/clear/ easy/proper/ appropriate

The questionnaire consisted of expert assessment and student assessment. The questionnaire was used to determine the assessment of experts on the feasibility of an instrument developed. The instruments were rated by experts such as modules draft, test questionnaire, and legibility modules. Student assessment questionnaire was used to determine the students' perception about the feasibility of modules developed. Perceptions of students were asked in two phases: (1) perception of the individual readability was a stage to require an assessment for 3 students to using questionnaire and (2) perception of readability test group was the stage of knowing the assessment of 15 students based on the format of the questionnaire provided.

Validators were involved to give an assessment. The validators consisted of two material experts and a media expert. Validator criteria for material experts who have been selected in the research and development were: (1) mastering concepts in the course of Chemistry, (2) having a minimum master degree, (3) being a lecturer who teaches chemistry, and (4) understanding the descriptions of Generic Science Skills. The total number of validators involved was three lecturers.

Design of the first revision was the result of the improvement of previously developed module. Design of the first revision was based on expert assessment. The results of design of revision I were subsequently used on individual readability test stage.

Individual testing aimed to test the readability level module development on design of revisions I. The students provided an assessment to the design of revision I based on the questionnaire. The data of exam result of Chemical Bond course were analyzed. This step aimed to determine the student rankings in order to obtain top rankings, middle rankings, and bottom rankings. Ranking used to determine the 15 participants representing students were achievement of over, middle, and bottom level.

Determined criteria as a basis to choose student to individual readability test were as flollows: (1) has been following the Basic Chemistry I course, (2) a sixth semester student of Chemistry Education Department PMIPA FKIP Universitas Palangka Raya, (3) has been getting pretest, (4) represents the students in high rate capability, middle, and low based on test results, and (5) willing to thoroughly examine and give value feasibility modules. Design of revision II was the result of the improvement of revision I. Design of revision II was developed based on the student assessment individual readability test

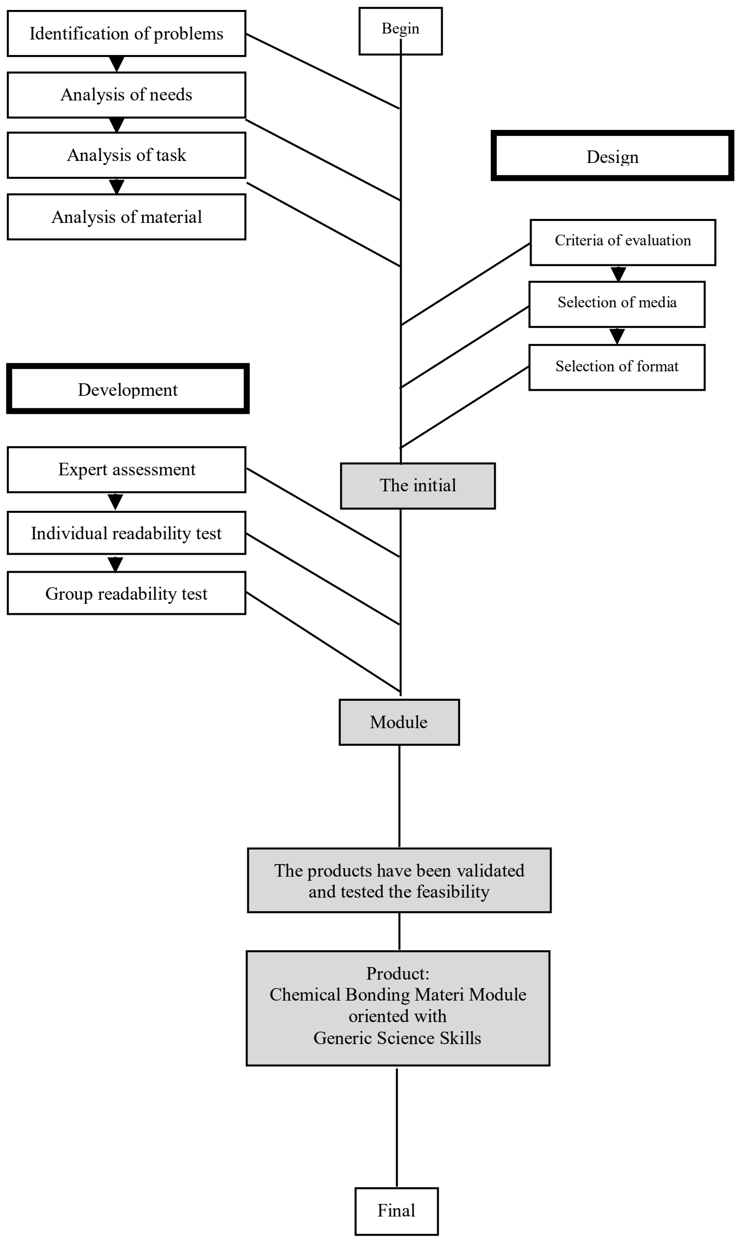

Fig. 1. Fishbone diagram development research steps of the module

Group readibility test involved 50 students. Group readibility test aimed to reexamine the readability level of design of revision II. Design of revision III was the result of the improvement of the design of revision II. Design of revision III was based on assessment on group readibility test.

Expert assessment questionnaire was intended to measure the validity of the instrument. The data from expert assessment questionnaire were scored and suggestions for improvement of validatorwere given. Student assessment questionnaire consisted of a questionnaire for individual and group readibility test. Individual readability test questionnaire by students was used to examine the readability of revision result module I and group readability test to examine the readability of revision result for module II. The questionnaire was needed to be validated before being used as a measurement instrument of readability module on the individual readability test and group readability test. The formula to calculate the validity of using average calculation is as follows:

$$P = \frac{\sum X}{\sum X_1} \times 100\% \qquad (1)$$

Where are P = percentage, $\sum X$= sum score of the assessor, and $\sum X_1$ = highest total score

According to the research design that uses one class, the prerequisite test analysis conducted is a normality test. Normality test was used to determine if the data analyzed were normally distributed or not. The test was calculated using SPSS 16.0 for Windows. The data were distributed normally if the significance valuewas greater than 0.05 and were not distributed normally if the significance value was less than 0.05. Normality test was done on the data from pretest and posttest.

Descriptive qualitative analysis was done based on the opinions and suggestions of experts and students. Descriptive quantitative analysis was based on data obtained from the questionnaire. Descriptive quantitative analysis aimed to determine the feasibility of the module. Categories of feasibility for the percentage of modules can be seen in Table 2.

TABLE II. FEASIBILITY LEVEL MODULE[32]

Feasibility Level (%)	*Category*	*Information*
80 – 100	Decent	No need revision
60 – 79	Fairly decent	No need revision
40 – 59	Less decent	Need revision
0 – 39	Not decent	Need revision

III. RESULT AND DISCUSSION

The products that have been compiled still required the validation process. Validation was done to improve product quality. Table 3 is an explanation of expert validation data. Validated products were draft module. Improvements based on the validation experts were used to produce revision I. The average score of the feasibility level of the Module, Individual Readability Test Questionnaire, and Group Readability Test Questionnaire were 81.5%; 75.0%; and 85.0%, respectively. Based on the criteria listed in Table 2, the feasibility level of the Module, Individual Readability Test Questionnaire, and Group Readability Test Questionnaire were respectively categorized as very decent, decent, and very decent. Therefore, the research instrument can be used for group trials.

TABLE III. EXPERT VALIDATION FOR PRODUCT DEVELOPMENT AND QUESTIONNAIRE

Aspects Assessed	*Average Percentage (%)*	*Category*
Module	81.5	Very decent
Individual Readability Test Questionnaire	75.0	Decent
Group Readability Test Questionnaire	85.0	Very decent

Empirical test of product development was necessary to know the feasibility of module for users. In this case, the students acted as the users. Readability test has been done in two stages. The first stage was individual readability test and the second stage was group readability test. The readability test recapitulation is summarized in Table 4.

Fifteen students who were involved in the group readability test were given three days to evaluate the revised I module. Individual readability test results are listed in Table 4. Based on Table 4, the module was categorized as decent.

TABLE IV. ASSESSMENT RESULTS OF READABILITY TEST MODULE

Readability	***Average Percentage (%)***	***Category***
Individual	80.0	Decent
Group	79.4	Decent

The number of students involved in group trials was 50. The module given to the students was the result of revision II. At this stage, the students were given one week to evaluate the module. The data of readability test module in group readability trials can be seen in Table 4. The results of the group readability test showed that the module was categorized as very decent to use as an alternative of teaching materials. This is accordance with the opinions of experts that KGS can improve student learning outcomes [14, 15, 16, 17, 18].

IV. CONCLUSION

Product result of this research and development is a module. The module design was oriented to seven KGS components namely symbolic language, causality, logical consistency, scale comprehension, logical inference, logic framework, and modeling. The seven components of KGS can be trained on chemistry learning. One of them is chemical bonding material because it has the relevant characteristics.

Module readability was evaluated in three stages: (1) expert test, (2) individual readability test, and (3) group readability test. The results from expert test were very decent, decent, and very decent categorized. The result from individual readability test was decent categorized. The result from group readability test was decent categorized. Based on the results of three stages, it is concluded that the developed module can be used as an alternative learning material.

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Evaluation on Training Program of Integrating Character Education in Civics Education for the Teachers Learning Community

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***Abstract*—The main objective of this research is to analyze the levels of reaction, teaching and learning, behavior, and results of the participants of character education training program from Teachers' Learning Community of Civics Education in Tapin Disctrict. This research used a qualitative approach based on Kirkpatrick's program evaluation model. Data were collected using the techniques of observation, interview, questionnaire and documentation. Research result showed that (1) reaction level was in the high category, (2) teaching and learning level was effective. Learning achievement obtained from the pretest and posttest results showed that there is improvement as the learning results of learning, teaching and training, (3) behavioral level was effective and very useful, because it changed the behavior in teachers' attitude, skill and knowledge, and (4) the responsibility of Civics Education teachers showed positive response as seen from their working effectiveness as the manifestation of qualities of working and creativity.**

Keywords—Training, Character Education, Teachers' Learning Community (MGMP), Kirkpatrick's evaluation model

I. Introduction

Development Program of Teachers' Profesionality is a program of improving competences through working group, individually or in group, sustainably conducted, for management, improvement, teachers' development of knowledge and competence according to their expertise, in order to present an impact on the learning process. Implementation of sustainable development of teachers' profesionality has been conducted in the working group of MGMP (*Musyawarah Guru Mata Pelajaran*/ Subject Teachers' Learning Community) for junior high school (SMP/MTs) teachers and also senior high schools (SMA/SMK/MA) teachers, including teachers involved in MGMP of Civics Education; while the teachers' profesionality has been conducted in the working group of KKG (*Kelompok Kerja Guru/ Teachers' Working Group).*

Teachers have duties to sustainably improve their competencies as a part of the Sustainable Profesionality Development. In this relation, it is necessary to empower KKG and MGMP as the learning communities that are very strategic for teachers' competence and their working performance. Therefore, the empowerment of KKG and MGMP must be sustainably conducted, among other things, through training, improvements of facilities and infrastructure, and managerial quality of KKG and MGMP [2].

Based on the educational policies, especially on Indonesian character education, Civics Education (PKn) have to specially integrate character values in the learning and teaching process. Character education has been conducted in a long period of time at schools, from pre-school education (TK/PAUD), primary school (SD), junior high school (SMP), senior high school (SMA/SMK), special need-based school, and PKBM. SKB, as it has been conducted at the pilot school for South Kalimantan since 2010, namely the pilot school of Banjar District, but there have been many problems faced by the teachers in its implementation.

The results of interview to the teachers of Civics Education (PKn) and observation on the teaching anf learning processes of Civics Education at the VIII grade of SMP Negeri 1 Rantau with the material of globalization impact toward nation and country of Indonesia in the teaching and learning on character values such as religious, disciplinary, honest, tolerant, democratic, curious, nationalism, social and environment care, self-control, responsible, and appreciative to achievement values showed that the lesson plans were not designed well based on the character values. In relation to development of learning material, the character values were not well developed. This is to say that the learning material did not present the integration of Civics Education material and relevant character values.

In relation to the case, MGMP of Civics Education of Junior High School in Tapin District conducted Training on Integration of Character Education in Learning and Teaching of Civics Education for Civics Education of Junior High Schools. The program has been running for a long time; however, research studies to examine the effectiveness of the program execution have not much conducted. Therefore, it is necessary to study how the reaction, teaching and learning, as well as result of integrating training execution of character education in teaching and learning of Civics Education for MGMP of Junior High Schools in Tapin district.

Theoretically Civics education refers to character education, for the charater education is in the same quality as Civics Education [8], in percieving toward crisis in society [11], motivating the learners to be appreciative, and simphatic based on values approach [4]. A part of character education taxonomy relies on Civics [9]. Character education covers Civics, and Civics education factually needs the foundation of character education [6]. In the context of Civics education, character education determines to improve *civic virtue, namely: good citizenship behavior* [8]. Based on the education policy, especially character education of Indonesia, Civics education must specially integrate character values in the process of teaching and learning [10].

Integrated character education in the process of teaching and learning is related to introduction to values, facilitation on how values awareness are achieved, values internalization into students' daily behavior through direct and indirect teaching and learning processes. There are two subjects that are directly related to the development of ethics and morality, namely: the subjects of Religious Education and Civics Education. These two subjects directly introduce values, and make the students have a care as well as internalize values into daily behavior through teaching and learning processes, from the steps of planning, execution, and evaluation [10].

Lesson plans are constructed based on syllabus, teaching program planning, relevant teaching material, implementation of teaching and learning processes, and evaluation based on the contextual teaching and learning principles. Implementation of the teaching and learning consists of preliminary, core, and closing activities. In addition the behavior of teachers throughout the learning process should be a model of implementation of the values for students presenting the character building through the implementation of teaching and learning.

The educational program consists of planning, implementation, and evaluation. This is to say that evaluation is a systematic process of collecting and analyzing information on the quality of education [12]. In addition, the evaluation is conducted for making decision [5], meanwhile Isaac and Michael state evaluation as a form of activity in order to see the feedback and improve continually for the sake of enlightenment, accountability, program improvement, clarification programs, program development, and symbolic reasons [5].

One of the forms of evaluation is the program evaluation. According to Joint Commette, as quoted by Brinkerhoff, that the program evaluation refers to a process of evaluation toward a program or activity [1]. Evaluation model used in this research is a Kirkpartrick's evaluation model that consists of four evaluation namely evaluation of reactions, evaluation of learning, evaluation of behavior, and evaluation of results [7]. The four levels of evaluation describe a series of ways for evaluating the programs. In relation to Kirkpatrick's model, the evaluation must be started from the first level (reaction), the second level (learning and teaching), the third level (behavior), up to the fourth level (result). Information found from each level is used as a basic line for executing the next level of evaluation. This means that each level of evaluation presents an accurate measurement of effectiveness on training and its analysis.

The main objective of this research is to analyze the levels of reaction, teaching and learning, behavior, and results of the participants of character education training program from MGMP of Civics Education in Tapin district.

II. METHOD

This research was designed to evaluate the training that integrated character education in the teaching and learning of civics education for the junior high schools teachers learning community in Tapin district.

The research on program evaluation of training refers to Kirkpartick's evaluation consisting of four levels of evaluation, starting from evaluation of reaction, teaching and learning, behavior, up to result/impact, with the improving orientation training program. This research used a qualitative approach. This is to say that the researcher collected qualitative data, namely: those were in the form of manuscript, narration of interview result, pictures/video taken in the process of observation, field notes, ducuments, memo, and personal documents, and also the other relevant documents to the object of the research. Quantative data were also collected in this research, such as the results of pretest-posttest, and those of questionary instrument as the initial data.

Validation of the instrument was done through the process of preparing a research instrument consulted to and guided by the promoter commission. Then, the research instrument that was constructed based on the consultation and guidance were validated by several experts to assess the suitability of the items constructed based on a framework to measure indicators of the variables to be measured and used to collect the quantitative data

Data collection techniques used in this research were observation, indepth interview, documentation, and questionnaire. Furthermore, qualitative data were validated through triangulation.

The data were qualitatively analyzed using the Miles and Huberman's data analysis technique, namely; data reduction, data presentation, conclusion drawing. Quantitative data were also justified toward the result of quantitative data analysis based on the percentage of achievement scores of assessment results obtained from comparison between empirical scores of assessment results and theoretical maximum scores [13]. In addition, analysis of quantitative data derived from the questionnaire results were presented in the tabular form of frequency and data interpretation, and data analysis based on justification were categorized from the evaluation results. The categorial justification of evaluation results on actuality decison making at each level of evaluation were done by measurement at each focus to be summarized in the form of matrix, and to be adapted into case-order effect matrix.

TABLE I. FEASIBILITY RESULTS OF TEACHER ACTIVITIES

Evaluation Compo-nents	Aspects evaluated	Data Sources	Data collecting techniques	Types of Instruments used
Reaction	Initial Teaching Program Plan (RPP) and Training	Teachers of Civics Educatio n, Head Masters	Questionnaire, Interview Observation Documents	List of questions Interview guide Observation sheet Documents
Learning and Teaching	Knowledge, attitude, and skill, RPP of training	Teachers of Civics Education, instructor	Questionnaire, Interview Observation Documents	List of questions Interview guide Observation sheet Documents
Behavior	Teachers' creativity and behavior, Students' behavior	Teachers of Civics Education, students	Questionnaire, Interview Observation Documents	List of questions Interview guide Observation sheet Documents
Results	Teachers' innovation, RPP of Civics Education, Having characters, Fornative Test	Teachers of Civics Education, students	Questionnaire, Interview Observation Documents	List of questions Interview guide Observation sheet Documents

The data were qualitatively analyzed using the Miles and Huberman's data analysis technique, namely; data reduction, data presentation, conclusion drawing. Quantitative data were also justified toward the result of quantitative data analysis based on the percentage of achievement scores of assessment results obtained from comparison between empirical scores of assessment results and theoretical maximum scores [13]. In addition, analysis of quantitative data derived from the questionnaire results were presented in the tabular form of frequency and data interpretation, and data analysis based on justification were categorized from the evaluation results. The categorial justification of evaluation results on actuality decison making at each level of evaluation were done by measurement at each focus to be summarized in the form of matrix, and to be adapted into case-order effect matrix.

III. RESULTS AND DISCUSSION

A. Purpose and Target of Training

The purpose of the training is to achieve the same perception on character education for the teachers of Civics Education of Junior High School in Tapin district to follow. Having the same perception on character education, the teachers of Civics Education will be able to maximize the improvement of insight and quality of competence, so as to become professional teachers, namely having improved knowledge, skills and attitudes as the professional teachers. The target of training is to present Civics Education teachers who have the competence, professionality, and good teaching performance. In particular, the target of training is the teachers of Civics Education of SMP / MTs in Tapin district to be educated teachers, having increasing competence, performance and professionalism.

B. The Practicality of Teaching Media

1) Level of Reaction

Evaluation of reaction level for the training participants on perception, material, instructor, means and infrastructure can be categorized as being effective and in high qualification, as can be seen in the Table II below.

TABLE II. EVALUATION OF REACTION IN TRAINING OF INTEGRATING CHARACTER EDUCATION INTO TEACHING AND LEARNING OF CIVICS EDUCATION

No.	Aspect of Reaction	Score	Total Score
1	Material of Training	561	660
2	Training Instructor	687	990
3	Training Means	371	440
Total		1619	2090
Percentage of Score		77,46%	

Based on the table above, the ratio of total score of the evaluation results of Civics Education teachers of SMP/MTs' reaction to total of theoretical maximum was equal to 77.46%, as a percentage score was 77.46%, based on quartile distribution, is above Q^3; it can be justified that the result of the evaluation is in a high evaluation category. Therefore, it can be said that the participants' reaction is high.

Interview results also support the teachers' reaction. It can be seen from the statements relating to perception; "it is positively responded"; the material presented is "appropriate", " the schedule is in accordance with the execution"; instructors' presentation is "easy to understand", they are "charming and humorous"; they are '"easy in communication"; we are "comfortable to ask", "I am pleased"; we "understand"; "I am very grateful I can understand"; and the infrastructures are "adequate".

2) Level of Teaching and Learning

Evaluation on teaching and learning conducted by the training participants covers the aspects of knowledge, attitude and skill, observation toward activities of teaching and learning, documentation of teaching and learning after attending the training. From the aspect of knowledge, it is effective; it shows a maximum score, 86,73%; attitude, 66,18%; skill, 77,27%. Meanwhile, the result of observation toward learning and teaching, the Civics Education teachers of Grade VII achieved the score of 86,42%; those of Grade VII, 82,26%, and those of Grade IX, 90,94%. The result of observation toward teaching and learning conducted by the Civics Education teachers, viewed from the percentage achieved and based on quartile distribution, showed that the position is above Q^3. Thus, it can be justified that it is in a high category. Besides, the documentation of the students' learning achievement in Civics Education showed a significant improvement, namely: 75% for Grade VII, 05, 83% for Grade VII, and 61, 54% for Garde IX.

The whole evaluation result of teaching and learning conducted by the training participants can be seen in Tabel III as follows.

TABLE III. EVALUATION ON LEARNING AND TEACHING OF TRAINING OF INTEGRATING CHARACTER EDUCATION IN CIVICS EDUCATION

No.	Aspects of Learning and Teaching	Score	Total score
1	Learning and Teaching Process	660	880
2	Skill	440	660
	Total	1100	1540
	Percentage of score	71,43 %	

The evaluation result on the level of teaching and learning conducted by the training participants shows a theoritic maximum score total of 71,43%. Referring to the quartile distribution, it can be categorized as the moderate achievement. This is because the percentage of 71,43% is below Q^3. Thus, the teaching and learning conducted by the training participants is in the moderate category. This result is caused by the fact that there were some training participants who did not attend the training seriously; meanwhile, the training material, training instructors, and training equipments were sufficiently prepared. The teaching and learning have been well conducted so the changes happened just for the serious training participants.

Meanwhile, the interview result showed that the training participants could improve their knowledge. They have improved their *"insight knowledge, especially in constructing Plan of Learning and Teaching Program in Charater-Based Civics Education";* they have got knowledge from the training as in the statements: *"there is knowledge gotten from the training", "in the past time, we did not know Plan of Learning and Teaching Program in Charater-Based Civics Education, and now we understand it"; "we have got much knowledge from the training"; and "our knowledge have been increasing".* From the aspect of attitude, there were some statements such as : *"love feeling to the students becomes better"*, *"there are creativity and innovation, and become more active", "trying to find the material via di internet", "to be impressed that character values are implemented in our own attitude and behavior", "there are changes in attitude and behavior, either as teachers or participants", "personally I think this training is useful*"

From the aspect of skill; "*the teachers have ability to implement it*", "*it is implemented throuh habit*", "*skill to integrate character values according to the material of Civics Education, and implementative skil in learning and teaching of Civics Education in the classroom....the next is to try implement character values in attitude and behavior for the daily activities at school, at home and in society"; "we observe their daily activties at school, we give them homework";* "*it is needed the various assessments", "it is needed to assess the affective and psychomotoric aspects, other than the cognitive aspect".*

3) Level of Behavior

Evaluation on the level of behavior toward the training participants covers the aspects of usefulness, attachment, and communication; the indicator is a behavioral change. The result of evaluation is presented in Table IV below.

TABLE IV. EVALUATION ON TRAINING PARTICIPANTS FOR INTEGRATING EDUCATION CHARACTER IN LEARNING AND TEACHING OF CIVICS EDUCATION

No	Behavioral Aspects	Σ score	% maximum scores	Criteria		
				Effective	Less effective	Ineffec-tive
1	Usefulness	288	87,27	√	-	-
2	Establish-ment	475	86,36	√		
3	Commu-nication	465	84,55	√		
4	Behavioral Change after Training	478	86,91	√		
	Total score	1706	86,27	√		

Evaluation result on the level of behavior toward the teachers of Civics Education showed maximum total score of 86,27%. Referring to the quartile distribution, it can be categorized as a high category. This is because the percentage of score is 86,27 % positioning above Q^3. This can be explained that after they have attended the training and came back to their working places, they showed the changes in their attitude and behavior. At their schools, they politely behave, condusive, and are willing to share their ideas to their friends; they also try to improve tactically their mistakes; they can transfer their knowledge gotten during the training, and then implement it in their working palces, so that they can improve their working quality.

The interview result also indicated the behavioral changes, such as "character values are implemented in our own [teachers and students'] attitude and behavior", "the teachers' creativity in completing the material beyond the classroom", " the teachers have Plan of Learning and

Teaching Program of Civics Education, and then it is implemented in Learning and Teaching Process“. This condition “gradually changes in the teachers’ attitude and behavior” to be able “to construct Plan of Learning and Teaching Program of Civics Education based on character values” and “to implement it in the learning and teaching process”, and “its result can be written to be a scientific work”. There are changes in the teachers’ and the students’ behavior. These changes can be seen from the facts that they “become accustomed to be low profile, polite, and respective to one and another”, and one of the teachers declared “I communicate it to the teachers of other subjects”.

4) Level of Result/ Impact

Evaluation on the result/impact toward the training partcicipants covers the aspects of working effectiveness, working quality, and working responsibility. The evaluation result on result/impact can be seen in the Table V below.

TABLE V. EVALUATION OF RESULT/IMPACT ON TRAINING PARTICIPANTS IN INTEGRATING CHARACTER EDUCATION INTO LEARNING AND TEACHING OF CIVICS EDUCATION

No	Aspect of Result/ Impact	Σ Score	% maxi-mum score	Criteria		
				Effecti-ve	Less effec tive	Ineffec-tive
1	Working effetive-ness	475	86,36	√	-	-
2	Working quality	470	85,45	√		
3	Working responsi-bilty	336	76,36	√		
	Total score	1281	84,55	√		

Evaluation on the level of result/impact toward the teachers of Civics Education shows score total of 84,55%. Referring to the quartile distribution, it is categorized as the high achievement. This is because the percentage of score, 86,27 %, is above Q^3. The indicator is the height of score and it is supported by the result of interview. The quotations of review as follows. “It is effective if it is seen from the viewpoint of result such as the Character-Based Plan of Learning and Teaching Program. The teachers are able to construct it by themselves; they are able to implement it in the classroom. Besides, they are able to be instropective toward themselves; they are aware when they give advice to the others, at the same time, they give advice to themselves. The other statements are: “Achievement of aspects of knowledge, attitudes and skills can be known after conducting the assessment of learning achievements, both learning achievement of the semester test and that for grade promotion. These three aspects can be seen in the test grating that I determined, so that I can identify the levels of difficulties of questions, distinguishing point, validity, and reliability of the tests I presented”.

IV. CONCLUSIONS

Conclusions that can be drawn from the research results are as follows:

- The effectiveness of training program of integrating character education in the teaching and learning of Civics Education for the teachers learning community in Tapin district seen from the level of reaction based on the aspects of perception, training material, training instructors, and training equipments are justified as the high category.
- The effectiveness of training program of integrating character education in the teaching and learning of Civics Education for the teachers learning community in Tapin district seen from the level of learning and teaching based on the aspects of knowledge, attitude, skill, learning and teaching process are justified as the high category. The learning achievement significantly increased. However, the overall level of the teaching and learning is justified as the moderate category.
- The effectiveness of training program of integrating character education in the teaching and learning of Civics Education for the teachers learning community in Tapin district seen from the level of behavior based the aspects of usefulness, behavioral changes, attachment, and communication are justified as the high category;
- The effectiveness of training program of integrating character education in the teaching and learning of Civics Education for the teachers learning community in Tapin district seen from the level of result/impact based on the aspects of working effectiveness, working quality, and working responsibility are justified as the high category.

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How to Develop Students' Experience on Mathematical Proof in Group Theory Course by *Conditioning-Reinforcement-Scaffolding*

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***Abstract*— Some mathematicians and mathematics educators attested that students found difficulties in mathematical proving. The difficulties faced by students in conducting mathematical proofs, including: (1) problems in reading and understanding mathematical proofs; (2) presents a mathematical proof; (3) to prove directly, indirectly or by mathematical induction (4) and develop mathematical arguments to prove or disprove a statement. Meanwhile, mathematical proof have an important role in group theory course. As a consequence, mathematical proof is an activity that is too important to ignore. Therefore this study focus on develop students experience of mathematical proof in group theory course by conditioning-reinforcement-scaffolding (CRS). The research aprroach is quantitative, and reasearch methods is experiment with quasi experimental design; the matching-only pretest-posttest control group design. The findings show that Ability of mathematical proofs through the implementation of CSR theory better than the ability of mathematical proofs through the implementation of constructivist theory.**

Keywords*— Conditioning, Mathematical Proof, Reinforcement, Scaffolding

I. Introduction

The ability of mathematical proofs is a basic ability that has an important role in the subject of group theory. This is because the course contains a definition of group theory, theorem proving, and the lemma so as the students are able to understand it. Students must have the ability to prove the theorem and lemma they study, as well as to prove some problems related to the application of the definitions, theorems, and lemma [1]

Based on research result [2] in the seventh semester students of the academic year 2014-2015 of Mathematics Education FKIP UNSIKA there are some problems faced by the students in performing mathematical proofs, including problems in: (1) reading and understanding mathematical proofs; (2) presenting a mathematical proof; (3) proving directly, indirectly or by mathematical induction (4) and developing mathematical arguments to prove or disprove a statement.

These problems show that for the students, the ability of mathematical proofs is not easy to achieve. Meanwhile, for the lecturers, teaching mathematical proofs is not an easy matter. In general, it is a matter of applying the theory of constructivism in presenting the material on the group theory course. The learning process through the implementation of constructivist theory in group theory course generally gives more emphasis on process and freedom in exploring knowledge and efforts to construct a mathematical proof independently. Thus, the lecturing activities are dominated by students.

However, the learning process through the implementation of constructivist theory is not so effective when applied to students of Mathematics Education FKIP UNSIKA. The students of Mathematics Education FKIP UNSIKA are mostly workers (part time teachers, administrative personnel, factory workers), meaning that their time has been spent for their working activities than for learning activities, so that the learning time and students' independence in learning are very limited.

Based on these issues, the lecturer plays a dominant role in presenting the material during and outside the course. The lecturer also needs to develop teaching methods that take into account the students' characteristics. This is in line with the fact that the students have limited time for independent learning. That is to say that it is necessary to create habituation (conditioning), reinforcement, and help the students to bridge (scaffold) in constructing the mathematical proofs.

Conditioning is necessary to make the students accustomed to do mathematical proofs. Conditioning process can be carried out through the drill and exercise in the forms of written and oral quizzes through which they are motivated and conscientious in following the conditioning process. The necessary reinforcement can be given with addition and subtraction of scores. Meanwhile, in order to help students to construct mathematical proofs, the lecturer provides scaffolding. Scaffolding is given by techniques of probing, namely: the probing posing, and probing prompting, either in the forms of user authentication, examples of evidence or post materials as well as examples of exercises of proof on the blog page, Facebook, whatsapp (social media) to enable students to learn independently at anytime and anywhere.

Based on the above, it becomes urgent to conduct research on ability of students' mathematical proofs through the implementation of conditioning-reinforcement-scaffolding (CRS) theory in group theory course. This research is expected to contribute to the development of teaching methods, especially for application in group theory course in order to improve students' mathematical proofs. This research aims to determine the students' ability in mathematical proofs through the implementation of CRS theory and students' ability in mathematical proofs through the implementation of constructivist theory.

II. METHOD

The research uses a quantitative approach, and experiment method with quasi experimental design, namely: pretest-posttest control group design. Experiments carried out by providing treatment through the implementation of CRS theory in group theory course. The treatment is directed to improve the ability of mathematical proofs. Research paradigm is illustrated by [3] in Fig1.

M	O	X	O
M	O	C	O

Fig 1. Research Design

Information:

M = purposive sampling with subjects matching.

X = learning through the implementation of CRS theory in group theory course.

C = learning through the implementation of constructivist theory in group theory course.

O = observation through the execution of pre-test/ post-test.

The population in this research are all the students of fourth semester of the academic year 2015-2016 Mathematics Education FKIP UNSIKA who follow group theory course. The samples of this research involved are from two groups of students, who are selected using purposive sampling technique with subjects matching. Each group of the samples consists of 32 students. The subject matching is done by pairing individuals based on certain criteria. The criteria are determined by considering the students' prior knowledge on mathematics obtained based on the placement test. It is done in an attempt to obtain an equivalent group. Reference [3] illustrates how to sampling with subject matching as in figure 2.

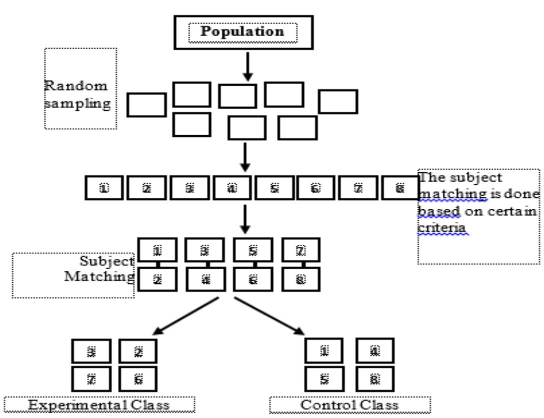

Fig 2. Purposive Sampling Technique with Subjects Matching

Flow data analysis technique is illustrated in Fig 3.

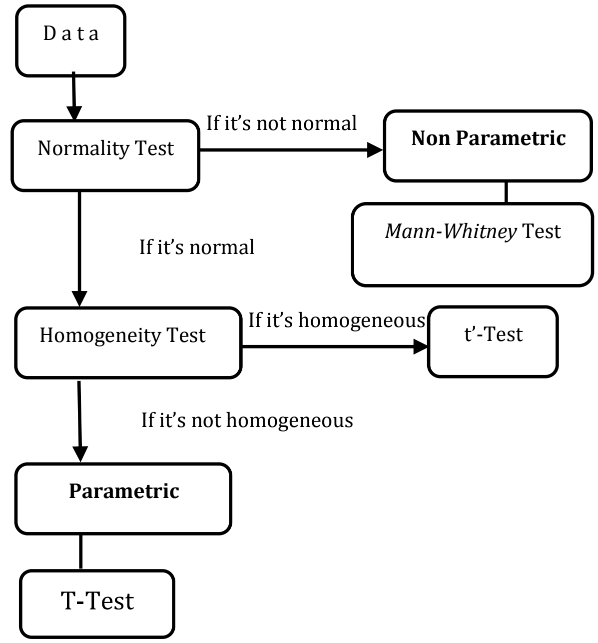

Fig 3. Data Analysis Technique

III. RESULT AND DISCUSSION

A. *Result of Pretest Data Analysis*

Result of Pretest data analysis is presented in Fig 4.

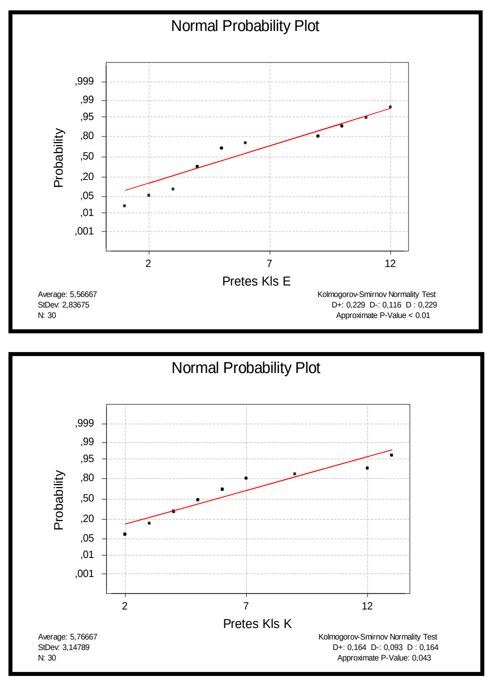

Fig 4. Output of Normality Test for Pre-test Data

Based on Fig 4 it is obtained ρ-value for the experimental class and control class, each of which is 0.01 and 0.043. This value is less than 0.05 so that according to the Kolmogorov-Smirnov test, the sample data for the experimental class and control class are not derived from normal distributed population. Therefore it is not necessary to test the homogeneity, but directly to use the difference tests of two median for non-parametric i.e. Mann-Whitney test.

Mann-Whitney Test and CI: Pre-test Cls Exp; Pre-test Cls Con

```
Pre-test Cls Exp   N =  32  Median =  24,00
Pre-test Cls Con   N =  32  Median =  25,00
 Point estimate for ETA1-ETA2 is    -0,000
95 Percent CI for ETA1-ETA2 is(-2,000;1,001)
                W = 872,0
Test of ETA1 = ETA2  vs  ETA1 not = ETA2 is
          significant at 0,6309
     The test is significant at 0,6300
            (adjusted for ties)
     Cannot reject at alpha = 0,05
```

Fig 5. Output of Difference Test of Two Median for Pre-test Data

The value of significance is 0.63. The value is greater than 0.05 so that based on testing criteria, it shows that the students' prior knowledge of experimental and control classes are the same, or it not significantly different.

B. *Result of Posttest Data Analysis*

Result of posttest is presented in Fig 6.

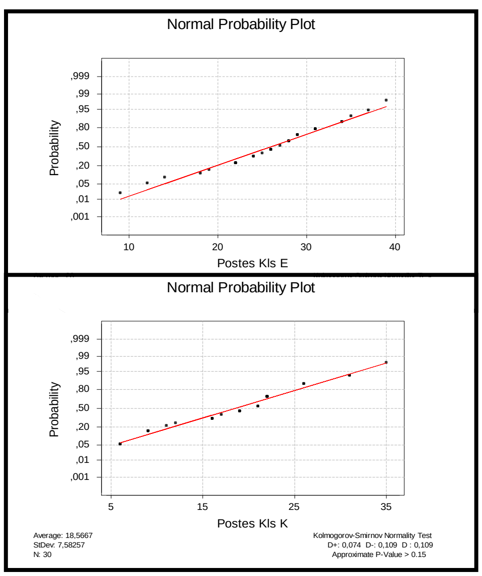

Fig 6. Output of Output of Normality Test for Post-test Data

Based on Fig 4, it is obtained ρ-value for the experimental class and control class, each of which is >0.15 and >0.15. This value is greater than 0.05 so that according to the Kolmogorov-Smirnov test, the sample data for the experimental class and control class are derived from normal distributed population.. Therefore it is necessary to test the homogeneity before difference test of two mean i.e., by using F test or Lavene Test.

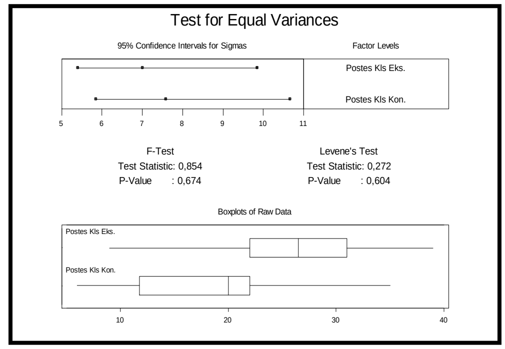

Fig 7. Output of Homogeneity Test for Post-test Data

Based on Fig 7 it shows that the ρ-value for the experimental class and control class is 0.674. This means that the value is greater than 0.05 so that according to the F test it can be said that there is no different variance between the experimental class and control class. Therefore it can be concluded that the data obtained are homogeneous. Furthermore, to compare the two mean value of each class is by using the t test.

Two-Sample T-Test and CI: Post-test Cls Exp.; Post-test Cls Con.

```
Two-sample T for Post-test Cls Exp. vs Post-
test Cls Con.
                 N   Mean   StDev SE Mean
Post-test Cls Exp 32 75,00   7,30   1,3
Post-test Cls Con 32 55,00   7,34   1,4
Difference = mu Post-test Cls Exp.- mu Post-
test Cls Con
Estimate for difference:  7,41
95% lower bound for difference: 4,19
T-Test of difference = 0 (vs >): T-Value =
3,94  P-Value = 0,000     DF = 56
Both use Pooled StDev = 7,30
```

Fig 8. Output of Differences Test of Two Mean for Post-test Data

Fig 8 shows that the value ρ-value obtained is 0,000. This value is less than 0.05, so that by t-test it can be seen that the average of scores of the experimental class is higher than that of control class. It can be concluded that the students' ability on mathematical proof in experimental class is better than that of control class**.**

C. *Discussion*

The test result indicates that the students' ability of mathematical proofs through the implementation of CRS theory is better than that through the implementation of the theory of constructivism. This is because in the first phase of implementation of CRS theory, the students are conditioned to get used to perform mathematical proofs through a series of drills and exercise activities. The drills and exercises were held in the form of a written quiz at the beginning of each lecturing process and the oral quiz was conducted during the lecturing process.

In addition, during the second phase students are given an additional reinforcement with a score of 85 for the students to answer questions in an oral quiz, and a reduction in score of 50 students who answered incorrectly and 60 for students who cannot answer at all. Thus, this phase requires the student to be trying to optimally perform mathematical proofs. The research result is related to the research from [2] that the CSR theory can help students to improve the ability on mathematics.

In the third phase is the presenting of a number of aids that can bridge or scaffold students to do mathematical proofs. Scaffolding is given by techniques of probing, namely: the probing posing, and probing prompting, either in the forms of user authentication, examples of evidence or post materials as well as examples of exercises of proof on the blog page, Facebook, whatsapp (social media) to enable students to learn independently at anytime and anywhere.

While the implementation of the contructivist theory the lecture does not play a dominant role during and outside courses, on the other hand students are required for understanding the course material without more strategies. Because the relief is only carried out only during course, so there is no control on time outside course. In the implementation of contructivist theory, lecturers do not choose teaching methods according to the characteristics of the students.

IV. CONCLUSION

The students' ability on mathematical proofs through the implementation of CSR theory is better than that of mathematical proofs through the implementation of constructivist theory due to the students learn through a series of drills and exercise activities.

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Application of Quantum Teaching Model on Environmental Pollution Contents to Train Junior High School Students Creative Thinking Ability

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***Abstract*— This research aims to determine the influence of learning model of Quantum Teaching on environmental pollution material to train students' creative thinking ability of SMP. This research was conducted using pretest-posttest design. Learning devices are tested on 30 junior high school students. Data were analyzed using qualitative and quantitative descriptive methods. Validation result of valid learning device is in the average reliability of 90,57% and reliability of learning implementation is in 80,95%. The test of students' learning outcomes on cognitive competence analyzed using N-Gain has increased (0.88). The students' creative thinking ability at the beginning of learning is 42.67% with creative enough category and at end of learning it shows 70,12% with creative category. Based on the research result, it can be concluded that the Quantum Teaching model on environmental pollution material can be used to train students' creative thinking ability.**

Keywords*— *Science, Quantum Teaching, Creative Thinking

I. INTRODUCTION

Education is a conscious and well-planned effort to create an atmosphere of learning and learning process so that learners actively develop their potential to have spiritual power, self-control, personality, intelligence, noble character, as well as the skills needed by him, society, nation and state (UU RI no 20 pasal 1, 2003). Many educational problems encountered in our country, one of them is the weakness of the learning process. Reference [1] confirmed that the weakness of the learning process in Indonesia is a learning strategy. Learning process is still a teacher-centered learning, meaning the teacher still emphasizes the role as a conveyor of the subject matter. During the learning process, students are less encouraged to develop thinking skills and emphasize more on memorization [2]. Based on the results of PISA (*Program for International Assessment of Student*) data in year 2015, Indonesia is ranked 9th in the bottom of 72 countries. There are three aspects studied by PISA, namely the ability to read, math, and science, following the average of PISA research results in 2012; Reading (397), Mathematics (386) and Science (403). This predicate can reflect how Indonesia's education system is currently running. Referring to PISA data in 2015, Indonesian children are still low in science literacy skills such as identifying scientific problems, using scientific facts, understanding living systems, and understanding the use of scientific equipment.

Students must be trained in thinking skills in the learning process [3]. Further [4] states that learning is centered on the process of thinking or mental processes, not just on the results. The process of thinking or mentality is the creative thinking which is a mental activity to develop or find original ideas, aesthetic, constructive that directly relates to the view of the concept and emphasizes the aspect of intuitive and rational thinking [5]. The 2013 curriculum is designed to prepare Indonesian people to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative, and affective and able to contribute to the life of society, nation, state and civilization of the world [6]. According to Minister of Education and Culture, Mohammad Nuh (in Kompas 09 December 2013), this creativity is the basic capital to give birth to innovative children, who are able to find alternatives to problems or challenges in the increasingly complicated future.

Reference [7] explains that creative thinking is a thinking process that has characteristics: fluent, flexible, original and elaborative. Creative thinking can be developed in science learning. According to Rogers (in Munandar 2009) emphasizes that the source of creativity is the tendency to self-actualize, manifest the potential, the impulse to develop and mature, the tendency to express and activate all organisms. Creativity can be taught through several approaches, one of them through Quantum Teaching model.

Reference [8] explained that the Quantum Teaching model includes specific guidelines for creating an effective learning environment, designing curriculum, conveying content, and facilitating the learning process. Quantum teaching is excellent for teaching in every subject, including science, so teaching science with Quantum Teaching is more interesting, challenging, and will motivate students in teaching and learning. Through the Quantum Teaching model, teachers will combine learning features into the form of teaching planning that will improve students' learning outcomes.

Reference [9] affirmed that the learning model of Quantum Teaching has six learning steps known as the TANDUR learning framework, which is the growth of students' learning interest, that is, to create real experiences that can help students learn, i.e provide the keyword so students can name and demonstrate the concepts studied, and give students the opportunity to show that they know or understand the material being studied, repeat that tells the students how to repeat the material, celebrate that is to give recognition for completion, participation, and the achievement of understanding the concept of the material being studied. In addition, reference [9] describes the reasons for using the Quantum Teaching learning model as follows: (1) giving students opportunities to learn as desired through extracting experiences of students; (2) cultivating students' interest in learning; (3) giving students opportunities to learn according to their abilities; (4) providing opportunities for students to be actively involved and creative in the learning process, as well as to interact well with the material, friends, and teachers. This condition is expected to trigger students' creative thinking.

Reference [2] in his research states students' response to Quantum Teaching is very good and can improve students' learning outcomes. Furthermore [10] in his research stated Quantum Teaching model as an alternative model can improve understanding of science concept and student's creative thinking skill.

Presenting materials should be tailored to the characteristics of active learning, meaning that any new subject matter needs to be tied to previous knowledge and experiences [11]. The subject matter according to the characteristics of the target school is a school that utilizes the natural surroundings in the learning activities, so that students can find a real example of the environment around the school about the problem of pollution.

One of the problems closest to the students is environmental problem. Environmental issues that are most expressed in the study of natural science (biology) is the problem of environmental pollution. Environmental pollution in general can be distinguished into pollution of water, air, soil, and sound. Environmental pollution material in accordance with the basic competency of science class VII even semester on basic competence 3.9 that describes pollution and its impact to living creatures, should be presented to the students because they are the successor of the nation and part of the community members through learning in the classroom. Students will be faced with a variety of environmental pollution problems. At the time of environmental pollution materials given, students will be challenged with these problems so that with the ability to think creatively, they will be able to create solutions to address these environmental problems.

Based on the background described above, it will be conducted research on the application of Quantum Teaching model on environmental pollution material to train the ability of creative thinking of junior high school students.

II. RESEARCH METHOD

This study aims to determine the effect of learning model of Quantum Teaching on environmental pollution material to train junior high school students' creative thinking ability. The method used in this research is quasi experiment with one group pretest-posttest design that is experiment research conducted on one group which is called experiment group without any comparison group or control group. This study was conducted in Second Semester of Junior High School. The students tested are totalling 30 determined from the class VII.

The research instruments used for data collection in this research were non-test and test instruments. Research instruments (Pretest, Posttest, and creative thinking) are multiple choice questions with four choices of answers and descriptions; whereas non-test instruments are Syllabus, Learning Implementation Plan (RPP), and students' worksheets on creative thinking ability. Prior to the research, it is necessary to test and analyze the test instrument that aims to determine the quality of a test instrument. Qualified instruments can be reviewed from several things such as validity test, reliability test, difficulty index test, and distinguishing power test.

Analysis of the students' creative thinking ability test is conducted by calculating the number of answers of each question on each unit of test. Creative thinking skill score is obtained by summing the scores obtained from each unit of the test. The summed score is then parsed on the score of each student. The greater percentage of each unit test result will be analyzed descriptively-qualitatively. Students are said to be creative when the results of creativity test scores ≥ 61, 2% (Khanafiyah, 2010). The percentage of scoring can be calculated using the following formula:

Percent of Acquisition Score = (Acquisition Score/Maximum Score) x 100 %

The creativity criteria of the students from the percentage of the acquisition score are categorized as follows:

TABLE I. CRITERIA FOR STUDENT CREATIVITY

Average Score Interval	Category
81,6% - 100%	Very Creative
61,2% - 81,5%	Creative
40,8% - 61,1%	Fairly Creative
20,4% - 40,7%	Less Creative
0,00% - 20,3%	Not Creative

Source: Khanafiyah, 2010

Level of learning effectiveness using Quantum Teaching learning model is analyzed to normalized gain score formulated as follows:

$$\mathbf{(g)} = \frac{S_{post} - S_{pre}}{100 - S_{pre}}$$

Information:

(g) = Improving academic skills learning outcomes

S_{pre} = Average pretest or initial skill

S_{post} = Average posttest or final skill

III. DISCUSSIOIN

A. Validity of Learning Instruments

The valid validation value of three validators is 4.37 with very good category with 92% instrument reliability so that RPP can be used and reliable. LKS used by researchers include environmental pollution material oriented model Quantum Teaching. The average value of validation of 4.28 is very good category with 96% reliability of the instrument so that LKS can be used and reliable.

The learning result test developed in this research is a learning result test consisting of 5 items of multiple choice and 7 items of description. Validate the test of learning outcomes and test students' creative thinking ability, providing valid judgment so that it is worth using.

B. Observation of the Implementation of Learning

The average implementation of RPP class VII students of 3.79 is very good category with reliability 80.95%. Observational instruments observed include: 1) introduction obtaining an average rating of 3.56; 2) core activities earned an average grade of 3.82; 3) the cover obtains an average rating of 4.00 so that it conforms to the learning summary; 5) time management earns an average grade of 3.67; And 3) the observation of the classroom atmosphere scores an average of 3.92 so that it fits in with the enthusiasm of students and teachers.

Based on observations made by two observers, the results of the implementation of learning states that all learning stages performed with the category of each aspect is good, i.e. in the range of score 3.5-4.0.

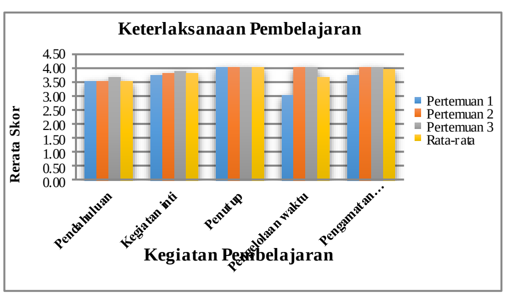

Fig. 1. Diagram of the Implementation of Science Lesson

C. Student Learning Outcomes

Student learning outcomes are measured from a complete indicator consisting of 12 indicators and 12 instructional objectives outlined in 12-item test questions covering five multiple choices and seven descriptions. The test of the students' learning result is done twice as much as the pretest test to know the students' initial ability before being given the treatment and the final test (posttest) to know the students' concept understanding after being given treatment using the learning device of science oriented Quantum Teaching on the contamination material environment. Completeness of learning outcomes can be known based on the value of pretest and posttest. The determination of the value of the competence of knowledge is poured in the form of numbers and letters, namely 4.00-1.00 for the equivalent of the letters A to D. Learning completeness for knowledge competence is set with a minimum score of 2.67 (B-) [12]

Results of pretest with the object of research as many as 30 students, nothing is complete. This is because students have not found the concept of the material being studied. All students achieve mastery at the time of posttest implementation because in accordance with the syntax model Quantum Teaching **Namai** meaning that students have found the concept of the material studied the environmental pollution and teachers have done question and answer at the end of learning. Based on the posttest result, the class is said to be thorou

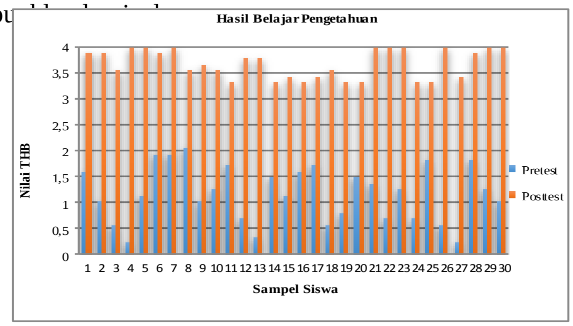

Fig. 2. The Test Chart of Learning Outcomes

Increased competence of students' knowledge, this can be seen from the average pretest value of 1.17 (D) and posttest 3.68 (A-). The average test result of this learning increases because of the influence of the learning given. This is consistent with the sensitivity index of each item that was developed obtained an average of 0.56. The item has a sensitivity to the effects of the learning given and the improvement of students' learning outcomes after the treatment is the effect of the learning of science oriented Quantum Teaching. Forms of mastery of student on concepts can be seen from the answers they provide, then the results of these learning tests are analyzed using a normalized Gain Score.

Based on the results N-Gain obtained an average value of 0.88 with high Gain category. This shows that the ability of mastering the concept of students who have followed the science learning oriented Quantum Teaching to train students' creative thinking ability to improve. Mastery of student concepts at the time of learning included into the syntax model Quantum Teaching Namai meaning that teachers expect students to find the concept of the material he studied. In addition to knowing the mastery of student concepts, the analysis of N-Gain can also indicate differences in student learning outcomes between before and after treatment. This can be seen from the improvement of student learning outcomes. The average pretest that was originally 29.24 increased to 92.00. Reference [13] states that a high normalized Gain Score shows a level of effectiveness. Completeness of the overall indicator is said to be complete because it reaches 93.61%, so the class can be said classically.

Improvement in the mastery of student concepts, shows the implementation of learning devices running well. It is based on the development of tools and learning instruments with good validation will become worthy of use for learning activities and measure student learning outcomes. Learning activities using learning tools Quantum Teaching-oriented IPA will affect students' responses to learning, students will tend to be active, happy, and interested when their learning is meaningful and beneficial to them, so students will be motivated in learning which will further affect their learning outcomes. This is in accordance with Quantum Teaching syntax ie; Grow means that students are motivated to learn; **Experience** which means students play an active role, happy, and interested in the learning process; **Demonstrate** which means students are able to work together in groups and demonstrate group work in front of other groups.

D. The Ability of Student Creative Thinking

The ability to think creatively in this study was measured by providing a test of creative thinking skills adopted on verbal tests developed by [14] and [15]. This research is to know the existence of improvement of ability of creative thinking of student hence this test is given at the time before learning and after learning. The tests developed included five sub-unit tests including; The beginning of words, composing words, the same traits, the extraordinary use, and what akibantya, which will represent each indicator of the creative thinking skill that is fluency, flexibility, originality, and elaboration).

The verbal test developed in this study is associated with environmental pollution according to the topic being taught. The selection of verbal tests refers to Guilford's intellectual theory that states that creative thinking is also called divergent thinking, which is the ability of students in providing various alternative answers.

The results of this creative thinking ability test are calculated based on the number of relevant student responses and an increase. This is in accordance [13], students are said to be able to think creatively if there is an increase in the results of tests before being given treatment (pretest) and after treatment (posttest). The number of relevant answers given by the students has increased, it can be assumed that the students experience an increase in creative thinking skills due to learning by using the model Quantum Teaching. This shows that Quantum Teaching is able to help students to practice creative thinking skills.

The ability of creative thinking or divergent thinking can be interpreted as the ability to find the number of relevant answers to a problem (based on available information) with an emphasis on quantity, usability, and diversity of answers [14]. Furthermore, the more likely answers are given to a problem, the more creative one becomes. But the answer given should be relevant to the problem. So, not only the number of answers that can be given but also the quality of the answers given there should be relevance of answers to the problems posed.

Preparation of the test before learning gets an average of 42.67% with the creative enough category. This is because students are still adapting to new learning, thus allowing to influence students' ability to do the test. The answer to unit 2 is the word composing test, the students have difficulty in compiling words of the given word.

The result of the test of creative thinking ability is tested by qualitative descriptive. The average yield at the time of pretest of 42.67% with the category quite creative. Most students have not been able to issue creative ideas, this is because students have never been taught using the model of learning Quantum Teaching in the classroom. The average posttest is 70.12% with creative category. This happens because the students have begun to be independent, fluent in expressing creative ideas, and able to make work steps in the design of creative ideas they design. This increase is due to the application of Quantum Teaching models trained to students to stimulate students' creative thinking skills during the learning process. This can be seen in the student response result of 100% which states that learning Quantum Teaching is new for the students. Reference [16], Quantum Teaching learning model is the conversion of various interactions in and around learning activities. These interactions change the students' natural abilities and talents into good and evolving that will benefit the students and others.

IV. Conclusion

Based on the above description, it can be concluded that Quantum Teaching model can be applied to environmental pollution material can be used to train students' creative thinking ability of SMP.

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The Effectiveness of Quartet Card Utilization as Learning Media to Improve Speaking Skills in German for Students

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***Abstract*—The purpose of this study was to obtain data and information on the effectiveness of quartet card utilization as a learning medium in speaking skills on German language. This study was a quasi-experiment. The population was all students of class XI at Madrasah Aliyah Negeri 1 Makassar. By using random sampling, 50 students were selected, consisting of 25 students of XI MIPA 4 as the experimental class and 25 students of XI MIPA 3 as the control class. The data were collected through tests of speaking skill, and analyzed by using t-test. The results showed the quartet card was effective in improving German speaking skill for students of Madrasah Aliyah 1 Makassar. Thus, quartet card can be used by a German teacher in teaching German language especially speaking skill.**

Keywords—Games, German, Speaking Skills, Quartet Card

I. Introduction

Language has a central role in the development of intellectual, social, and emotional of learners. Language also supports the success of learning across all subject areas. Language learning is expected to help learners recognize their culture and other cultures; propose ideas and feelings; participate in the community who use the language; find and use the analysis and imagination that was in them.

In this globalization era, the existence of Indonesian as muttersprache or native language is not enough to support the level of life. It takes a foreign language as an alternative that is highly recommended to be known by the public. Foreign languages are needed to compensate the advancement of technology and communications that becomes faster.

One of the most foreign languages studied in Indonesia is German. German is the second largest of language in Europe after French. Learning German as a foreign language has its own advantages. One of them because Germany is the center of technology assessment and education which takes quite a lot of attention of people to visit or study in the country. Thus, as a preparation prior to it, we should at least be familiar with their language and culture.

There are four competencies that must be mastered in order to understand German well, namely listening, speaking, reading, and writing skill. These four skills are a unity that mutually synergized to form a unified language skill.

This study focused on students' speaking skill. Speaking is a vital activity in human life. It is the embodiment of social values and intellectual emerge from the elaboration of deep thinking that has been confronted in the brain. By speaking, the ideas transformation will be easier.

German language learning at schools should go well with the absorption of the transformation of knowledge to students in maximum. The indicators can be measured by the ability of learners to repeat the speech or simple conversation in German in everyday life which supported from rich vocabulary and good grammatical ability.

In fact, there are still many obstacles in learning to speak German at school. Many students are less able to convey their ideas through verbal communication. The observation in MAN 1 Makassar showed that most students had difficulty in speaking skills. This is due to the practice of speaking of the student in the learning process as well as outside of the learning process was still less.

The above drawbacks are also reinforced by several studies about students speaking ability that was sorely lacking before being given treatment in the learning process. One of which is Ardiansyah (2014: 34), he indicated that the German speaking skill of class XI students at SMAN 11 Makassar was categorized enough with the result of 63.46%. Results of research conducted by Gaffar (2013: 40) the previous year indicated that the German language speaking skills of SMKN 6 students Makassar included in the category of less with the result of 47.00%.

One alternative to overcome the problem of activity and learning outcomes of the low German language ability is the use of an instructional medium namely quartet card game. Quartet card game is suitable for use as a medium of learning because besides playing, students can learn in a pleasant atmosphere. Students can immediately put into practice of what the teacher is taught to make it easier to remember the lessons.

Games itself can help facilitate student in remembering and imagining the words in the quartet card because it comes with the image making it easier for students to speak German language.

The effectiveness of the quartet card media is supported by several researches. [1] explained that the use of quartet cards media can motivate students and make students enthusiastic in learning to speak inasmuch 82.50%. From the research results of [2], the obtained result increased the students activity in speaking with an average 85.48%.

Based on the above background, the authors conducted a study with entitled utilizing Quartet card as a learning medium in students' German speaking skill.

II. Theoretical Review

A. Speaking skills

Speaking skill as one of the skills in the language skills is required by everyone to communicate their thoughts to others. According to [3] "Talking is a language skill that develops in a child's life, which only preceded by listening skills, and the term is exactly the ability to speak or said learned." According Iskandarwassid and [4] Speaking skill is in fact reproduce skill articulation current sound system to convey the will, needs the feelings and desires to others. This skill is also based on the confidence to speak fairly, honest, truthful and responsible by eliminating psycho-logical problems such as shyness, low self-esteem, stress, heavy tongue, and others. "

[4] also added that "the process of learning to talk will become easier if the students are involved actively communicate." Michael there are some things to consider before starting to talk, consider a few things like how dialogue can take place and the selection of appropriate words and terms required. Make key points using common words and vocabulary that includes a situation or theme.

Based on the above explanation, it can be concluded that the speaking skill aims to express thoughts and feelings to others orally with confidence and responsibility on what he said. In addition, to make students speak a foreign language fluently they must repeat the phrase that was said in the long run so that they understand how the formation of sentences in foreign languages is, and finally they are able to speak the foreign language fluently.

B. Instructional Media

The learning process at schools will be easy to be saturated when there is no learning media provided. Learning media are expected to be a mediator or an introduction to learning information. Media are one of the components of learning resources or physical vehicle containing instructional materials in the student environment that can stimulate students to learn [5]. Furthermore, according Locatis and Atkinson, media have two components (hardware and software). Hardware is the machinery or devices used to produce or present messages for instance film projectors, tape recorders, overhead transparency projectors, record players, television monitors, and computer terminals. Meanwhile, the software materials that are transmitted through the hardware are suchs as films, audiotapes, transparencies, record, video tapes and computer program".

The purpose of learning media according to Machmudah in [6] is "Everything that can be used to deliver a message from the sender to the receiver so that it can stimulate the mind, feelings, concerns and interests as well as the attention of the recipient (student) such as a sign of the learning process". Even though using a different word editorial, experts in the abovementioned have the same perception with regard to the media.

From some of these opinions, it can be concluded that the media are messages container you want forwarded by the source or distributors to target or recipient of the message with the aim of creating the learning process more active.

More specifically, the media of quartet card game is a game that was originally developed as a medium of learning vocabulary by Dauviller and Hillrech. They explained quartet card is "one of the games in the memo, dominoes, Quartette, Listen-/Dialogspiele, Reihenspiele, Kim-Spiele which can be used as a medium of learning vocabulary" [7].

Furthermore, according to [7], the quartet card game understanding is as follows Quartet is a kind of card game picture card game with a picture title is written on the top of the card and writing enlarged and bold. This title is the theme of the quartet card. While the above image are the words, the two lines on the right and two rows on the left. One of the four words that refer to the picture which is located beneath the word and usually colored or highlighted another of the four words on the top of the card ".

Furthermore, Agustika commenting on the quartet card specification as follows: the size of the quartet cards vary, there is a small, medium, and large. Quartet card game consists of 32 cards that refer to a particular theme. One group of cards consisting of four cards that make up the quartet. Each player seeks to collect a quartet as much as possible by asking the card to be fitted to the other players, until the card into a quartet."

According to [8], "the quartet cards are similar to playing cards which consists of a set number of cards with each card set consists of four cards worth. The difference is that the number of card sets indefinite, can be customized to the needs".

Based on those opinions, it can be concluded that the quartet card game is a card game that consists of a number of picture cards with a predetermined theme. On each card there are titles and subtitles to explain the picture. There is also a title at the top center, while at the top of the image are the words that are sub-themes, namely the two lines on the right and two rows on the left. One of the four words that refer to the picture which is located beneath the word and usually colored or highlighted another of the four words on the top of the card.

C. Steps Quartet Card Games

Quartet card game steps start from the teacher opened the day's lessons aiming to motivate students, then teachers deliver the learning materials to students. Teachers begin the game by first submitting the rules of the game. The teacher groups the students into eight (adjusted for the number of students). Each group consisted of four students. Teacher can also participate whenever one group needs an extra player.

If a group has been formed, one of the students in each group is asked to shuffle the cards and distribute them to each student. Each student gets four cards. The rest of the card is unused and stored in the midst of a spade. If participants get the four series card then it happened quartet and the game starts from the player to take a spade card. If no series in the beginning of the game, the game starts from the lowest card number. The player asks the other players whether he has a card that has the same subtitles as the card has. The game is then given to the next player. If there is a player who already has four cards that series then the card series called "quartet" and then set aside/stored to be calculated at the end of the game. The game ends when the eighth quartet have all been collected by the players. Once the game is finished, the teacher asks students to make some sentences based on the theme that is in the quartet card that they've got and then present it to the class.

III. Methods

A. Research variable

This study consisted of two variables namely the independent and the dependent variables. The use of instructional media quartet is as the independent variable (X), while the German speaking skill of students in class XI MAN 1 Makassar as the dependent variable (Y).

B. Research design

This study uses a quasi-experimental design to form a non equivalent control group design. The population of this study is was class XI MAN 1 Makassar consisting of 4 classes with the total number of 100 students. Given the limited time spent on doing research with a number of grade four classes the total sample is not used in this study. Determination of the sample used in this study were (random sampling), grade 4 Mathematics XI as an experimental class consisting of 25 students and class XI MIPA 3 as the control class consisting of 25 students as the study sample. So the total sample was 50 students.

The data were collected from speaking test. The test to be used is a follows: 1) Initial test (pretest) was a test given to students at the beginning of the study aiming to determine the level of students' initial ability of the material to be taught; and 2) Final test (posttest) was achievement tests given to students after being taught by using quartet learning medium. This test aimed to determine how the student's level of achievement both in the experimental class that implemented quartet learning medium and the control class that did not implement it. The data obtained from the students' speaking test were analyzed using t-test.

Data analysis techniques in this study is inferential statistical analysis to examine the research hypothesis by using t-test analysis.

IV. Results And Discussion

A. Descriptive Statistics Analysis of the Pretest

This study started by giving a pretest to both classes, experimental and control classes. The test was provided in the form of speech. 25 students in class XI MIPA 4 was as an experimental class, the average (mean) of learning outcomes of students was 43.5. The highest score was 75 and the lowest score is 17. The test results of the experimental class speaking skill were grouped into six categories.

Based on the obtained scores in the pretest for Class XI Mathematics 3 as the control class, 25 students obtained an average (mean) of learning outcomes of students was 48.48, the highest score was 92 and the lowest score was 17. The test results of control class students' speaking skill were grouped into six categories.

B. Statistical Analysis Result

Based on the results of inferential statistical analysis using the t test, the t obtained was 9.35 and ttable was 2.011. Based on t test analysis of the obtained $t_{h} = 9.35$ and $t_t = 2.011$ so $t_h = 9.35 > t_t = 2.011$.

It indicated that there is a significant difference between the German speaking skill between the students who were taught using quartet card instructional media and students who were not taught using instructional media cards in class XI State Mathematics MA 1 Makassar. Thus, quartet card learning medium in learning German speaking skill was effective.

C. Discussion

In general picture of students' grades during the pretest and posttest can be seen in the following description.

Pre-test results showed that the average (mean) for the experimental class was 43.5 and control class was 48.48 in German speaking skill class XI student of Mathematics MAN 1 Makassar, where the amount of gain for the experimental class score was 1075 and the control class was 1207.

Based on the posttest results, the use of quartet card instructional medium has a positive impact in improving students' German speaking skill. It can be seen from the obtained score of the students post-test. The experimental class highest score was 91 with an average score of 69.8, while the control class obtained highest score was 67 with the average score of 38.1. The result of the analysis followed by t-test to see the final results of this study on each class was done with the same formula. H1 was accepted. There were significant differences between the students' German speaking skill taught using quartet card instructional medium in class XI MIPA MAN 1 Makassar. H0 that stated there was not any significant difference on the students' German speaking skill on the students who were not taught using quartet card instructional medium in class XI MIPA MAN 1 Makassar be rejected. Therefore, it can be concluded that the instructional media quartet cards are effective in teaching speaking skill.

V. Conclusions

Students' post-test score on the experimental class consisting of 50 the lowest value and the highest grade 91 with an average score of 69.8, while the control class 8 score for the lowest score and 67 for the highest value with an average value of 38.1. Based on the research that has been conducted, it was concluded that the quartet card instructional medium in students' German speaking skill is effective.

VI. Suggestion

To improve the students' German speaking skill, it is recommended that:

1) educators using quartet card learning media so that the German learning becomes more varied, students are more enthusiastic and active in learning German.

2) students utilizing the quartet card instructional media to obtain information and exchange information with a friend in accordance with the material being taught.

3) further researchers developing and strengthening the results of this research to conduct further research on the use of instructional media quartet card in German speaking skill.

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Developing a Connected Model of Integrated Science Material to Improve Students' Science Process Skill

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***Abstract*—The research and development was proposed to produce a connected model integrated science teaching material with proven effectiveness. The teaching material was packaged in the printed form and based on student characteristics. The teaching material was developed to improve science process skills of junior high school students. The researchers developed the teaching material using a model of research and development by Borg and Gall (2003). The stages consisted of six steps, namely: 1) preliminary study; 2) planning; 3) development; 4) validation; 5) trial; 6) the final product. The validation results of the teaching material and the development of materials experts showed that the teaching material was valid and the responses of two science teachers indicated that the teaching material was generally good and appropriate for use in learning. The results of the analysis of legibility and attractiveness of the teaching material by 6 students of class IX showed that the teaching material was very easy to read and very interesting for students. The results of science process skills after treatment showed significant difference between the two classes. The science process skills in the experimental class were better than the science process skills in the control class. Based on these data, the connected model integrated science material was appropriate for use because it has been categorized as very valid, effective in improving student learning science process skills, and practical in the process of learning science in junior high school in Malang city.**

Keywords*—Developing Material, Integrated Science (IPA), Connected Model, Science Process Skill

I. INTRODUCTION

Integrated Natural Science consists of several fields of scientific study, including Astronomy, Biology, Chemistry, Geology, Physics, and Zoology. Therefore, it requires an integrated approach to avoid overlapping concepts in several fields of scientific study [1]. The scopes of natural science in SMP/MTs are the energy and its conversion (Physics), earth space (IPBA), living organisms and life processes (Biology), and the materials and its characteristics (Chemistry) [2]. According to the Regulation of Indonesian National Education Ministry (*Permendiknas*) No. 22 in 2006, the scopes of the science are taught in one course. Therefore, there is a science learning approach which connects or unites various fields of scientific studies into one discussion. Learning science integrally improves the achievements, science process skills, and attitudes toward science [3].

The outcome of education in Indonesia, especially in the field of natural science is still low based on the data of PISA (Program for International Assessment of Student) in 2009, namely; Reading (57), Mathematics (61) and Science (60) [4]. Based on the data, the science literacy in Indonesia is still low. The students' science ability in Indonesia can also be seen by the results of the TIMSS research in 1999, 2003, 2007, and 2011, which were consecutively 435, 420, 427 and 406. Indonesian students' science achievement scores only reach low international benchmark with the average score of 500. With these achievements, on average, the Indonesian students are only able to recognize some basic facts. They have not been able to communicate and associate the various topics of science as well as apply critical and abstract concepts [5].

Another finding observed in November through direct interviews and questionnaires to 15 science teachers and 100 students of junior high school in Malang shows that most of the teaching materials are derived from MGMP forum or from the publisher or bookstore. It is only a fraction made by the junior high science teacher. The field of physics, biology, and chemistry are described separately which are not in accordance with the cover title of integrated natural science. This is due to the teachers' diploma or disciplines. It is not science but physics, chemistry, and biology. The reason of the teachers who do not use the 2013 curriculum-based teaching materials is because the teachers' skills in preparing the material are still low. According to the science teachers, the materials are too dense. Moreover, there are too many exercises with a little example, too small writing, and unappealing image display.

Based on the results of questionnaires for some students in Malang, 85 students reveal that they love science because of their interest in nature. Instead, 15 students dislike science because they find it difficult to understand the materials and too many demands to memorize. In general, the students learn science by memorizing them, not understanding them. This problem is often experienced by students especially when they do practical and memorize the Latin names and the formulas. According to the students, natural science learning will be more interesting if the theory presented by the teacher is accompanied by the practice.

Interviewed teachers reveal that the text books used are good enough because the materials presented are complete, compact, and profound. Therefore, it can be said that the perception of the teachers about good textbooks is still not right. Good textbook is not only complete and dense in terms of contents or materials but also accurate, relevant, communicative, complete and systematic, student oriented, nation and state ideology oriented, has appropriate language rules, and has high legibility [6].

After conducting an analysis of the teaching materials entitled Belajar IPA Membuka Cakrawala Alam Sekitar (BSE) and Alam Sekitar IPA TERPADU to support the learning process in the classroom, the results show that both are less appropriate for the learning process standards of the 2013 curriculum. The science materials such as physics, chemistry, and biology in those two books are still presented separately. The student competencies and the benefit for the students of learning the material are not listed. Although the language used in the books is quite communicative, the dense material presented and the difficult words make the students less interested in reading the books.

The alternative or possible solutions to deal with the aforementioned condition is to develop an integrated natural science teaching material which can help students to learn science as stated in the 2013 Curriculum by using a scientific approach inquiry. Beside the teaching materials for students, this study also developed the teaching materials for teachers to help them guide their students in integrated natural science learning.

Teaching material produced of this research was a connected model of integrated natural science teaching materials for students and science teachers of SMP/MTs to implement the integrated learning as the demand of the 2013 curriculum. The teaching material presents the interrelation of natural science by combining several basic competences at once. This is based on the main base of integrated learning which tries to combine several subjects, integrate and unify a number of basic competences which are seen to have similarities or associations in a theme. Integrating some basic competences in one theme can make the students acquire the knowledge of science completely and thoroughly so the integrated learning will be more easily achieved [2].

In general, this research and development aimed to find the solutions to problems faced in the education system. The research and development of integrated natural science teaching material has been done using the different product development models. Some research developments that have been produced are: the development of integrated natural science teaching material based on ideational learning to improve the junior high school students' creativity [7], the development of integrated natural science teaching material to improve junior high school students' higher thinking skills [8], the response of Khodijah Surabaya junior high school students to the test of integrated natural science teaching materials [9], and the development of integrated natural science teaching material using connected model in English with a contextual base focused on material about energy, nutrient, and molecule for junior high school students VIII [10]. Based on the former research, it can be concluded that the development of teaching materials can be used to improve science process skills and students' achievement in accordance with the objectives of this research.

II. Method

This research was conducted by using research and development. The development model chosen was a modified model of Borg and Gall's Research and Development by Cunningham. The modification was a simplification from 10 stages to 6 stages. It needed to be modified due to the inability of researchers in conducting large scale field testing and dissemination. The stages of research and development are: 1) research and data collection, 2) planning, 3) development of the preliminary form of the product, 4) preliminary field testing, 5) main product revision, 6) main field testing, 7) operational product revision, 8) operational field testing, 9) final product revision, and 10) dissemination and distribution. Then, the stages modified were: 1) preliminary study; 2) planning; 3) product development; 4) product validation; 5) product trial; and 6) the final product.

Product validation of teaching material development was conducted by two expert lecturers in content/materials natural science and two teachers of natural science as practitioners. The product trial was divided into two. They were a small group trial which was used to determine the level of legibility as well as attractiveness and a limited class trial which was used to determine the effectiveness and practicality of teaching materials. The small group trial was carried out on a group of six students in the ninth grade of SMPN 1 Malang while the limited class trial was carried out at class VIII C (experimental group) and VIII D (control group) at 2013/2014 academic year.

The data in this research were quantitative and qualitative data. The data obtained during the process of the research were analyzed using descriptive statistical analysis.

III. Result

A. Validation Result by Experts and Practitioners

The data of teaching material validation were obtained from assessment by two expert lecturers and two science teachers as practitioners. The validation results showed the validity of the teaching material in the aspect of contents or materials. The validation results are presented in Table 1.

TABLE I. VALIDATION RESULTS BY MATERIAL EXPERTS AND PRACTITIONERS

No	Material Experts	Material Practitioners
1	79.12%	81.50%
Average	80.31%	

The data in Table 1 show the percentage of validation for each aspect. They were 79.12% for the experts of teaching materials and 81.50% for the practitioners of teaching materials. The average was 80.31%. After the average score was included in the conversion table, the integrated natural science teaching material using connected model was categorized quite valid.

B. *Legibility Results of the Teaching Material*

The data of legibility level of the teaching material were obtained by testing the material to a small group. The researchers provided valid teaching material based on the results of expert validation to six ninth-grade students of SMPN 1 Malang. The ninth graders were chosen since the legibility test had to be done by the subjects who had received the materials from the teaching materials before it tested on limited trial subjects. The recapitulation of the legibility results is presented in Table 2.

TABLE II. RECAPITULATION OF LEGIBILITY RESULTS

No	**Score**
1	52
2	55
3	47
4	49
5	51
6	47
Average	50.2
Percentage	89.6%

Based on Table 2, the percentage of the legibility of the material was 89.6%. The score was then converted in a table of legibility criteria for teaching material. The legibility was categorized as excellent. Thus, the teaching material can be used by the eighth graders of SMPN 1 Malang.

C. *Effectiveness Results of the Teaching Material*

1. *Mann-Whitney Test (Science Process Skills)*

In this study, the Mann-Whitney test was used to see whether there was difference in science process skills between the experimental class and control class after the treatment. The Mann-Whitney test result can be seen in Table 3.

TABLE III. THE RESULTS OF MANN-WHITNEY TEST ON STUDENTS' SCIENCE PROCESS SKILLS

	TABLE IV. SIG (2-TAILED) ON MANN-WHITNEY TEST
Students' Science Process Skills	0.030

The result of the Mann-Whitney test for students' science process skills scale was0.030. This value is smaller than 0.05, so Ho was rejected, which means that there was significant difference in process skills between the experimental class and control class. Thus, it can be said that integrated science teaching material using connected model effectively improve students' science process skills.

2. *Practicality of the Teaching Material*

The practicality of the teaching material was examined through the response of users (teachers and students) after the implementation of learning by using connected model of integrated natural science teaching material. The percentage of score given by the students and the teachers is presented in Table 4.

TABEL IV PERCENTAGE OF TEACHING MATERIAL PRACTICALITY

No	Students	Teachers
1	88.12%	93.63%

On Table 4, it is known that the percentage of students' responses was 88.12% and the teachers' responses was 93.63%. When matched with practicality criteria table, both students' and teachers' responses were very practical. Thus, the integrated natural science teaching material using connected model is practical to use in learning activities in the eighth grade of SMPN 1 Malang.

IV. DISCUSSION

The teaching materials developed in this research were packaged in the form of Integrated Natural Science book using connected model. Based on the analysis of basic competences, this research and development used a connected model [11]. This model has advantages such as a problem is not only seen from one field but also from the other field and the learning implemented follows the basic competences. Unfortunately, this model has a weakness. The area of the field is already visible, but it is still dominated by a specific field [2]. The teaching materials developed used *Transportation Systems in Living Things* theme and was compiled with the connected model.

The book had undergone three revisions. Revision I was obtained from the validation of materials and development experts. The parts needed to be revised were the home page (cover), the indicators of learning, and the materials. The materials in it were considered less integrated. Therefore, all the materials in the sub units should be related with the flow of blood pressure in Pascal principle, so the integration of the materials was more visible. Additionally, the researchers provided an experimental activity in each learning activity and assessment of performances on certain materials. The validation results were used to make some revisions before the preliminary test [12].

Revision II was done after the trial to a small group involving two junior high school science teachers and six students of the ninth grade. Based on the evaluation from junior high school science teachers, there were some of the contents to be revised. They were the clarification of indicators, the integration of natural science, and the accuracy of the answer key. Furthermore, the results of the data analysis from the questionnaire distribution for six ninth graders showed that the materials should be clearer, the more materials should be added, and the cover should be made attractively. All the data that had been obtained from the small group trial were used to consider in Revision III.

Integrated natural science teaching materials using connected model consisted of a student's handbook and a teacher's handbook. The technology used to compose the book was Adobe Photoshop CS4 for its front page and the contents. The parts of the book consisted of front page, opening paragraph, preface, table of contents, the instructions for use, the learning materials, the concept maps, the summaries, the glossaries, the test capability, the references, and a biography of the author. In general, the color chosen used consistently to make it easier for the reader to understand the contents of the teaching materials. For example, the information of science was written consistently in an orange box with a picture and black writing and placed at the end of a learning material, *ayo kunjungi* (containing a website) was written consistently in a purple box with black writing. Other findings on the product which had been revised were the front page, the student experimental activities, and the materials. The front page of the book experienced three changes. The changes were on the color, picture, and text. The front page color was dominant in blue. The front page after being revised can be seen in Figure 1.

Fig. 1. *The front page of the book*

The students' experimental activities were only found in certain meetings. After the revision, the experimental activities for students were given in each meeting to increase the students' science process skills before learning the materials in each learning activity. In addition, teaching materials were presented integrally by directing all the sub units on the chosen theme.

The examples of syllabus and lesson plans were only found on the teacher's handbook. They could be used by the teacher originally or they could be customized to the needs of the learning process in the class. The method used in those examples was a scientific approach.

The revised integrated natural science teaching material was used in the learning process. The learning process involved two classes, VIII D as the control class and VIII C as the experimental class. The control class used BSE teaching materials by Saeful Karim, et al and the experimental class used the integrated natural science teaching material using connected model with the theme "*The Transportation Systems in Living Things*". The effectiveness of the teaching material was done using post test only control group design. Before the treatment, the researcher gave a pre-test to choose two classes that would be studied. Then, the researcher found two classes. They were VIII C and VIII D. The selection was based on the normality and homogeneity test. The effectiveness test of teaching materials and students' science process skills were conducted in the two classes and done in three meetings using guided inquiry learning model. During the treatment, the two classes were observed in the ability of science process skills between the experimental and control classes. The science process skills were measured using observation sheet. Based on the results of the Mann-Whitney test for students' science process skills scale, the difference of the process skills was significant between the control group and the experimental group.

The effectiveness results reinforce the findings of the previous studies. Learning the natural science integrally can improve the learning achievement, the science process skills, and the students' attitudes toward science [3]. Developing teaching materials can increase high-level thinking skills of junior high school students [9].

V Conclusions and Suggestions

In the explanation of the observation results, the data analysis, and the studies, it can be concluded that the connected model of integrated natural science teaching material is valid from the aspect of the contents or materials. It effectively improves the learning achievement and science process skills of the students in SMPN 1 Malang Academic Year 2013/2014. Moreover, it is practical to use by both the students and the teachers.

Integrated natural science teaching materials which have been revised can be used in the classroom but it need to pay attention to a few things. To optimize the utilization of integrated natural science teaching materials connected models, the researchers suggests the following points. Before using the teaching materials, the teacher should understand the teacher's teaching materials handbook first so the teaching and learning process in the classroom is more purposeful. These teaching materials are based on the characteristics of the students of SMPN 1 Malang. If it will be used for the other schools, it should be adapted to the characteristics of students of the school. At the end of the teacher's teaching materials handbook, it is presented an example of syllabus and lesson plans but the teachers can also create a syllabus and lesson plans which fits their individual needs. Before inviting the students to undertake the activities, the teachers should do first outside of the lesson hours in order to make the learning process more effective. It is done because the students' activities are given every meeting. The teachers should guide their students to do the activities seriously and pay attention to the time allocation which has been planned.

In order to make the usefulness of these materials be felt on a broader scale, the products of this teaching material should be tested further in a field test on a large scale. After that, the product can be published and disseminated. The suggestions given to develop the product are as follows.

a. The development of the teaching materials in this study is to enhance the science process skills and the students' achievement. To develop the product in the future, the teaching materials developed can also be used to increase the activities and to improve critical and creative thinking of the students.
b. The learning model used in the testing of teaching materials effectiveness is guided inquiry learning. To develop the product in the future, at this effectiveness testing stage, it can use the other learning model alternative of Problem Based Learning and Project Based Learning. Yet, there are some methods which cannot be implemented such as direct learning and jigsaw method for these materials involve the students in groups and the same activities performed by all groups.

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The Development of Handout on Palm Tree Population Structure at Rampah Manjangan Waterfall

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Abstract*—Development of teaching material is very necessary because it will make valid, practical, and effective teaching material. The purpose of this research was to develop the teaching material in the form of valid field research based handout on palm tree population structure in Rampah Manjangan waterfall, Loksado region, as a supplementary material on ecological plants population concepts. The type of this research was Research and Development (R & D). The measures used in this study refer to Sugiyono (2013) which have been modified into the steps of: 1) Doing the needs analysis 2) Developing the initial product 3) Validating to the experts and legibility 4) Revising Product and 5) Analyzing the data. The results showed that the validation score of teaching materials in the form of handouts feasibility aspects of the content was 88.23% (highly valid), the presentation of the feasibility aspects was 91.66% (highly valid), feasibility aspects of language was 93.26% (highly valid) and students test legibility was 87.50% (excellent). From the assessment of expert validation and test of legibility students the teaching materials, the handout on palm tree population structure (Arenga pinnata Merr.) in Rampah Manjangan waterfall Loksado was highly valid and very well used as a supplementary material on ecological plants population concepts in Biology Education Department, Universitas Lambung Mangkurat, Banjarmasin.

***Keywords*—Development, Valid Hand Out, Palm Tree Population**

I. INTRODUCTION

Teaching materials progress rapidly from time to time. Teaching materials were not only known in the form of a textbook or module, but also has been developed in a CD, learning website, electronic books, instructional videos, etc. The teaching materials that have been mentioned above are claimed to be still too conventional and theoretical. In addition, there has not been developed any teaching materials that are contextual especially those that based on surround local potential such as the environment, humans, plants, and animals.

Local potential is a potential diversity of a region. Local potential can be taught to students using the teaching materials created by faculty that is based on a contextual approach so that the content of the material based on the real condition of the area or environment. Loksado is an area that has a local potential in South Kalimantan. This area can be learned and be a source of learning for students. Local potential that can be found there is Aren (palm tree). Aren itself is usually used by local communities as the fulfillment of various requirements that need to be assessed on the palm population in Loksado, precisely in Rampah Manjangan waterfall area.

Based on the students observations to ecology plant, these students found difficulty to learn the concept of population because there is a lack of examples of the specific structure of plant population in an area that can be a source of learning. As a result, the researchers realized that the teaching material is necessary to create as a supplementary material on population structure concept.

This use of teaching materials that has been developed for the course on ecological plant population material at Biology Education Department is appropriate as a supplementary material for this course uses a conceptual and contextual approach. The conceptual approach refers to the textbook provided and supported by libraries. Meanwhile, contextual approach directly goes with the learning field, measures and examines the structure of plant populations in certain areas. Therefore, combining the use of teaching materials that have been developed on the study of the structure of the population is a very good thing to do because it will add and enrich the knowledge of students about examples of the materials concept of population structure.

The above consideration encourages researchers to conduct research on the structure of Aren plant population (Arenga pinnata Merr.) in the Niagara Region Rampah Manjangan Loksado, Hulu Sungai Selatan as a creative supplementary material on ecology of plant subject.

II. METHOD

This type of this research was a research and development (R & D) as modified by [11]. According to Borg and Gall, R & D is a process or steps to develop new products or enhance an existing product in which all activities can be justified [8]. According to Ministry of Education and Culture [5], the implementation of research and development at the level of Tier 1 can be done through the stages of design improvement. Therefore, the modified research steps include; (1) needs analysis, (2) planning, (3) preliminary product design, (4) design validation, and (5) design repair.

Data validation results of teaching materials from a team of experts and students were analyzed descriptively by calculating the score validity of the results of expert validation using the formula:

$$VS = \frac{OSV}{TS} X\ 100\% \quad (1)$$

VS : Validation Score
OSV : Obtained Score Validation
TS : Total Score

The results of the validity of a known percentage can be matched with the criteria as presented in Table I.

TABLE I. CRITERIA VALIDITY OF EXPERTS

Percentage (%)	Qualification	Decision
79,78 – 100	Highly Valid	New product is ready to be used on site for learning activities.
59,52 – 79,77	Valid	The product can continue to add anything less, perform certain considerations which do not increase too much, and not fundamental.
39,26 – 59,51	Lowly Valid	It needs revision to be re-examined carefully and found a weakness for the refined product.
19,00 – 39,25	Invalid	It needs large scale revision and fundamental content of the product and require more consultation.

Adapted from [7]

The legibility of the students test data were analyzed based on the results of questionnaire using the following formula:

$$SR(\%) = \frac{\text{Number of scores obtained}}{\text{total maximum score}} x100\% \quad (2)$$

SR : Score responds

A percentage that has been obtained is then converted in accordance with the following parameters:

TABLE II. PARAMETERS

Score	Criterion
79.78 - 100%	Very Good
59.52 - 79.77%	Good
39.26 - 59.51%	Fair
19.00- 39.25%	Bad

Adapted from [9]

III. RESULT AND DISCUSSION

TABLE III. RESULT OF EXPERT VALIDATION AND READABILITY OF THE TEST

Validity	Validity Final Score	Specification
Content Feasibility aspect	88.23%	Highly valid (the new product is ready to be used on site for learning activities).
Presentation Feasibility Aspects	91.66%	Highly valid (the new product is ready to be used on site for learning activities).
Language Assessment	93.26%	Highly valid (the new product is ready to be used on site for learning activities).
Test readability	87.50%	Very Good.

A. *Content Feasibility Aspect*

Based on the expert validation data, the first validity by two validators on the content feasibility aspect obtained an average score of 72.79% with a quite valid criterion and needed revision of the product. The revision was made to obtain the data such as ratings, opinions, advice, advantages and content feasibility before the handout is used by students.

According to Husamah, the expert validation is done for getting the scores, advice, advantages and disadvantages of a product which is developed. Some of the advice given on the validity of the first, namely: (1) completing and giving depth material for this type of handout as a supplementary material to enrich students knowledge, (2) providing accurate and good references based on the research at Rampah Manjangan Waterfall Region, Loksado HSS, (3) the accuracy of picture, diagrams and illustrations are expected to be made as good as possible or real because it will make students to be attracted in learning using this handout.

The second validation score was 88.23%, referring to the assessment criteria by [7], the handout of palm tree population structure in Rampah Manjangan Waterfall Region, Loksado HSS has highly valid and very fit to use. The handout of palm tree population structure (ArengapinnataMerr) was declared to be valid by a final judgment of the validators. The completeness of the handout material presented includes the materials in standard competence and basic competence. The handout material was into the deep category of the material presented particularly on the concepts, definitions, and procedures in accordance with the level of education of learners as well as standard competence and basic competence.

The accuracy and definition including the definition and concept category have not made many interpretations. The accuracy of pictures, diagrams and illustrations were presented on the real condition with the data for increasing students knowledge. The analogy of example according to the facts and data (referring to the results on population at Rampah Manjangan Loksado Waterfall region) were because the students will learn about how to calculating population of plan. The assessment on complement material is very good with the complete explanation and did not make students have many interpretations. The supporting linkage of learning materials is complete with attractiveness of the material on the handout by containing illustrations, diagrams and pictures.

The accuracy of the concepts and definitions included in the category of concepts and definitions do not cause a lot of interpretation and in accordance with the biological sciences. The accuracy of the drawings and diagrams and illustrations are presented in accordance with reality and efficient for students. The accuracy of the facts and data presented in accordance with reality and efficiently to improve the students understanding. The accuracy of the sample is presented in accordance with reality and efficiently to improve the students understanding.

The accuracy of the references of the handout is included in the reference of good literature. Scoring of supporting material is very complete with the explanation in every paragraph. Scores item for the implementation of the handout material support learning can be done with a complete explanation and trace. The attractiveness of the material on the handout contains illustrations, diagrams and pictures. The students want to have more exploration because the handout included hypermedia.

The suitability of the material with the development of science in the handout is included in the category of actual or in accordance of the science. Score of pictures, diagrams, and illustrations is describing the real condition of the Loksado, but the comparison is not real yet. There are several examples of cases in Indonesia and few examples from the outside Indonesia. In addition, recent literature is presented in the handout including bibliography, glossary, and keywords.

B. *Presentation Feasibility*

The aspect of the presentation feasibility is divided into the feasibility assessment indicators, namely presentation techniques, presentation material and completeness of the presentation, referring to Asasi who assesses the presentation aspect of the product that he developed.

Validation results of the assessment score by validator 1 obtained a a score of 63.88%. Referring to Pratama, the handout criterion is valid, but it still needs revision. The revision of the handout is on the material presentation, a summary and the involvement of students. Chapter 1 should be about the concept of population, population structure and description about palm tree. Chapter 2 should explain the method or technique of the research of population structure at Rampah Manjangan waterfall area, Loksado and should make the students are able to understand by themselves because the characteristic of this handout is self instructional and increasing their critical thinking. Chapter 3 contains a discussion of material about the population structure in the palm tree at Rampah Manjangan waterfall area, Loksado HSS.

The second validation after handout revision obtained a score of 91.66% validity refers to the criterion of validity of [7], the handout includes highly valid criterion. Thus, the assessment by experts has stated that the criteria are highly valid. The revised product according to [10] aims to improve the product so worthy and ready to use in the real learning. The revised draft product is the final draft which is ready to use in learning.

The feasibility aspects rate of the presentation by Suhartanto includes several indicators or assessment item described by BSNP such as presentation techniques, supporting presentation, presentation learning, and sequence flow of thought.

Systematic consistency in the handout consists of introduction, content and cover. Sequence presentation handout was presented. In the foreword to the introduction at the beginning of the handout, the purpose of writing the handout, the teaching method including any material that should be given to the students for future teaching unit or one specific term, as well as another thing that is important for learners are presented. A summary/conclusion as a key concerned concept handout is declared with a clear and concise sentence (containing the whole purpose of the handout), enabling students to understand the overall content of the handout. Bibliography in a handout was fully written in the bibliography.

Involvement of students in the handout included in the category of interactive and participatory. The completeness of presentation rate is divided into the introduction, content part and cover part included in this category is a good thing in accordance with the assessment of validators I and II with an average value of 3 and 4.

C. *Language Assessment*

The language assessment indicators are namely the straight forward, communicative, dialogical-interactive, effective words and use words symbols or icons. Development of teaching materials carried by [10] obtained good linguistic validation and fit to use. This is done to determine whether the language in the teaching materials are in accordance with the level of emotional intellectual and social development of students.

Based on the results of the validation on language assessment, the obtained score from the first validator was 77.88% with the criteria according to [7] is a valid criterion. Improvement (revision) on handout that was suggested by the validators 1 and 2 are on the point of accuracy and effectiveness of the sentence structure and the use of language rules. The second validation was done after revising the section suggested by the validators with a validation score obtained is 93.26% with the criterion of highly valid. The validators assessment is the accuracy of sentence structure represents the content of the message to be conveyed. The effectiveness of spoken sentences is simple and direct to the material, and the language refers to KBBI (Dictionary of Indonesian).

D. *Readability Student Test*

According to [1], the first test was done by five to ten students. This trial aims to determine the enforceability, benefits and effectiveness of the use of media in learning that needs to be done before the next test.

Based on the results of student assessment test involving legibility by five students of Biology Education department

Universitas Lambung Mangkurat Banjarmasin who have taken the plant ecology course, referring to [9] that the test result data legibility this handout is worth with 87.50% and categorized as very good use by doing a small revision. In this test the students provide the value of the lowest value that is equal to 1 (bad) to a value of 4 high value (very good).

According to five students, the legibility test of this handout is already attractive cover design and a portrait in it. The images in this handout are interesting and appropriate to the topic. The images presented in this handout are clear or opaque. The handout language is easy to understand. The terms in the handout are easy to understand as well. The material presented in the handout already coherent, and the Plant Ecology assisted material can be understood easily in this handout.

At the students readability test, there was not any student who gave point 1, but there were few students who gave point 2 and that the assessment was at point 4 and 6. The minor revision was made on points 4 and 6 so that the students are expected to no longer feel that writing in a handout that includes letters, words combination, the color is not clear, then the next point about the pictures in this handout were unclear and difficult to understand after the revision it is expected to be clear and easy to understand.

IV. CONCLUSION

The development of handout on palm tree population structure at Rampah Manjangan waterfall area, Loksado HSS as the supplementary material to the concept of population is highly valid or fit and proper to use. The score of validity on the feasibility aspect content is 88.23% with highly valid criteria, eligibility aspect of presentation is 91.66% with a validity of highly valid criteria, feasibility aspects of language is 93.26% and test the validity of students legibility is 87.50% with excellent criterion.

V. SUGGESTIONS

The study developed by the researchers only covered the expert testing and students legibility. Further study in the form of a small test or continuity test/class and dissemination of materials that can be used in accordance with the purpose of learning the ecology plant course material of population is required. Studying the current development has been demanded by universities to enrich the research methodology. One of which is the concept of population to add some insight and experience to independent learning (self instruction study).

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Developing Learning Materials with Search-Solve-Create-Share Strategy to Enchance Pre-Service Teachers' Basic Skills of Teaching Mathematics

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***Abstract*—One of skills which must be achieved by mathematics pre-service teachers is the basic skills of teaching mathematics. By having these skills, the pre-service teachers are expected to be able to become qualified teachers of the field they are going to have. However, there are still many mathematics pre-service teachers and mathematics teachers who haven't achieved good basic skills of teaching mathematics. This was one of many factors that cause students' low achievement in math. This study aims at solving the problem by developing learning materials with Search-Solve-Create-Share strategy to enhance the pre-service teachers' basic skills of teaching mathematics. The research method used in this study is modified research and development method. In a nutshell, this study provides a significant contribution towards research in the mathematics education field particularly in producing suitable learning materials to enhance the pre-service teachers' basic skills of teaching mathematics.**

Keywords—Basic Skills of Teaching Mathematics, Learning Material, Search-solve-create-share

I. INTRODUCTION

Legislation, Number 12 Year 2012 concerning College explicitly states that learning in college is expected to provide opportunities for students to optimally develop their cognitive, affective, and psychomotor aspects. In order to support that, the government has issued Presidential Regulation Number 8 Year 2012 concerning *Kerangka Kualifikasi Nasional Indonesia (KKNI),* which becomes the reference in preparing nationally the learning outcomes of graduates from every level of education nationally. Learning outcomes of bachelor's degree graduates is contained in the level of 6 [1].

In relation to the matter, The Indonesian Mathematical Society (IndoMS) has formulated learning outcomes of bachelor's degree of mathematics education program based on several parameters, by which one of them is the parameter of field work capability. Learning outcomes based on the mentioned parameter are as follows: 1) To be able to plan, implement, and evaluate mathematics learning innovatively by applying didactic pedagogical concepts of mathematics and mathematical science as well as to make use of the various learning resources, science and technology which orientates in life skills; 2) To be able to study and apply various available mathematics learning methods innovatively and tested; 3) To be able to assist students in mathematics learning; 4) To be able to plan and conduct research in order to obtain ways of solving problem in mathematics fields as well as to publish the findings [2].

Based on qualifications of learning outcomes in KKNI and the formulation by IndoMS, bachelor's degree students majoring in mathematics education program should have good teaching skills as the foundation in teaching mathematics. Teaching skills are defined as measurable and coherent activity that teachers use in order to make students learn [3]. Therefore, teaching skills are related to several fundamental skills or abilities and must be mastered by teachers in doing their job.

The importance of teaching skills are in accordance with Legislation Number 14 Year 2005 concerning the teachers and the lecturers, one of which is pertained to pedagogical competence and professional competence. Reference [4] states that teaching skills are required by teachers in order to be able to perform their role in managing the learning process, so that the learning can run effectively and efficiently. Reference [5] states that one of the skills that mathematics teachers in high school need is the skill of being able to demonstrate various methods and techniques in teaching the subject taught.

In reality, it is demonstrated that teaching skills of most teacher-to-be students are still low, which is evidenced in several previous studies [6], [7], [8]. It is caused by the lack of opportunities to probe and integrate various things in relation with mathematics learning.

This problem should be soon addressed through the use of specific strategy in designing learning activities in class, so that learning process can be beneficial for the students. One of the learning strategies that is believed can improve teaching skills on teacher-to-be students is learning with Search-Solve-Create-Share (SSCS) strategy. Learning stages of SSCS strategy consist of four phases, they are *search, solve, create,* and *share* phase. In order that each phase in SSCS learning runs well, there needs to be supporting learning materials. Unfortunately, learning materials for SSCS learning are still limited; therefore, the researcher is interested in developing learning materials.

The question that arises to the researcher is, "what kind of learning materials can be used in learning with SSCS strategy which can provide solutions to the lack of teaching skills of pre-service teacher?" This is what interests the researcher to conduct a study on development of learning materials in learning using SSCS strategy in order to improve teaching skills of mathematics pre-service teacher. Hence, the researcher proposed a study entitled "Developing Learning Materials with *Search-Solve-Create-Share* Strategy to Enhance Pre-Service Teacher' Basic Skills of Teaching Mathematics."

II. LITERATURE REVIEW

A. Mathematics Teaching Skills

Teaching skills are defined as a measurable and coherent activity that teachers use in order to make students learn [3]. Wragg [3] sees teaching skills as "strategies that teachers use which facilitate pupils' learning and which are acknowledged by those competent to judge as being skills."

Teaching skills are related to several skills or abilities which are fundamental and inherent, and must be owned and actualized by every teacher, lecturer, or instructor in doing their job. In relation with teachers' duty, Regulation of Ministry of Empowerment of State Apparatus and Bureaucracy Reform Number 16 Year 2009 states that teachers should be able to plan and carry out excellent learning, assess, evaluate learning outcomes, and carry out learning/enrichment and remedial. Besides, teachers are also authorized to select and decide the materials, strategies, methods, learning media, and assessment/evaluation tools in teaching. This aims at achieving educational outcomes of quality according to teachers' code of ethics.

Based on that matter, every teacher should have good teaching skills. These skills involve skills in questioning, affirming, making variations, giving explanations, beginning and ending class sessions, guiding small group discussions, managing class, and individual teaching [9]

Teaching skills in teaching mathematics are related to several special abilities which are according to characteristics of mathematics, and it should be actualized by every teacher [10], [11], [12], [13], [14], [15].

Based on definitions, notions, and results of the aforementioned studies, the researcher believes that in teaching mathematics, there needs to be teaching skills which can accommodate the characteristics of mathematics itself. This is in order for the teachers to be able to put together learning process in a good and interesting way, so that the students are eager to learn. These skills are called basic skills of teaching mathematics, they are:

1. The ability to master mathematics content,
2. The ability to explain mathematics concepts, definitions, formulas, and symbols,
3. The ability to question in order to probe mathematical ideas and respond to curiosity as well as to questions that students have,
4. The ability to use various mathematics learning approaches or strategies effectively according to the situations and conditions that one faces,
5. The ability to provide affirmation through mathematical connections,
6. The ability to manage the class including facilitating group and individual discussion,
7. The ability to begin and end mathematics learning/class,
8. The ability to do authentic assessment.

Furthermore, those skills will be the indicators of mathematics teaching skills in this present research.

B. SSCS Learning

Reference [16] *Search-Solve-Create-Share* (SSCS) is a learning model that teaches a process of problem solving and develops problems solving skills. There are 4 stages or phases in this learning model, they are *search, solve, create*, and *share* phase.

Search phase concerns other ideas that simplify, identify, and develop researchable questions. This phase helps students connect concepts in a problem to relevant science concepts.

Solve phase focuses on specific problems/issues which are specified in search phase. It requires students to create and implement their plans in order to get an answer. During solve phase, students reorganize concepts from search phase to higher-order concepts, in which these higher-order concepts identify ways to solve the problems and get the answers.

Create phase requires students to create a product-related issues, compare data with the issues, make generalizations, and if needed, modify. The results of creating phase is the development of an innovative product that communicates results from search phase to solve phase to other students [17].

Share phase has a basic principle of involving students to communicate answers of the issues or answers of the questions. The created product becomes the focus of share phase. Share phase is not limited only to communicating to other students. Students express their ideas through communication and interaction, receive and process feedbacks, which are reflected in the solutions of the problems and answers of the questions. Students also recreate researchable questions in other activities [17].

III. METHOD

Research method employed in this research is research and development method. Research and development method is defined as a research method employed to create certain products and to test the effectiveness of the products [18]. Research and development method that is employed aims at creating products which are mathematics learning materials with SSCS strategy in anthology of selected topics *(Kapita Selekta)* of mathematics for senior high school course.

The design of research and development of learning materials that is used refers to design of research and development modified from design of development by [19]. It consists of (1) conducting the research and obtaining data from previous studies, (2) planning, (3) preparing learning materials, (4) expert validity test, (5) product revision, and (6) dissemination and implementation. Steps of research and development are shown in chart 1 as follows.

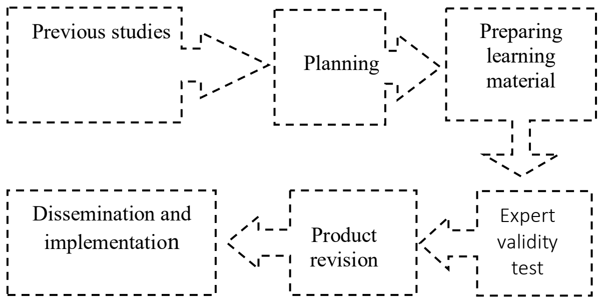

Fig. 1 Steps of Research and Development carried out

IV. RESULT AND DISCUSSIONS

Products created in this present research are learning materials with SSCS strategy. Loveridge (in [20] states that if the situation of a teacher is not properly qualified, then textbooks/learning materials become the guide and support in teaching. Learning materials developed is mathematics learning module in learning with SSCS strategy. It consists of four phases with the purpose of improving pre-service teacher' basic skills of teaching mathematics. These phases in SSCS learning becomes the base of learning materials development by the researcher.

Basic competences developed by the researcher in this learning material refer to eight basic skills of teaching mathematics indicators which have been described previously. The eight competences are developed integrally in seven chapters. Furthermore, chapters in this learning material are called "*Kegiatan Belajar (Kabel).*" Every "*Kabel*" has "objectives", "indicators of competence achievement", "description of the materials", "learning activities", "exercise questions", "summary", "feedback and follow-up."

"Objectives" are a part which conveys information about the aims of learning related to materials in general. "Indicators of competence achievement" are sentences containing information about specific competences that will be achieved from learning activities. "Description of materials" is subject matter and important matters which students need to comprehend. "Learning activities" consist of questions or structured commands that students need to be involved in during the learning activities. "Exercise questions" consists of questions that students need to do. "Summary" consists of brief description of materials. "Feedback and follow-up" are evaluation tools and reflection of the success of learning activities.

Learning materials with SSCS strategy are examined based on the presentation of learning materials and the effectiveness of learning materials. This representation of learning materials is in the form of a module that students use in learning, which is designed to be used in a group. This is also based on one of the phases in SSCS learning, that is, share phase.

Presentation and data analysis in this research are divided into two aspects, which are (1) presentation and data analysis of product improvement, (2) presentation and data analysis of product effectiveness. The data presentation of product improvement is classified in terms of aspect of face validity and aspect of content validity. Meanwhile, presentation and data analysis of product effectiveness are examined through the aspect of improvement in achievement of competence indicators, that is, basic skills of teaching mathematics.

According to the results of product trials, the mean score obtained is 4.68 of 5 (on a scale of 5). This indicates that the learning material is highly valid. Average score is obtained from assessment of face validity aspect and content validity aspect. From face validity aspect of learning material, the mean score is 4.52, indicating that the learning material is valid. Based on the results of qualitative and quantitative data of face validity validation aspect of learning materials, revision is done by (1) putting header and footer and giving the right theme according to the learning materials in order to mark the materials that is being learned, (2) adding empty spaces between exercise questions so that the students have spaces to write their answers. From content validity aspect of learning materials, the mean score is 4.84, which shows that the learning material is highly valid. Based on the results of qualitative and quantitative data of content validity validation aspect of learning materials, revision is done by (1) writing the indicators of competence achievement more specifically and in more detail, and (2) changing the term "the ... meeting" into "learning activity" to name the chapters of learning materials.

Aspect of effectiveness is analyzed by calculating score difference between score of basic skills of teaching mathematics after being treated and the score before being treated. Subsequently, the scores are compared with ideal total score subtracted from the score from before being treated. Aspects assessed include eight indicators of basic skills of teaching mathematics which have been mentioned previously. According to the result of the calculation, it can be concluded that this learning material can effectively improve mathematics teaching skills of teacher-to-be students. These results are obtained from calculation of improvement by using N-gain which indicates that there is an increase of 0.37 with medium category.

V. CONCLUSIONS

Suggestions of the use, dissemination, and development are directed at the use of products in learning, dissemination activities, and further product developments. Based on the results of the trials, it is discovered that this learning material is valid and can be used effectively in learning. However, there are several weaknesses. The weaknesses result in suggestions for further use of products. Dissemination is an activity of disseminating products or works which have been developed, so that they can be widely known by the community and be used as its functions. The products of development can be disseminated through science publication, some of which are through journals and research seminars.

Based on the results of product trials, the next product developers are expected to consider the right time in conducting the trials. Products must be presented in alignment with several basic competences so that it can be beneficial and efficient in terms of time. It is also suggested that the developers have links in conducting the research; meaning that the researchers should have links which can help them bridge the research and the school. Not every campus has adequate microteaching laboratories to conduct laboratory test. Thus, it is possible that the developers must conduct laboratory test in schools. It is also suggested that the developers choose the schools that support the research; meaning that not every school is concerned with this activity. Thus, it should be ensured that the selected schools where the trial is carried out are the schools that support the research activities.

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Validity of Poster on the Characteristics of Candida sp. in the Water of Campus Toilet

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***Abstract*— One of Microbiology fields studies about the characteristics of fungi and water microbiology, but in learning process any local resource is not used. Water contains many inorganic and organic substances as the place for microorganisms live. Candida sp. can be freely found in soil, animal's feces and in the air, but Candida sp. in the water of campus toilet has not been identified yet. Therefore, the water of campus toilet can be used as the closest learning resource for college students at Biology Education FKIP Unlam Banjarmasin in Microbiology subject. Learning Information can get more scientific when it shows by a poster. This research aimed to describe the validity of the poster on characteristics of Candida sp. in the water of campus toilet at FKIP 1 Unlam Banjarmasin. The method used in this research was Research and Development (R&D, and the steps were research and collecting information, planning, developing preliminary form of product, preliminary field testing, and main product revision. The result showed "Candida sp. Characteristics in the Water of Campus Toilet at FKIP 1 Unlam Banjarmasin" poster had high validity and high reliability.**

Keywords—Poster Validity, Species Characteristic, Candida Sp, Water Of Campus Toilet

I. Introduction

Learning media show rapid development from time to time, but there are still not many contextual learning media based on local resources, such as the environment, humans, plants, and animals. Learning media based on local resources can help college students to understand learning materials more easily. However, in Biology Education of FKIP Unlam not many learning media based on local resources are developed and found yet.

One of Microbiology fields studies about the characteristics of fungi and water microbiology, but any local resource is rarely used. For instance, we can use oil water containing many inorganic and organic substances which place for microorganisms live as the resource [1]. Therefore, our environment is so potential to be used as learning sources, such as in the water of campus toilet that we use in daily activity. Based on conditions that have been observed, the water of campus toilet at FKIP 1 Unlam Banjarmasin is not clean and there is some dirt in the water tub base. Such condition may contain microorganisms, so it can be used as the closest learning resource for college students of Biology Education of FKIP Unlam Banjarmasin in Microbiology subject.

In our environment Candida sp can easily be found in soil, animals' feces and in the air [2]. Usually infection occurs after using toilet water that contains Candida sp after defecation, contaminated from nails or urine. Therefore, Candida sp easily contaminates the water of campus toilets which are public facilities. Research about Candida sp in toilet water at different locations have been found, but Candida sp in the water of campus toilet has not been identified yet.

Valid Microbiology learning media about Candida sp characteristics have never been developed before. Water microbiology topic will be more understandable if the students are given the materials about Candida sp characteristics in the water of campus toilet at their own campus, FKIP 1 Unlam Banjarmasin. Learning Information can be more scientific when it is displayed using a poster, which contains about experiment steps until obtained the test results. The poster is more permanent and the content is easy to understand in short time by the reader.

This research aimed to describe the validity of the poster on characteristics of Candida sp in the water of campus toilet at FKIP 1 Unlam Banjarmasin.

II. Method

The method used in this research was Research and Development (R&D) with descriptive model describing step by step to produce a poster. The steps are described in Fig. 1.

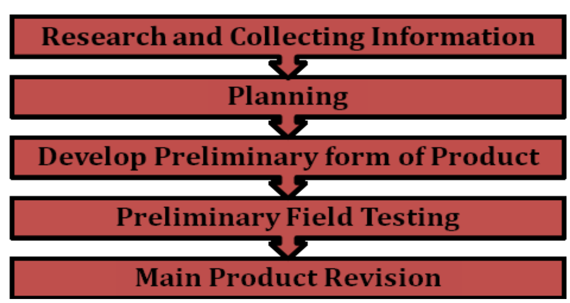

Fig. 1. Research and Development Steps

A. Research and Collecting Information

The problem of this research was based on conditions that have been observed in the water of campus toilet at FKIP 1 Unlam Banjarmasin. The water might contain many inorganic and organic substances as the place for microorganisms live. Another problem in this research was that there are not many learning media based on local resources developed and found yet in Biology Education FKIP Unlam.

B. Planning

Some information was collected to make the development of the poster. The source of data of this research was the water of campus toilet at FKIP 1 Unlam Banjarmasin. Descriptive method implemented in this research was observing some toilets in FKIP 1 Unlam Banjarmasin, interviewing janitors and doing some laboratory tests on the samples. The population in this research wass all of the water in 24 toilets at FKIP 1 Unlam Banjarmasin. The samples in this research were 50% of the total sample, namely 12 toilets. The sampling technique in this research was area probability sample that used 6 toilets at the main building, 2 toilets at the back building, and 4 toilets at PMIPA building.

C. Developing Preliminary Form of Product

The product in this research and development (R & D) was a poster about *Candida* sp's characteristics in the water of campus toilet at FKIP 1 Unlam Banjarmasin. The poster was designed for college students of Biology Education FKIP Unlam Banjarmasin in Microbiology subject. Poster is a development of abstract using illustrations (tables, figures, photos) [3]. The content of scientific poster as a learning medium includes: introduction, methods, results, discussion, conclusions and references.

D. Preliminary Field Testing

Design validation is the process to assess product design whether it is more effective than the old one or not. This research aimed to validate the poster by experts and by college students. Poster validation consisted of two steps. The first one was using validity instrument by expert who were thesis supervisors, and the second one was using readability instrument and held on 5 students of Biology Education S1 FKIP ULM Banjarmasin who have taken Microbiology subject. The small group trial was a trial of media by selecting 5-10 people who can represent the target population [4].

The results of expert validation were analyzed on the percentage and then validity can be measured using the following formula [5]:

$$\mathrm{Pi} = \frac{xi}{yi} \times 100\%$$

Pi = Aspect precentage
*x*i = Value of validator answer
*y*i = Maxium value

The precentage will be known by the calculation using the formula. The product criteria are shown in Table I [5].

TABLE I. VALIDITY BY EXPERT CRITERIA

Value	Validity	Decision
79.78-100%	High Validity	New product can be used in learning process.
59.52-79.77%	Valid	Product can be used by improving some aspects
39.26 - 59.51%	Low Validity	Product can be used by improving much aspects.
19.00 - 39.25%	Invalid	Big revison and should be consulted

The readability results of the poster measured by college student were analyzed the percentage, then validity can be measure using the following formula [6]:

$$Readibility = \frac{\mathrm{Tse}}{\mathrm{Tsh}} \times 100\%$$

Tse = Value of validator answer
Tsh = Maximum value

The product criteria are displayed in Table II [6].

TABLE II. READABILITY BY COLLEGE STUDENT

Value	Validity	Desicion
81.00-100%	High Validity	Can be used without revision
61.00 - 80.00%	Valid	Can be used with revision
41.00 - 60.00%	Low Validity	Suggested not for used
21.00 - 40.00%	Invalid	Cannot be used
00.00 - 20.00%	Highly Invalid	Cannot be used

E. Main Product Revision

After the product design was validated by experts, the poster weakness can be identified. The weaknesses were listed in instrument validation. Then improvement was done based on the suggestions in instrument validation. Design improvements were implemented by the researchers to produce valid product until it reaches validity of 59.52% by expert and reaches 61.00% for readability by college students.

III. RESULT AND DISCUSSION

A. Result

After the poster was designed, the validation by experts and validation by college students were conducted. The following is the result of the validity:

TABLE III. VALIDITY RESULT BY EXPERTS AND READABILITY BY COLLEGE STUDENTS

Value	Validity	Desicion	Criteria
Validity by Experts	Expert 1	79.13 %	Valid
	Expert 2	83.48 %	High Validity
Readability by College Students	College Student 1	77.50 %	Valid
	College Student 2	82.50%	High Validity
	College Student 3	85.00%	High Validity
	College Student 4	87.50%	High Validity
	College Student 5	87.50%	High Validity

Poster validity based on validity by experts was measured using validity instrument that consisted of content aspect, language aspect, presentation aspect, visual aspect, and improvement suggestion. The validation was conducted by thesis supervisor 1 and thesis supervisor 2. The reulst can be seen in Table IV.

TABLE IV. POSTER VALIDITY BASED ON VALIDITY BY EXPERTS

No	Aspects	Assesment Component	1st Validator	2nd Validator
1.	Content	Fact accuration	4	5
		Theory accuration	4	5
		Method accuration	2	4
		Suitability with science depelovement	5	5
2.	Language	Suitability with science depelovement	3	4
		Content language understandability	4	3
		Ability to encourage student crictical thinking skill	3	4
		Language structure accuration	3	2
		Use of term consistency	5	5
		Use of foreign term accuration	5	5
3.	Presen-tation	Presentation arrangement	5	5
		Illustration accuration by presentation	4	5
		Numbering and naming of tables or figures accuration	2	2
		Variation in the presentation	3	4
		Completeness presentation from introduction, methods, result, discussion, conclusion andreferences	4	4
	Visual	The composition of the layout elements (title, author, illustration,etc.) balancedwith the content layout	5	5
		Layout element size is proportion with the poster size	4	4
		Poster color contrast with the background color	5	5
		Font size proportional compared to the poster size	4	2
		Suitabilitythe poster font and not use ornamental/ decoration font	4	4
		Illustrations can describe the object character and poster content.	4	5
		The shape, color, size based on proportions of the object inreality	4	4
		Overallillustration well-suited, creative and dynamic	5	5
Total score			91	96
ValidityPercentage (%)			79.13	83.48

The poster validity measurement based on readability by college students was held with 5 students of Biology Education S1 FKIP ULM Banjarmasin who have taken the Microbiology subject. An instrument of readability measurement was used. Table V presents the results.

TABLE V. VALIDITY BASED ON READABILITY BY COLLEGE STUDENTS

No.	Aspect	College Student				
		1	*2*	*3*	*4*	*5*
1.	Poster design has been interesting and describing the contents	4	4	4	3	3
2.	Images in the poster interesting and appropriate to be understanding	3	3	3	3	4
3.	Images in the poster are clear and not blurry	3	3	4	4	4
4.	Texts in the poster using clear font, font combinations, colors, and pictures are matching	3	4	3	4	3
5.	The sentences are understandable	3	3	3	3	3
6.	Images areclear and understandable	3	3	4	3	4
7.	Terms are understandable	3	3	3	4	3
8.	The material presented in the poster has been coherently	3	4	4	4	4
9.	There is no sentence that causes a double meaning (ambiguous) in this poster	3	3	3	4	4
10	Fungi and Water Microbiology material can be understood easily using this poster	3	3	3	3	3
Total score		**31**	**33**	**34**	**35**	**35**
Validity Percentage (%)		**77.50**	**82.50**	**85.00**	**87.50**	**87.50**

Based on the validation, there were a lot of suggested improvements. The following is the result of design revisions that have been made referring to suggestion contained on aspects of assessment.

TABLE VI. SUGGESTION FOR IMPROVEMENT BY THE EXPERTS

No.	Validator	Suggestion for Improvement	Revision
1.	Expert 1	Improve the concept accuracy and the research procedures flowchart. Improve sentence structure for encouraging student critical thinking skill. Figures numbering and tables should be sorted as well.	The research procedure flowchart has been revised based on the suggestion. The sentence structure is changed and the numbering is already sorted.
2.	Expert 2	Put the title above the table, based on scientific writing rules. For the results and discussion, please improve it and adjust the font size.	The title table has been moved to top. Result and discussion have been improved based on the suggestion and the font size has been adjusted.
3.	College Student 1	The image can be presented more clearly and some materials are random.	The image has been clarified and enlarged, the material presented is already sorted correctly.
4.	College Student 2	The design is nice, but not to bother the content. Images are presented fairly obvious, but it is better when using a DSLR camera. The sentence in the poster is understandable, but it should improve.	The design has been corrected and images have been edited by contrast and brightness. The sentence has been corrected.
5.	College Student 3	Poster image should be added more about research and caption in the table is placed above.	Image has been added and caption has been moved above the table.
6.	College Student 4	Poster design has been interesting, but could be made better. There are still images less clear. There are some lines that are still difficult to understand. The picture is enlarged again in the process of research activities. Materials are understandable, but they are scattered and not focused on the discussion.	Poster design has been improved and the image has been enlarged for more clear. Sentence poster has been revamped and the material focussedon thediscussion.
7.	College Student 5	Poster colors and writing should be more varied. The sentence was replaced with another appropriate word. There is a sentence that unclear. The material sorted already coherently, but need to be completed.	Colors designed more varied colors. The sentence has been replaced with appropriate word. The material has been improved to make it more complete.

B. Discussion

The poster design that has been made was appropriate since it included the introduction, methods, results, discussion, conclusion and bibliography. This was in accordance with the opinion of [3] that the poster is an enrichment of abstract by using illustrations (tables, drawings, images).

Implemented steps in designing the poster was appropriate since there were clear verbal information, the listed elements poster complete, color and physical quality combined with a good poster, appropriate size and composition. The presentation of data in a poster was also good. This is due to several consultation meetings with the experts, some improvements based on suggestion, and the implemented steps already referred to the scientific literature of poster guidelines [3]. The poster was able to proceed to the next stage of design validation.

Validation by experts was held only once because the validity results have been reached. The results from the first validator showed the percentage value 79.13%, while the second validator gave 83.48%, so the validity of the poster was considered as high validity by experts. As the poster has reached high validity criteria, it can be followed by design revisions and improvements without second validation.

Based on the validation scores in Table IV, aspect of language regarding language structure accuracy was considered low validity as there were still some bad structures that need to be improved. Aspect of language structure accuracy is the phrase used to represent the content of the message should be corrected into Indonesian language structure [7].

Furthermore, the presentation aspect regarding to numbering and naming of tables or figures was at low validity. It is caused by wrong position of table title, so it must be revised by moving title to the above the table. The aspects of numbering tables, images, and attachment sequence and the title should match the specification in the text.[7]

Presentation aspect is varied and not boring to the reader. There are various explanations such as images, tables, and graphs to make the poster easy to understand. The visual aspects such as size comparison between the layout, size elements (typography, illustrations and other supporting elements) must be proportionate. In addition, the product must be able to dynamically visualize things that can encourage readers' comprehension and understanding of the presented material.

The validation is to determine the validity of learning material based on the contents, language, presentation and visual aspects [8]. Valid learning materials have been able to be used in the learning process. Development of learning materials supports the good and more focused learning process.

Readability test involving college students was held only once as the results has reached high validity. The poster validity results obtained from the students were 77.50%, 82.50%, 85.00%, 87.50% and 87.50%. Therefore, the product can be used without revision. Nevertheless, college students still gave some improvement inputs on some aspects that still achieved score of 3 for the betterment of the poster. The poster can be followed by the step of design revisions and it did not need the second validation by the college students.

Based on the validation scores in Table V, the fifth and tenth aspect only reached score of 3. The fifth aspect was about sentence comprehension in the poster, and the scores were caused by some incomprehensible words which needed to be improve. Aspects of understandable sentence is a sentence that used to represent the content of the message and follow the correct Indonesian language structure [7].

The tenth aspect was about understandability Fungi and Water Microbiology material by using this poster did not have maximal score since the poster has limitations in terms of size and content. Scientific poster is a medium that is easy to understand in terms of the content in a short time by the reader, so that it does not need to be too much but can be maximized with the visual communication. The enrichment of the scientific poster abstract was done to strengthen it uses illustrations (tables, drawings, images) [3]. The poster was revised at the next step of research and development that was design revision.

Design revision can be implemented based on the suggestions by validators in design validation step. After the product design was validated through discussions with experts, the weaknesses was known. The weakness was further tried to be reduced by improving the design [9].

The first expert validator suggested the improvement of the concept accuracy, flowchart of research procedures, language sentence structure, as well as the numbering of figures and tables. Revisions were implemented to improve research procedure flowchart, the language sentence structure was corrected and the numbering was already sorted. Revision of the design has been done to make the poster better, so it left second validation as the poster was valid.

Second expert validator suggested that the title was placed above the table in accordance with the rules of writing scientific papers. Parts of results and discussion were improved again and the font size was adjust. Thus, the poster was revised based on the feedback. A revised draft of the poster was implemented based on expert validation so that results were better and in accordance with the theory [6].

The five college students as the validators also gave suggestion about the image and the material presented. The images on the poster were requested to be enlarged and clear. The revised design was larger image size than the previous version and the poster was also edited for image contrast and brightness. The material presented in poster was revised by adjusting the sentence structure and the words. Poster material is added with more complete information in order to improve the understanding for college students and other readers. This revision related to the effort to ensure understanding of readers is important since the function of instructional media is to clarify or enrich the information provided verbally and attract the attention of students to learn. Thus, design revisions according to the college students aimed to make the poster information easy to understand [10].

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The Development of Blended Learning Model Using Wordpress

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***Abstract*—In general, the learning process is implemented using face-to-face model, meaning that students and teachers are in one place and at one time. With this model, common communication between students and teachers can be easily implemented. However, there are some obstacles that may be faced such as the lack of time to discuss and the limited space that can be used. To overcome these problems, a model that provides a medium for gathering students and teachers without limited time and space is needed. One of these models is known as blended learning. The blended learning model allows students and teachers to discuss and share material as well as practice questions on a virtual classroom. The research undertaken was to develop a blended learning model using an analysis of the blended learning implementation framework and the use of Content Management System (CMS) WordPress technology. This model is expected to be an additional medium used to support the teaching and learning processes.**

Keywords—Blended learning;Virtual class; Wordpress.

I. Introduction

The development of a blended learning model is a combination of face-to-face conventional classroom teaching and online virtual classroom. The use of blended learning model aims to unlimit the time and space in conventional class. The blended learning model should be implemented using a good framework for optimum results. In addition to a good framework, the selection of appropriate supporting technologies can also be a successful factor in the application of blended learning.

The research is conducted to analyze the application framework of blended learning model and analysis of technology selection supporting model. The framework used refers to the existing research results while the technology used was the CMS WordPress. This CMS was chosen because in addition to open licensed, it also has a number of features that are quite complete and the number of plugins developed. Given a good framework and appropriate technology, the development of blended learning model is expected to run properly.

II. Literature Review

A. Blended Learning

Blended learning is a combination of conventional learning model in the classroom and an online learning model. This model allows students and teachers to interact in unlimited time and space. Blended learning combines aspects of web/ internet based learning, video streaming, as well as synchronous and asynchronous audio communications with traditional "face to face" learning [1].

The use of blended learning model has been increasing and adopted by many schools, colleges, universities and industries around the world [2]. Blended learning will be a tool that encourages the proportion of teaching in secondary schools offered in online form by 50% by 2019 [3].

The online learning model has a number of advantages, including[4], [5]: (1) increasing time for students to repeat the lessons; (2) helping introvert students to learn without embarrassment; (3) allowing each individual to study independently; (4) allowing individuals to follow learning in their own more comfortable environment; and (5) learning materials can be easily reproduced and distributed for all students.

The blended learning model can be implemented using a number of approaches. There is an identification of approaches that can be used to develop blended learning model in higher education such as supplemental, replacements, emporiums, fully online, and buffets. More details can be seen in Table I.

Implementation of blended learning itself needs to be well planned in order to run well and provide optimum results. In general, the application of blended learning system consists of eight stages, namely [5]: (1) defining the learning objectives; (2) analyzing the students learning; (3) establishing readiness; (4) determining pedagogical approaches and instructional strategies; (5) developing blended learning model; (6) implementing of blended learning model; (7) collecting feedback for evaluation; and (8) finishing the final form of the system.

TABLE I. BLENDED LEARNING MODEL IN HIGHER EDUCATION[6]

Approaches	Description
Supplemental	(1) Maintaining the basic structure of traditional teaching, especially the number of face-to-face meetings. (2) Adding lectures and books with a number of online activities (example: online quiz).
Replacements	(1) Reducing meeting time in class. (2) Changing face-to-face meetings with online learning activities for students.
Emporium	(1) Eliminating all classroom meetings. (2) Replacing all classroom meetings with centralized learning that provides materials online. (3) Allowing students to learn independently as needed.
Fully Online	(1) All learning activities are done online (2) Using automated assessment system to provide fast feedback to students.
Buffet	Offering students a range of learning offer options such as teaching materials, group reviews, group study sessions, and videos.

In addition to consider the approach to be used, the application of blended learning model requires attention to a number of issues that can be considered. The detail can be seen in Table II.

TABLE II. ISSUES RELATED TO THE IMPLEMENTATION OF BLENDED LEARNING MODEL [2], [5],[6]

Keywords	Consideration
Institutional support	(1) Is there any sufficient technical support? (2) Are there adequate human resources for planning, designing, and developing blended learning?
Infrastructural readiness	Is there a reliable and powerful broadband system and access?
Content readiness	(1) Are all the materials prepared themselves from scratch? (2) Are materials adopted from a number of open educational resources?
Instructor readiness	(1) Do teachers have the ability to provide online discussion facilities? (2) Are teachers willing to contact students who are not participating? (3) Do teachers have the ability to deal with annoying online students? (4) Are teachers able to promote the developed online learning system? (5) Do teachers have the ability to properly prepare lecture websites?
Learner readiness	(1) Do students have experience in the use of information technology? (2) Are students experienced in internet usage?

B. *WordPress*

WordPress is a Content Management System (CMS) technology that can be used to build web, personal blog, or Learning Management System (LMS). One of the main advantages of the WordPress is the amount of plug in that was developed by independent developers [7].

WordPress is one of the CMS licensed open. It can be used for free. Based on a survey conducted by Alexa, WordPress received a percentage of 12.5% for one million websites using CMS technology, followed by Joomla 2.5% and Drupal at a percentage of 1.4%[8]. The key features owned by WordPress among others are (1) dashboard for content setting; (2) writing management (post); (3) media management (images, audio, video); (4) page creation; (5) comment management comments; (6) setting themes, views, menus, and headers; (7) plug in management; and (8) user management

III. ANALYSIS

A. *The Blended Learning Implementation Framework*

Application of the blended learning model should be done in a planned manner. Research that has been done by experts can be used as a reference for the application framework of blended learning such as research conducted by Hew and Cheung [2] as summarized in Table III.

TABEL III. BLENDED LEARNING FRAMEWORK [2]

Step	Description
1. Determining learning goals	This stage is done to determine the expected objectives of the development of blended learning system. In addition, the purpose can be used as a control to perform monitoring and evaluation of system implementation.
2. Analyzing students learning	This stage is done to analyze the students readiness. In detail, this stage is in step 3 (this stage can be ignored).
3. Establishing readiness	At this stage, there are five main issues to be considered: (1) institutional support; (2) infrastructural readiness; (3) content readiness; (4) instructor readiness; (5) learner readiness
4. Determining pedagogical approach and instructional strategy	At this stage, pedagogical approach in system development is determined.
5. Developing blended learning model	At this stage, the development of blended learning model is desired. There are five forms of model that can be used as a reference: (1) supplemental; (2) replacements; (3 emporium; (4) fully online; and (5) buffet.
6. Implementing blended learning model	This stage is executed to perform the implementation of the previous steps. The selection of technology will be used to develop blended learning system.
7. Collecting feedback for evaluation	This stage is run to evaluate and monitor the system that has been implemented; the objectives contained in step 1 can be used as evaluation reference.
8. The final form of the system	Once the system is applied and evaluated, it is expected to form a blended learning system that fits the purpose.

Based on the results of the analysis on the application framework of the blended learning system, the simplification of the steps that can be used for the application of blended learning can be seen in Fig. 1 adopted from [2]).

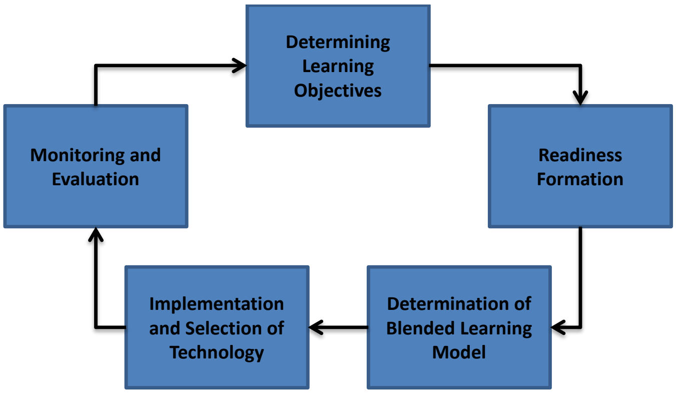

Fig 1. The Blended Learning Implementation Framework

B. *WordPress as Supporting Technology*

The use of blended learning model is the mixing of conventional learning model (face-to-face) in class with internet-based learning model. The technology used to support blended learning model must be able to represent the real conditions contained in the physical class.

WordPress is one CMS that can be developed as a supporting technology in blended learning model. Mapping WordPress features with attributes found in physical classes can be used as a reference for WordPress selection as a support technology (Table IV).

TABLE IV. MAPPING OF CONVENTIONAL CLASSROOM AND WORDPRESS ATTRIBUTES

Conventional Class	WordPress
The teacher gives an explanation	Audio Media Video Media Post
Teaching materials	Audio Media Video Media Post
Class Discussion	Comment
Assignment	Audio Media Video Media Post
Collecting of Assignment	Email

IV. RESULTS

Based on the results of the framework analysis, the stages in the development of blended learning system consists of five steps, namely determining learning objectives, establishing the formation of readiness, determining blended learning model, implementing the technology selection, as well as monitoring and evaluating.

The focus of this research is on the implementation and selection of technology. Development of the blended learning model can be done by using WordPress. WordPress itself has a number of features that can represent the attributes that exist in the conventional class into the online classroom [8].

WordPress has a main dashboard interface that is quite easy to understand. On the left side, there is a main menu for post management, pages, media, and comments. More clearly can be seen in Fig. 2.

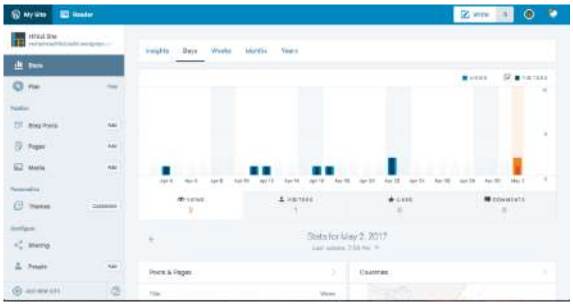

Fig 2. The main WordPress dashboard view

One of the important features contained in WordPress is Post. This post allows users to publish articles either in the form of teaching materials, lecture assignments, or other important announcements. More clearly form can be seen in Fig. 3.

Fig. 3. Writing material and assignments

Another feature that can be used as a medium for displaying material is media management. WordPress supports media such as video, audio, and images. In addition to having independent media management, WordPress also supports embed code like links from YouTube or any other storage media to display on WordPress pages (Fig. 4).

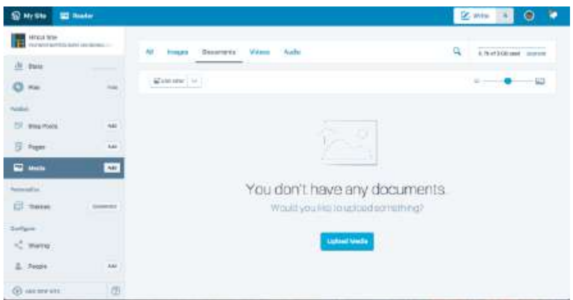

Fig 4. Media management for audio, video, and image

To represent a discussion in a conventional physical class, WordPress has a comment feature. Comments can be written by visitors (students) at the bottom of the post or page and may be replied by the admin (teacher) or by other visitors. More clearly can be seen in Fig. 5.

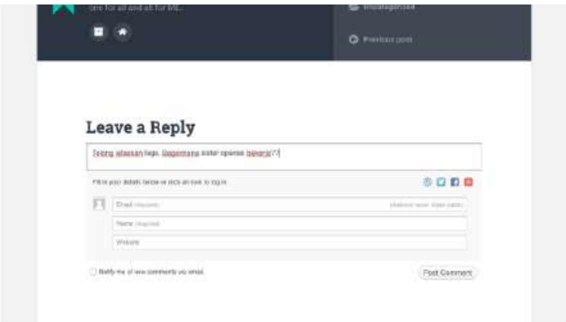

Fig. 5. Feature comment as a discussion medium

V. Conclusion

There are five major steps in the framework of blended learning implementation: (1) defining the learning objectives; (2) establishing readiness; (3) determining the blended learning model; (4) implementing the blended learning model; and (5) monitoring and evaluating.

In addition to a good framework, the selection of the right technology is also one of the factors supporting the success of the blended learning model. One of the technologies that can be used is WordPress. WordPress can be used for free, and has a number of features that can represent physical class conditions.

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A Study on Character Building Based on Habituation to Form Students'Character

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***Abstract*—The aim of this study was to describe character building based on habituation to form character of junior high school students. The formation of character on students is important with the expectation that students have a glorious personality as well as adequate preparation to live with the times which are increasingly exposed and dynamic. This study was a qualitative descriptive studyto describe phenomena based on the existing circumstances. The study was conducted at junior high schools in Banjarbaru which have implemented the 2013 Curriculum. Also, it has been carrying out movements that establish character based on habituation. Data analysis technique in this research was by means of percentages. The results showed that the character building based on habituation has been implemented in schools. This is for establishing the character of students. Based on the results of data analysis, the higher habit was indicated by taking care of the students themselves and the school environment. The lower habit was indicated by developing positive interaction among students.**

Keywords—Character Building, Habituation, Students' Character

I. INTRODUCTION

Character is very valuable to life wherever humans are. Character is a term used to refer to a person's good personality. In another term, character is morals. Someone who has a good character is someone who has a positive habit in his life. Of course, this is not a momentary occurrence, and it is not a day-long process. It requires a long process. Someone is referred to as honest because he has lived his daily life with the values of honesty. Furthermore, character building is expected to be a culture in school.

Character building is the effort to form human, educational system, and culture. Character building is based on conditions where the application of basic human values based on Pancasila is still neglected. Thus, the understanding of its value is still within the conceptual level, and it has not yet materialized in its actual value by the fun way in school, family, and society environment.

Character building has the hope that the younger generation of the nation has a noble personality and has enough supplies to live with the current more open and dynamic circumstances. The progress of the globalization era will pose a danger that can ultimately damage the life of nation and state. Unfortunately, globalization gives not only a positive impact for society, but also negative impacts, especially for the younger generation. Therefore, character building plays a major role in shaping a positive character in the education process. Character building must be implanted since the age of children, especially those who are in the education process. This is where the formation of personality is necessary. If good value has been formed in the children, they will be more responsible and dignified in the future.

By juridical, the government has made efforts with the Regulation of Ministry of Education and Culture Number 23 of 2015 about the character building which stated that character building is the activity of habituation of positive attitude and behavior in school which starts from elementary school and continues to junior high school, high school/vocational school, and school on special education path. This strats from the orientation of new learners to graduation. Character is a positive behavior done through habit [1]. This means that a person is taught something good from childhood to adulthood through exercises. This is in accordance with the concept of moral conduct based on the consideration that the implementation of basic human values of Pancasila is still neglected.

The values that have been implanted will have an effect on the personality of learners of everyday life. Parents are obliged to educate and nurture children from weaknesses. However, due to the parents' busy schedule as found in the city of Banjarbaru, there is a symptom that parents have a tendency to surrender their children to educational institutions. Children's education is fully submitted to school. This problem cannot be denied because of parents' busy work. Therefore, schools have an important role in the formation of the learners' character. Schools eventually as educational institutions focus not only on cognitive development but also affective and psychomotor aspects. School is expected to change the character behavior of learners.

In schools, there are values of national character that have been implemented. However, the implementation is not maximal, so learners have not reflected the attitude of character [2]. The value of characters performed in schools is developed through the habituation of learners in behaving. In this case, teachers are required to bring learners towards life in accordance with the values of Indonesian life. In addition, teachers should strive in forming habits for the formation of *aqidah* and morals of learners. However, in reality, the process of building the behavior of the nation's generation is increasingly worrisome. Low morality of the nation's generation is often a cynical view for some people. Thus, it also has an impact on education that is considered not successful in building the character of learners. There are still many children and adolescents as learners who lack knowledge of the manners. They are brave to parents, disrespect teachers, and act at will without regard to the environment. Therefore, the need to instill strong character in children and adolescents is prioritized in order to prevent some factors that can damage the character of the Indonesian nation. Impressions of news published by various media often make people sad to hear about the behavior of learners such as bullying behavior, fights, promiscuity, drug cases, school-aged teenagers who commit immoral acts, even elementary school students who celebrate graduation with alcoholic drinking. This is made worse by the circulation of pornographic photos and videos, teacher disobedience, increased violence and cheating, and increasingly common lies. Due to the phenomena, often the educational outcome disappoints society.

The data from ICRW 2015 and UNICEF 2014-2015 in the national executive summary of the national strategy for the elimination of violence against children in 2016-2020 by The Ministry of Women's Empowerment and Child Protection show that 84% of students have experienced violence in schools, 75% of students have committed violence in schools, 45% of male students mentioned that teachers or school staff were perpetrators of violence, 22% of female students mentioned that teachers or school staff were perpetrators of violence, 40% of students aged 13-15 reported experiencing physical violence by peers, and 50% of children reported having bullying experience in schools. The results of the study of the National Consortium for the Development of Character Schools in 2014 mentioned almost every school in Indonesia, has a case of bullying [3].

From these circumstances, the school is responsible for building good manners on the learners. The school becomes very important o renew the moral of their students. Schools with character education will include the values to build the expected character according to the school's vision and mission. In character education at school, all components (stakeholders) should be involved, including the components of education itself, that is, the content of the curriculum; process of learning and assessment; quality of relationship; handling or management of subjects; school management; implementation of activities; empowerment of infrastructure; financing; and work ethic of all citizens and school environment [4].

Character building based on positive habituation can be done integrally in every school environment to form dignified Indonesian character. Education in schools currently tend to build more intellectual intelligence, but still make minimum effort with the element of refraction that leads to character building and educational habituation. The learners' understanding, awareness, and responsibility for the social environment are also low.

The process of familiarizing learners with activities before learning starting in the classroom has significance in an educational process. Habituation becomes the key to one's success in education. An excellence learning is not merely an act, but it is an initiation of a positive and meaningful habit for learners who are considered effective and responsive through the habituation of good examples. This is in line with the Regulation of Ministry of Education and Culture No. 23 of 2015 which states that habituation is a series of activities to be undertaken by students, teachers, and education personnel, which aims to build good habits and build a generation of positive character. Character building is done through a series of non-curricular activities through daily and periodic mandatory and optional activities [5]. Cultural ways should be taught, familiarized, trained consistently, and in turns, they become habit, character, and then become a culture.

Habituation not only teaches the knowledge of the things that are right and wrong, but also enables us to feel good and bad values. Attempts to character formation through habituation includes the values of religion, honesty, discipline, tolerance, hard work, peace, love, responsibility and so forth. These values need to be nurtured in the learner and the values will ultimately be the reflection of the life of the Indonesian nation.

In order to realize character education in the development of learners' attitude, some phenomenon of learners' behavior must be concerned and improved through habituation. This is also considered in Banjarbaru city located in South Kalimantan. The phenomena of learners in Banjarbaru shows some irresponsible behavior. In schools, it is not clear that some character building is done. Some problems in character building should be studied based on deeper habituation to know the character growth for learners in schools. Thus, a study is necessary to conduct to investigate habitual character building in Banjarbaru city. If this problem cannot be solved, then it could be a threat in the development of character education in Banjarbaru city. It should be emphasized that the vision and mission of the government in Banjarbaru City focus on character building of community that is religious, virtuous and loving of the homeland, which should be instilled in various fomal education/schools at all levels. Therefore, it is necessary to identify the factors that inhibit and support the character building of the students in the school, as well as the habituation of what has been done in the character building in the school.

From the description, to investigate the implementation of character building based on educational character for learners in Banjarbaru City, the researcher intended to conduct a study on this issue with the title *"A Study on Character Building Based on Habituation to Form Character of Junior High School Students"*

Based on the background of this study, the formulation of the problem in this study is as follows: what are the factors of high habituation of teachers and students in character building based on habituation to form the character of junior high school students in Banjarbaru City?

II. Character Building Based On Habituation To Form Character Of Junior High School Students

Character education is a relational dynamics among people with various dimensions, both from within and from outside of the people. It is expected that the person is increasingly able to live in freedom, so as to be responsible for the growth of himself as the person and the development of others in their lives. Character education is anything teachers do that can influence the character of learners [6]. In addition, character education is the morality, truth, goodness, strength and attitude of a person who is shown to others through action [7].

Character is the culmination of the habit that results from the ethical choices, attitudes and attitudes of the individual, which is the prime moral even when no one can see it [8]. Character education is a comprehensive undertaking for people to understand, care, and behave according to basic ethical values. These values can be obtained through the process of internalization of what is known, which takes time to form a good character. These values are the values of life that are the realities existing in society. Character education is a system that builds the values of character to the school community that includes the components of knowledge, awareness or willingness, and actions to implement those values [9]. Character education can be interpreted as *"the deliberate use of all dimensions of school life to foster optimal character development"*. In character education in schools, all components (education stakeholders) should be involved, including the components of the education itself. Character education is a planned effort to make learners recognize, care, and internalize the values, so learners behave as human beings [10]. Based on these insights, it can be interpreted that character education is a systemically designed and executed effort to help learners understand the values of human behavior embodied in thoughts, attitudes, feelings, words, morality, truth, goodness, person's strengths and attitudes, as well as actions based on religious norms, law, etiquette, culture, and customs.

The objectives of cultural education and the character of the nation are: (1) to develop the potential of learners to be good-hearted, good-minded and well-behaved human beings; (2) to build a nation characterized by Pancasila; (3) develop the potential of citizens to have a confident attitude, proud of the nation and country and love humanity [11]. Furthermore, the function of cultural education and the character of the nation are: (1) to build a multicultural nationhood life; (2) to build a civilization that is intelligent, cultured and able to contribute to the development of human life; to develop the basic potential to be good-hearted, good-minded, and well-behaved, and exemplary; and (3) to build the attitude of peaceful, creative, independent citizens and able to live side by side with other nations in harmony.

Character education is aimed at improving the quality of education implementation and results in schools that lead to the achievement of character formation or noble character of the learner intact, integrated and balanced, according to the competency standards of graduates [12].

There are 18 values of character education developed by the government namely: religious, honest, tolerance, discipline, hard work, creative, independent, democratic, want to know, spirit of nationality, affectionate toward the country, appreciate achievement, friendly/communicative, love peace, diligent in reading, caring for the environment, social care, and responsible.

Although there have been 18 values of the nation's character, the educational unit can determine its development priorities by continuing the pre-condition value reinforced by some of the priority values of the 18 values. In the implementation of the number and type of characters selected will certainly be different from one region or school to one another. It depends on the importance and condition of each unit of education. Among the various values developed, the practice can start from an essential, simple, and easy value to implement in accordance with the conditions of each school or region.

Character education assessment is essentially an evaluation or learning process of an individual to live his or her role in a school environment for the growth of his or her moral integrity as a human being. Character education assessment is closely related to the elements of understanding, motivation, will, and praxis of the individual. Character education grows as motivation in the individual and becomes the driving force for their moral behavior in the company of others. From this essence, we can draw conclusions about the purpose of character education assessment.

Furthermore, good character involves understanding, caring, and acting in accordance with ethical values. A holistic approach to character development is to develop the cognitive, emotional, and behavioral aspects of moral life. Learners develop to understand basic values by studying them, discussing them, observing behavioral models, and solving problems that include values. Thus, learners must understand the basic values and commitment to practice in everyday life.

Guidance or technical guidance provided by Curriculum Center at Research and Development Agency, Ministry of National Education, explains that measuring the level of successful implementation of character education in educational unit is done through various assessment programs by comparing the initial conditions with the achievement in a certain time. The assessment of success is accomplished through the following steps: (1) establishing indicators of established or agreed values, (2) establishing various assessment instruments, (3) recording the achievement of indicators, (3) conducting analysis and evaluation (4) follow up. Practically there are things that objectively can be used as a criterion to judge whether character education has been successfully implemented or not. The objectives in question here are data and facts, whether in the form of actions or the effects of decisions that can be verified. The criteria and objects discussed here only relate to objective matters that are used as guidelines for the assessment of character education in schools. From these data and facts we can see the extent to which students and individuals within the school have carried out character education.

The ability of principals and teachers to improve the role of schools in character education can bring about change and affect the behavior of learners. Changes in learning achievement cannot be used to draw conclusions in general. Nevertheless, the influence of character on behavior and learning achievement can be expected. If the principal and teachers succeed in creating an atmosphere and learning process that encourages and motivates students, the students' learning spirit will rise, so they will become more diligent in learning and more disciplined. Demonstration of exemplary models is an initial step of habituation. If other educators and education personnel require that learners behave and behave in accordance with the values of character, other educators and education personnel are the first and foremost examples of how to behave accordingly with the values [12].

In the classroom, character learning is carried out through the learning process of each subject matter or specially designed activity. Each activity must be capable of developing capabilities in the cognitive, affective, conative and psychomotor domains. Therefore, it is not always necessary for special learning activities to develop values in character education. Nevertheless, the development of certain values, such as hard work, honest, tolerance, discipline, self-reliance, national spirit, homeland love and reading, can be developed through the usual learning activities of educators. The development of some other values, such as social care, environmental care, curiosity and creativity requires conditioning efforts, so that learners have the opportunity to create behaviors that show the values.

If the 18 character values are deeply understood, there are are some character values that can improve the behavior of learners to be better, among them are as follows: *First*, value of hard work aims to encourage learners to do their tasks seriously with habituation given by the teacher in assigning tasks or homework. *Second*, independent values aim to encourage learners to behave appropriately in completing tasks or homework provided by the teacher. By being independent learners, they can learn to solve problems encountered. *Third*, the value of curiosity is aimed at forming every attitude and action of learners who always strives to know more deeply and extensively from something they learn, see, and hear. This can be familiarized by the teacher by asking questions or giving the learners the opportunity to ask about the lessons. Furthermore, *the fourth* is the value of reading which aims to encourage learners to have the habit of providing time to read the various good materials. Habituation to learners to read will have an impact on student achievement.

Character education can improve the behavioral change of learners and also affect the academic achievement. Thus, the creativity of principals and teachers is needed, so character education and academic ability improvement run simultaneously, complement each other and mutually reinforce. Therefore, all principals and teachers need to be encouraged and given the opportunity to improve their qualifications in character education so that all lessons of activity can be used as a vehicle for character education.

In conclusion, character education that has been done correctly will have a positive impact on the behavior of learners. An integral education certainly has an impact on the growth of intellectual and affective ability of learners. Growing morals in the learners is very important to do in developing the values of nationality and humanity in the students themselves.

The implementation of character development is based on the basic values of nationalism and humanity which includes the habit of growing in accordance with the Regulation of the Ministry of Education and Culture No. 23 of 2015 as follows: moral internalization and spiritual attitude, which are able to live the spiritual relationship with God; firmness to maintain the spirit of nationality and diversity as well as to glue the unity of the nation; positive social interaction between learners and adult figures in the school and home environment; positive social interaction among learners which concerns for the physical and psychological condition among peers, seniors, and juniors; maintenance of the school environment; an appreciation of the uniqueness of potential learners to be developed; strengthening the role of parents and related community elements.

The method of implementing character building activities for elementary school level is still a transitional period of playing in early childhood education (formal kindergarten) in entering the formal school situation. The method of execution is done by observing and imitating the positive behaviors of teachers and principals as a direct example in the habit of recurring and repetition. Teachers also play a role as a companion to encourage students to learn independently as well as lead friends in group activities, namely: playing, singing, dancing, storytelling, simulation, and role play in the group.

The method of implementing character building activities for junior high, high school/vocational school, and school on special educational pathways is done with the independence of learners to familiarize with regularity and repetition, starting from the orientation of new learners, extracurricular, and intracurricular activities.

Furthermore, it is also explained in the Regulation of the Ministry of Education and Culture No. 23 of 2015 that the activities of the movement of moral character in schools through habituation-habituation involves the following elements.

A. Growing Moral and Spiritual Values

Realizing moral values should be done in everyday behavior. Moral values are taught to students. Teachers and students practice them routinely until the values become a habit. Compulsory activities for teachers and learners might be in the form of praying together in accordance with their beliefs before and after the day of learning led by a learner in turn under the guidance of the teacher. Other examples of activities are familiarizing to perform the worship together according to religion and belief, both done in school and with the community. Furthermore, an examples of periodic habituation is familiarizing the celebration of the Great Muslim Day with simple activities and wisdom for muslim students.

B. Growing National Values and Diversity

This element is instilled by fostering the love of the homeland and receiving diversity as a bound for the nation of Indonesia. The practice of gratitude is also important so that the benefits can be felt in everyday life.

The activities for this element such as carrying out flag ceremonies every Monday in accordance with the school's regulation, .

- Conducting the flag ceremony at the opening of a new student orientation period for junior high school, high school/vocational school, and school on a special education path equivalent to junior high/high school/vocational school. Students serve as commanding officers and ceremonial officers and principals/representatives acting as ceremonial inspectors;
- After each prayer to start the day of learning, teachers and learners sing the national anthem of Indonesia Raya and/or one national mandatory song or one of the latest songs depicting the patriotism and love of the motherland.
- Before praying when ending the day of learning, teachers and learners sing a regional song.
- Introducing the uniqueness of students' potential areas through various media and activities
- Familiarizing the celebration of the National Day by reviewing or introducing the thoughts and passions underlying through various media and activities.

C. *Developing Positive Interactions Among Students, Teachers and Parents*

Education is the responsibility between schools, learners and parents. Positive interaction between the three parties is needed to build a positive perception, mutual understanding and mutual support for the realization of an effective education.

Compulsory Activities can be actualized by the meeting between schools and parents in each new academic year to socialize: (a) vision; (b) rules; (c) material; and (d) student learning achievement plan for parents to support the four points. Examples of good habits that school can do are greetings and smiles to everyone in the school community. Teachers and education personnel come early to welcome learners in accordance with the applicable values. Examples of periodic habituation are familiarizing learners (and families) to say good-bye to their parents as they go and report when they return home according to the customs of each family and to salute teachers before the lesson begins, led by a learner in turn.

D. *Developing Positive Interaction Among Learners*

Learners learn academic aspects and learn to socialize. Positive interaction among learners will actualize the learning of peer (peer learning) as well as helping students to learn to socialize. Examples of good habits that can be done by the school are movement of care to fellow citizens of the school by visiting the school residents who are experiencing disaster, such as illness, death, and others and familiarizing students to help each other when there are students who are experiencing disaster or distress.

E. *Taking Care of Learners themselves and School Environment*

School environment will affect the school community both from the physical aspect, emotion, and health. It is therefore important for the citizens of the school to maintain safety, comfort, orderliness, hygiene and health of the school environment. The example of mandatory activities is doing the cleaning up of the school environment by forming cross-class groups and sharing tasks according to the age and ability of the students.

Examples of good habits that can be done by schools are familiarizing the use of school resources (water, electricity, telephones, etc.) through creative campaigns from and by students, organizing canteen that meets health standards, building a learner's culture to always maintain cleanliness in their respective stools as a form of individual responsibility as well as cleanliness of class and school environment as a form of responsibility. Examples of periodic habituation are teaching the queue simulation through the line before entering the classroom and while using school facilities, maintaining safe school environment and implementing waste bank activities in collaboration with local sanitation service.

F. *Developing Learners' Self Potential*

Each student has diverse potential. Schools should facilitate optimally so that students can understand and develop their potential. Compulsory activities are as follows: a) Use 15 minutes before the learning day to read a book other than a subject book (every day); b) All school residents (teachers, education personnel, students) use the time before starting the day of learning on certain days for physical activities such as physical fitness exercise, regularly at least once a week.

Examples of good habits that can be done by the school are asking learners to familiarize themselves to have savings in various forms, such as Bank accounts and piggy bank; training students to asks critical questions; and familiarizing every learner to always practice leadership by giving every student an opportunity to lead in joint/group activities.

G. *Involving Parent and Community in School*

Education is a responsibility form all parties. Therefore, schools should involve parents and communities in the learning process. It is necessary to get support in various forms from parents and society. This can be done by holding an exhibition of student work at the end of each school year by inviting parents and community to appreciate students. As suggestion, parents can make the habit of providing 20 minutes each night for discussions with children about school activities. Moreover, communities work with schools to accommodate volunteering activities by learners in solving problems within the school environment. Society of various professions is involved to share knowledge and experience to students in school.

III. METHOD

This study used descriptive qualitative research type. Descriptive research is intended to describe the phenomena that exist based on existing circumstances. This study was conducted to describe empirical reality in accordance with the phenomenon that occurs through the collection of data on character building based on habituation in Banjarbaru City.

The population in this study was the junior high schools that have implemented the 2013 curriculum and character education. The samples were determined by using purposive sampling. The names of the schools that have been studied were SMPN 1 Banjarbaru, SMP Sanjaya, SMP Muhammadiyah Banjarbaru, with the participants consisting of 53 teachers and 140 students.

To obtain the necessary data, the researcher used questionnaire as data collection technique. Questionnaire method is a method used to find data about things or variables that form related to the aspect of organizing character building based on habituation in Banjarbaru.

Data analysis technique used in this research was descriptive qualitative data analysis using percentage. The collected data were analyzed by categorization to facilitate the interpretation of the data. Each of the data has been categorized and linked to a relationship to match the conclusion. Data analysis is a process for systematic searching and sorting, obtained by organizing data into categories, translating into units, synthesizing into patterns, choosing what is important and learning, and making a conclusion so easily understood by self or others [13].

IV. Result And Discussion

Based on the calculation results from the 7 indicators that have been determined, percentage of the activities in character building was obtained as shown in the following figure.

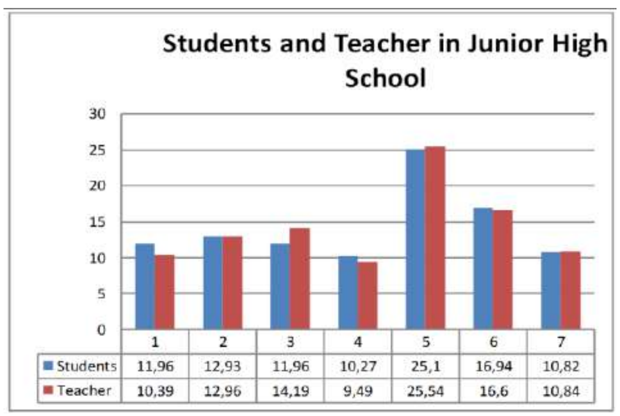

Fig. 1. Comparison of respondents: junior high school students and teachers

From Fig. 1, the comparison of respondents between junior high school students and teachers can be seen in accordance with 7 indicators as follows. First, the percentage of students' and teachers' responses in building spiritual moral values were 11.96% and 10.39%, respectively. The indicator of building nationality values and diversity obtained 12.93% responses of the students and 12.96% responses of the teachers. Third, the indicator of developing positive interaction among learners, teachers and parents obtained 11.96% responses of the students and 14.19% responses of the teachers. The percentage of students and teachers in developing positive interaction among learners were 10.27% and 9.49%, respectively. Furthermore, the percentage of students' and teachers' responses in self-care and school environment indicators were 25.10% and 25.54%, respectively. Subsequently, the indicator of developing students' self potential as a whole obtained 16.94% responses of the students and 16.60% responses of the teachers. Last, engagement of parents and community in school were responded by 10.82% of the students and 10.84% of the teachers. This means that this activity is often done only by different percentage of each indicator used. The average responses from the teachers in character building based on habitation of junior high school in Banjarbaru City does not differ much with students' responses.

The percentage of the responses from the students and teachers show the presentation of the 7 indicators in their action. Based on the results, average presentation from the teachers is not much different from the presentation of the students. Thus, character building based on habituation done by a teacher will be an example or a reflection of habituation for students in schools. The demonstration of exemplary models is an initial step of habituation. If other educators and education personnel require the learners to behave in accordance with the values of character, they are the first and foremost people to give examples of how to behave in accordance with those values [12].

V. Conclusion

Based on the results of this study, it can be concluded as follows. Habits in terms of character development have been implemented at the level of primary and secondary education in Banjarbaru. High-valued habits are taking care of themselves and the school environment. The lowest is developing positive interaction among students. The existence of cooperation between the school and parents in habituation to students is necessary to instill character education.

Several points can be suggested in this study. It is essential to encourage and facilitate character building through positive habits according to the vision of the regional goverment and the school itself. For example, there is cooperation between the government and the school to have extra-curricular activities in school. Development of character education model in fostering positive habituation in building character of students in school in order to support the vision and mission of government should be characterized based on religious values and noble values of nationality through habituation that has been scheduled in school activities. Moreover, teachers give exemplary example to the students about the positive habits to build character of the students. For example, there is a study of the Qur'an on a certain day in which teachers and students in build spiritual values, as well as activities such as caring for others to set an example of social awareness. Special interventions are needed in developing interaction among students and teachers, such as conducting the activities for Junior Red Cross Youth, scouting, sports, and other extra-curricular activities.

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Students' Science Generic Skills Using K*NoS*–KGS Model in Biology Learning

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***Abstract*—Science learning through science generic skill can provide generic science skills for students as the development of higher level thinking skills. Each individual basically and intuitively tends to do scientific activities (problem solving). The skills can be trained through learning at the school using learning model that makes students undergo a process of how knowledge is constructed. One of the goals in the learning assessment is to determine the position of the students in the classroom. Based on discussions with the biology teachers in SMA PGRI Banjarmasin, the implemented learning at schools was lecture as well as question and answer session, while the assessment made by the teacher always led to the cognitive aspect. Therefore, the other domains (affective and psychomotor) were abandoned. This study aimed to determine science generic skills of students as a result of KNoS–KGS collaborative learning model. The data of students' science generic skills in this study were obtained, and the data from the assessment from the observations during the learning process were also obtained. The results showed that average value of students' science generic skills was 86.82, and the observation result of students' science generic skills was 80.14.**

Keywords—Biology; Generic Skills; KNoS–KGS Learning Model; Science

I. Introduction

Education is a conscious and planned effort to create an atmosphere of learning and learning process. Education is intended to enable students to actively develop their potential to have the spiritual power of religion, self–control, personality, intelligence, esteemed character, and skills. These potentials are needed by them, the community, the nation and the state [1].

National education serves to develop students' ability, form their character, and create the dignity of nation civilization in the context of the education for the enrichment of a nation. It aims to develop students' potentials to become faithful citizens with fear to God Almighty, esteemed character, and good health, and are knowledgeable, skillful, creative, independent democratic and responsible.

The more a person has interactions through objects and environment, the more knowledge and understanding about the objects and environment they can reach.. Biology education is expected to become a medium for students to learn about themselves and the natural surroundings, which emphasizes at providing direct experience. To achieve an effective biology learning, the correct learning is required so the cognitive, affective, and psychomotor aspects can be developed by students. One of learning models that could lead to those three aspects is a Biology learning model named K*NoS*–KGS [2].

K*NoS*–KGS model provide more space and opportunities for students to engage predominantly in solving biological problems. This model is designed to improve learning outcomes. These learning outcomes are students' understanding of *NoS* and being trained in generic science skills. This model is characterized by cooperation between students and teachers and between students and other students in creating knowledge. Students can interact each other, sharing respect, sharing knowledge to complete each other, and help each other [3].

K*NoS*–KGS learning model is designed as more student-centered model. Students are more active in learning, do activities together in a group, give feedback and solve problems collaboratively and learn the Biology materials [3]. By using K*NoS*–KGS model, the study is expected to encourage more students' participation in the learning process and produce higher student achievement.

The assistance obtained by using this model may come from their peer in a group or their peers in other groups, or come from the teacher. The high student-centered pattern in the implementation syntax of K*NoS*–KGS model is designed to practice generic science skills. The activities that practice generic science skills in student centered pattern challenge students to think actively, seek and find the concept [3].

Generic science skills are skills that can be used to study a variety of concepts and solve various problems of science. A scientific activity, such as the activity to understand the concept, consists of several generic competencies. The characteristic of science learning through generic science skills is supplying generic science skills to students as the development of higher order thinking skills [3].

Based on the background, the researchers proposed a research question as follows: "How are generic science skills of students in the learning process using K*NoS*–KGS Biology

Learning Model?" This study aimed to determine the generic science skills of students in the learning process using K*NoS*–KGS Biology learning model.

II. Literature Review

Learning is the development of term from teaching. This term can be argued, or we could just ignore the significant importance of it. Learning is an effort which is made by someone.

One of the learning objective is to build a scientific idea after students have interactions with their environment, moments, and information from their surroundings community. Basically, all students have an idea or prior knowledge that has been built in the specific shape. From the preliminary knowledge and experiences, students use the information that is derived from the environment in order to reconstruct their personal interpretations and its meanings. The meaning has been built when the teacher gives the relevant issues with the knowledge and experience that are already presented, providing an opportunity for students to find and apply their ideas.

Reference [4] stated that generic skills are very useful for continuing education and successful career. Generic skills have three characteristics as follows:

(1) Generic skills that are examined in the working field are very dependent on the values and personal attributes. For example, a person's communication skills are related to integrity, ethical values, understanding of the topic, honesty, self–confidence, and attention to detail and follow–up.

(2) In the working field, generic skills are similar to technical skills. For example, in "preparing a report", someone will use the technical skills and generic skills.

(3) Generic skills tend to be "context–dependent". For example, planning and coordination for most employee are generic skills; but for the manager, a technical skill that involves scheduling techniques and technical computer applications is needed.

The research results of [4] showed the components of generic skills which are related to employment and lifelong learning as follows:

(1) the skills of socio–cognitive, including communication skills, problem solving, creativity, and interpersonal.

(2) academic skills, including language and numerical skills.

(3) self-skills / personality, including a sense of responsibility, initiative, effort, and self–learning.

Generic science skills are skills that can be used to study a variety of concepts and solving various problems of science, in one scientific activity. For example, activities to understand the concept consist of several generic competencies. The different scientific activities could contain the same generic competencies. According Brotosiswoyo as quoted by [5], the characteristic of science learning through generic science skills is supplying generic science skills to the students as the development of high order thinking skills.

Reference [6] suggests that to determine the scientific knowledge to be learned by students, first, teachers need to carry out the analysis of scientific concepts students want to learn. The further analysis is done to show the relationship between the types of scientific concepts with the developed generic science skills. Reference [7] state that the generic science skills are the academic skills, skills of social–cognitive and self/personal skills.

K*NoS*–KGS model is characterized by cooperation between students and teachers, and other students to create knowledge. Based on the students' experience, they make effort to develop their own strategies for responding the problem, by avoiding the dependence on a teacher either on the subject which are taught or in the learning process.

The syntax of K*NoS*–KGS model that is developed consists of five phases, namely phase I as background problems, phase II as case study discussion, phase III as training Inquiry, phase IV as collaborative writing, and phase V as presentation. A general description about the syntax of knos-KGS model is described as follows.

Phase I, background problems, involves issues introduction or biological problems related to the material. This material will be studied and packaged in the PowerPoint form, video, animation or macromedia flash to bring the environmental classroom. Students are faced to the unknown but interesting issues. These issues are related to the material that they are going to discuss about (the orientation into the case). The aim is to motivate the students in learning. Through these activities, students can practice their generic science skills (identification of issues/problems, formulating the problem).

Phase II, case study discussion, involves the information from phase I used as students' preliminary knowledge. Then, students at collaborative groups are involved in discussions about real-life scenarios that become dilemma according to identified biological problems. In this stage, students are directed to find what the problem is and what causes the problem. Discussions are carried out in this phase, could trigger the conflict and curiosity of students to formulate hypotheses, look for the theories that support the hypothesis (formulating hypothesis, devising how to test the hypothesis, and collecting data).

Phase III, inquiry training, involves testing the hypothesis by doing the observation, experiment or investigation which are guided by students' worksheets (responsibility, initiative, problem solving). This phase is obtained by following the design that is developed from the previous phase.

Phase IV, collaborative writing, involves the results of inquiry training in the next stage in which students in collaborative group are analyzing the results of experiment/investigation data, preparing the report in workshop/demo or presentation paper/PowerPoint from their work. This will be put in a document. The document is already checked in terms of its content and clarity to ensure interesting opening for the readers, strong hypothesis, and the conclusion that could give the readers a clear understanding about the writer's viewpoint including grammar, spellings, punctuation mark, written communication, and creativity.

Phase V, presentation, is done to give students the opportunity to present their work at a communication forum (verbal) with collaboration, and creativity. Students are given time to describe the results of discussion/ observation /investigation /their experiments with presentations, tournament, exhibition, or demonstration. The other group is given time to respond. This activity provides a framework for collaborative groups to engage in depth discussions, exchange and investigate ideas brought by the group as a result of their research. This activity is repeated for the next presenter.

III. METHOD

The type of research in this study was CAR (Classroom Action Research). Classroom action research includes activities carried out in the classroom. The researcher / teacher could see the learning practice directly or together with the other teachers to do research on students from the aspect of interaction in learning process. Teachers could analyze reflectively and synthesize what is done in the classroom. This means that by doing CAR (Classroom Action Research), the instructional learning practices can be revised to be better and more effective ones.

The aspects of Class Action Research (CAR) are as follows.

(1) Preparation Plan/Planning. In planning, an action plan is developed to solve the problems happened. Classroom action research plan should be structured and should be prospective in action. It should be a forward–looking plan. CAR plan should be flexible enough to be adapted to the unpredictable influences and constraints that have not yet been seen. Planning is based on the hypothesis issue of actions that are tested empirically. So, the changes are expected to identify the aspects and the results of learning process, as well as uncover the supporting factors and the inhibition of research activities.

(2) Action. The action in this study is the conscious and controlled act, which is a variation of an accurate and expedient practice. Practice is recognized as the idea into action and the action is used as a foundation for the development of further actions. They are the acts with the intention to improve the situation.

(3) Observation. Observations is done at the time when the action is running. So, the observation and implementation phases occur at the same time. The data collection is done with the help of observation format that has been prepared, including the accurate monitoring of the action implementation from time to time and its impact on processes and student learning outcomes.

(4) Reflection. Reflection was the act of reminding and contemplating an action exactly as it is recorded in the observation. In reflection, researchers usually try to understand the process, problems, issues, and constraints which are real in the strategic action.

This study was conducted at SMA PGRI 6 Banjarmasin. The subjects of this research was students of class XI. The implementation of this study was approximately for 4 months of the 2016/2017 school year at SMA PGRI 6 Banjarmasin.

IV. RESULT AND DISCUSSION

A. *Graph of Students Generic Science Skills on First Cycle*

The assessment of student's academic skills included: (1) formulating the problem, (2) formulating the hypotheses, (3) doing observation/investigation, (4) analyzing the experimental results, and (5) formulating conclusions. The assessment of students' generic science skills included: socio–cognitive skills (including teamwork, creativity, and communication), self skills/personal skills (initiative, responsibility, independent).

Fig 1. The Graph of the Results on First Cycle of this Study

B. *The Reflection of Cycle I*

The academic skill of students in the first cycle and the first meeting was 77.04. This was on C category. Then it increased in the second meeting. It was 82.27 and on B category. At the first cycle, the average value of academic skills that has been acquired was 79.65. It was on C category (fair) and it has reached the indicator of success. In the first cycle, the obstacles were encountered especially when the first meeting was held. In formulating the problem, students made the problem formulation incorrectly and have not fully showed the level of problem understanding. Hypotheses that have been formulated by the students were still not in accordance with the formulation of the problems they have created. During investigation/observation, the students were still making a lot jokes. There were still many of them who were being lazy to do observations. Only some parts of them who did observation/investigation. In the analysis of the experimental results, at this stage the students were still not doing the problems appropriately and there were some students who did not participate in the investigation/observation. In formulating a conclusion, at this stage, the students have not yet formulated conclusions that cover all the issues which has been discussed at the presented material. Based on the results obtained at the assessment of students' academic skills in cycle I, though the results have achieved the indicators, the researchers continued the classroom action research to see the development of students' academic skills in the second cycle. The obstacles that have been faced in the first cycle become consideration for improvement in the second cycle.

The observations of students' generic science skills included: socio–cognitive skills (teamwork, creativity, written communication, and oral communication), self-skill / personal (initiative, responsibility, and independence). In the assessment of generic science skills at the first meeting, the socio–cognitive of students was 60.79 in the D category (poor). In the second meeting, the socio–cognitive has increased to 77.28 on C category (fair). Therefore, the average value of generic science skills in socio–cognitive aspects of first cycle was 69.03 on D category (poor). It has not yet reached the indicators of success. This is because during the learning process has done, some students preferred to learn on their own. The creativity of students in solving the problems still only focused on students' books. The written communication of students was still not yet well–structured and the oral communication of students was still not optimal. This might have been seen during presentation in which some students were still shy in presenting their opinion. Self-skills / personal skills at first meeting was 61.73 in D category (poor) and the second meeting was 78.86 in C category (fair).

Therefore, the average value of generic science skills on the aspects of self-skill / personal was 70.29 on D category (poor) and it has not yet reached the indicators of success. Although it has increased during the learning process, some students still did not yet have an excellent initiative in cooperation. So, only some students had the initiative in doing the task that had been given. Only a small percentage of students was responsible in collaborative groups, and the independence of students has not yet been seen well. This is because during the learning process, the students still asked many questions to the teacher or still asked questions to the other friends of other groups.

C. The Graph of Students' Generic Science Skills on Second Cycle

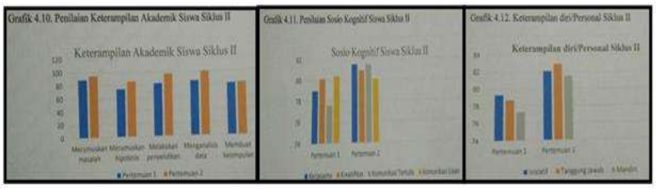

Fig 2. The Graph of the Results Study on Second Cycle

Based on those data in the graph, the academic skills of students in the second cycle have increased from first meeting to the second meeting. The improvement of students' academic skill in the second cycle was seen from the categories that have been obtained on first meetings. It was 82.05 average on B category (good). At the second meeting, it was 91.59 on A category (very good). Thus, the average value of students' academic skills in the second cycle was 86.82 on B category.

Based on the collected data, it could be seen that in the second cycle, the generic science skills of students increased slowly, yet in exact manner. At the first meeting, the average value of students' generic science skills in socio–cognitive aspects was 79.25 on C category (enough). It has increased at the second meeting. The average value was 81.03 on B category (good). Therefore, the results of the average value from generic science skills at the second cycle for socio-cognitive aspect was 80.14 on B category (good).

In the aspect of self-skills/personal skills, the average value obtained in the first meeting was 78.40 on C category (fair) and it has increased in the second meeting, namely 82.19 on B category (good). Therefore, the average value on the aspect of self-skills/personal skills at the second cycle was 80.29 on B category (good).

V. CONCLUSIONS

Generic science skills are assessed on a students' academic skills on the first cycle which result in the average value. The average value was 79.65. This was on the C category (fair). In the second cycle, this value increased. The average value in the second meeting was 86.82. This was on the B category (good) and this has already achieved the indicators of success that have been set.

Generic science skills of students were also observed in the first cycle on socio–cognitive aspects. The average value of socio–cognitive aspects was 69.03. This was on the D category (poor). The average value on the aspect of self-skill / personal skill was 70.29, whichwas on the D category (poor).

In the second cycle, the value has continued to increase. The average value of the socio–cognitive aspects was 80.14. This was on the B category (good). The average value of self-skill/personal skill aspect was 80.29 on the B category (good).

Learning outcomes have been observed. They were the positive attitude of students in the first cycle. The average value of the students' positive attitude was 3.12. This was on the B category (good). At the second cycle, it increased. The average value obtained by the students was 3.44. This was on B category (good). The results were obtained in the second cycle reached the indicators of success that have been set.

Psychomotor observation of students in the first cycle had the average value of 80.21 on the B category (good). At the second cycle, it increased. The average value, obtained by students was 83. This was on B category (good). The results were obtained in the second cycle has reached the indicators of success that has been set.

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5th South East Asia Development Research (SEA-DR) International Conference

Implementation Of Contextual Teaching and Learning (CTL) to Improve The Geography Learning Outcomes

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***Abstract*— The students in class X of SMAN 10 Banjarmasin has the low of learning outcome for geography study due to the low motivation of students. CTL approach uses to increase the motivation and to increase the learning outcomes of students. The objective of study is to improve the students learning outcomes of geography using the Contextual Teaching and Learning (CTL). This study uses a quasi-experimental using both pretest and posttest control group design. The population in this study is a class X at SMAN 10 in Banjarmasin. Sampling technique is cluster sampling technique. Samples of research is class X-3 as the experimental class with the number of respondent is 34 students and class X-2 as the control class with the number of respondent is 36 students. Primary data collection technique use observation and test methods. Data is analyzed using the percentage of enforceability, the calculation of the gain, and the t-test. The results of research shows that the percentage of CTL implementation is 83% or the excellent category. The result of the gain calculation shows that there is a very significant in the experimental class, t_{count}= 23.326. Gain calculation of control class is 10.721. The result of experimental class is greater than the control class. The result of the calculation of the t-test is t_{count} = 6.246, degree of freedom (df) = 68, t_{table} at 1% significance level = 2.39, and t_{table} at the 5% significance level = 1.67. t_{count} is greater than t_{table} at significant level of 1% and 5% (6.246> 2.39> 1.67). The result of calculation shows that there is a difference of geography learning outcomes both experiment class and control class. Geography learning outcome using CTL is better than a conventional method.**

***Keywords*— CTL, Learning Outcomes, Geography**

I. Introduction

Education refers all efforts planned to realize the human as an individual to develop his or her potential to be strong in personalities, religious, uphold, life prosperous, noble, and necessary skills [1][2]. The educational goals can be successful if the learning process is going well.

The learning process has the components to achieve the goal. Reference [3] states that the component is part of a system that has a role in the overall course of a process to achieve system goals. The components of learning include educational objectives, learners, educators, substance or subject matter, approaches, strategies and methods, media or tools, learning resources and evaluation. One important component is the learning model. Learning model is a conceptual framework and a systematic procedure used as a guide both in the classroom learning and classroom tutorial presented by teachers. Learning model will be able to organize a learning experience to achieve the learning objectives [4][5][6].

Learning is a process characterized by a change of knowledge, understanding, attitudes and behavior as a result of their experience with the environment [3][7], and [8]. The success or failure of education goals relies on the learning process experienced of students both in school and in home environment or family members [9].

Selection of learning models should also notice the depth of material and suitability of material being taught, students' characteristics, the teachers' competence and facilities. Contextual Teaching Learning (CTL) is a learning model that emphasizes the involvement of the students to remember the academic material and to connect material with real life situations and to increase students' motivation [4][10][6][11]. CTL makes students construct the knowledge through the analysis and synthesis processes [11].

CTL have more advantages for students. CTL makes high motivation of students to write, high participation in writing class, determining the topic and main idea of writing, developing their writing, helping to solve the problem, preparing way for students to be involved in a discussion and to interact with their friends, helping students to summarize the learning [12][13].

References [4] and [5] states that the Contextual Teaching Learning (CTL) has seven principles underlying the implementation of the learning process. The seven principles are (1) Constructivism, (2) Inquiry, (3) Question, (4) Community Learning, (5) modeling, (6) Reflection (7) Ratings Real.

Reference [14] explains that the problems in geography learning is too much information to be delivered, but too little time available, so that students are not able to explore information, especially on resources beyond textbooks and teachers. The students feel uninterested, bored, and difficult during geography learning. Students only learn a theory without practice; hence students' learning outcomes on geography is very low. Teacher should be able to solve learning problem on geography and to achieve the learning objectives.

CTL makes the lithosphere material fun and interesting. Students interested in the material may increase their learning outcomes. Reference [7] states that the results of learning correlate to the ability of students in receiving learning experience. Obtaining good learning outcomes indicates the good learning process.

CTL can increase students' motivation, and students' learning outcomes in geography lessons [7]. CTL can also improve students' critical thinking skills in geography lessons [15] due to the increasing of students' creativity.

II. RESEARCH METHODS

This research used a quasi-experimental research. Quasi experiment is defined as an experiment that has treatment, impact measurement, and experimental units. Variable control is not used fully to control external variables that affect the implementation of the experiment [16]

The research used Nonequivalent Pretest-Posttest Control Group Design. Nonequivalent Pretest-Posttest Control Group Design were two groups of subjects, i.e. one treated and one group as a control group. The population of research is a class X at SMAN 10 in Banjarmasin. Samples of research are class X-3 as the experimental class with 34 students as the respondents and class X-2 as the control class with 36 students as the respondents.

Pretest and posttest were used to get the learning outcome in the experimental class and control class. The research instrument used in this study was multiple choice questions with 10 points of questions. The research used SPSS 16. Validity and reliability were used for instrumental testing. Validity is presented in equation 1 and reliability is presented in equation 2 [17].

$$r_{x1} = \frac{n\,(\sum XY)-(\sum X)\,(\sum Y)}{\sqrt{\{n\sum X^2-(\sum X)^2\}\{n\sum Y^2-(\sum Y)^2\}}} \quad (1)$$

$$KR_{20} = \frac{n}{n-1}\left[\frac{S_t^2-\sum pq}{S_t^2}\right] \quad (2)$$

The research used difficult test and different test. Data analysis was independent sample t-test. Data were analyzed using Gain Score of students learning outcomes derived from the pretest and posttest. The analysis used SPSS 16. Independent t-test is presented in equation 3 [17].

$$t = \frac{\bar{X}_1-\bar{X}_2}{\sqrt{\frac{S_1^2}{N_1}+\frac{S_2^2}{N_2}}} \quad (3)$$

III. RESULTS AND DISCUSSION

Gain score calculation function is used to determine a significant difference between the values obtained in the students' pretest and posttest. Score Gain calculation results are presented in Table I below.

TABLE I. DIFFERENCES BETWEEN PRETEST AND POSTTEST

No	Class	The number of students	Difference (Gain)	
			t_{count}	t_{table}
1	X-2 (control class)	36	10.721	2.04
2	X-3 (experimental class)	34	23.326	2.04

Source: Data Analysis (2016)

The significant value is difference between pretest and posttest values, both in control group class and experimental group class. This can be seen in both classes that t-count are greater than t-tabel. The control group got the t_{count} (10.721)> t_{table} (2.04) and the experimental class got the t_{count} (23.326)> t_{table} (2.04).

Based on the results it can be concluded that the provision of pretest and posttest is important in learning activities due to the holding of pretest, in which a teacher can know the basic capabilities of students. Posttest is used as an evaluating instrument for the students' understanding on the learning material delivered by the teacher. The increasing of pretest to posttest value explains that the students understand about learning material delivered by the teacher. The data of students' learning outcomes between the pretest and posttest for the experiment class is higher than that of the control class. The research result explains that the CTL increases the learning outcomes when compared with the conventional one.

TABLE II. AVERAGE VALUE OF PRETEST AND POSTTEST

No	Class	The Number Of Students	Average Score	
			Pretest	Posttest
1	X-2 (Control Class)	36	56,94	68,61
2	X-3 (Experimental Class)	34	60,29	87,94

Source: Data analysis (2016)

Based on Table 2 that the pretest value is almost the same between control class and experimental class. Score in posttest between control class and experimental class are different. Posttest score in the experimental class is higher than that of control class due to the CTL is more effective for geography learning when compared with the conventional method.

Prerequisite test uses the normality test and homogeneity test. Normality test uses the Kolmogorov-Smirov's formula. Normality test value of experiment class is 0.058, while that of the control class is 0.110. Both values are greater than 0.05, hence the data are in the normal distribution. Homogeneity test uses the F test, that experimental class and control class show 0.174. This value is more than 0.05, meaning that Geography learning students have a homogeneous variant.

Hypothesis testing is done by using the Independent Sample t-Test in SPSS 16.0 for Windows. The test result is Sig (2-tailed) $\leqslant$ 0.05 (0,000 $\leqslant$ α 0.05). The result of research is that H0 is rejected and Ha is accepted, meaning that there is a significant difference of learning outcome between CTL and conventional learning. The result of the calculation of the t-test shows t_{count} = 6.246, degree of freedom (df) = 68, t_{table} at 1% significance level = 2.39, and t_{table} at the 5% significance level = 1.67. t_{count} is greater than t_{table} at significant level of 1% and 5% (6.246> 2.39> 1.67).

The results of this research indicates that CTL can improve students' learning outcomes on geography in class X at SMAN 10 Banjarmasin. These results indicate that CTL is more effective than that of conventional learning.

CTL is a learning model that emphasizes the process of students' involvement to determine the learning material related to real life situations, then apply it in their lives [4]. CTL forms a system for students to see meaning and remember the academic material [10].

CTL makes students feel pleased during learning process in the classroom. Students are also more active and creative related to the real life. Students are more active in expressing ideas and thoughts either independently or in groups. CTL makes students understand more about material of learning. Students are easier to answer the questions.

The results of this research can be concluded that the students of experimental class using CTL are more active and creative for expressing ideas than than those of the control class. Students become active using CTL, hence students can understand better not only to ask independently, but also in groups. The results are supported by [14], that there is significant influence of application of CTL for geography learning outcomes when compared with the conventional methods..

Excess of CTL is more meaningful and real, due to the students are guided to find the concept through discussion groups. Students have linking skills, thinking abilities, and social skills. Students can develop an the depth idea. Students can do tasks related to their interest. Subject matter of the soil is more effective using CTL. Soil is the object of study related to real life; hence students easily associate with the concepts of soil.

Results of research shows that there are six key differences between using CTL and conventional methods, i.e.:

a. CTL makes students more active and creative when compared with the conventional method

b. CTL makes students reconstruct the subject matter through group work and assignment, while the conventional method makes students memorize the subject matter

c. CTL uses environment as a learning resource, while the conventional method uses the information of teachers and textbooks as a learning resource.

d. CTL is centered on the students, while the conventional method is a teacher-centered learning

e. CTL process of learning is independently conducted by each student or in groups, while the conventional method of learning occurs between teachers and students

f. CTL is supported by instructional media as the modeling material, whereas conventional methods refer to the drawings in book.

IV. CONCLUSION

CTL is more effective for improving of students learning outcomes in soil matters. CTL is easy to implement due to it related to the real life, so that students easily associate with the concepts of soils. In addition, CTL makes students develop deep idea. CTL makes students more active when compared with the conventional methods.

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The Improvement Effort in Evaluation Study Using Problem Based Learning on Hydrology Subject

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***Abstract*—The subject of hydrology at the faculty of civil engineering department water resources is a basic subject that must be fully understood and acknowledged by both students of the faculty of authenticable civil engineering department and faculty of educational civil engineering department. Fundamental condition needed the result of the observation data within all aspects of precipitation, surface run-off, stream flow, infiltration, percolation and evaporation. Therefore, the process of learning requires a good learning pattern. Usually the education model uses lecture-oriented class, which can result in difficulty to understand the basic hydrology subject due to analyzing Water Resources (like calculating water discharge, counting the rain precipitation, etc.) Therefore, research is suggesting Problem Based Learning (PBL) model which ensures the growth sense of motivation, active-learning, independency, responsibility and comprehension in learning Hydrology subject by using multimedia facility (Video lecturing, students presentation, and exemplary picture). Serving a wide variety of video on Hydrology and practical props as a component of the tools used in everyday life with models and methods are expected to be able to encourage the emergence of self-reliance and stimulate student motivation in getting optimal understanding. This is supported by Learning Availability Tools, Semester Learning Plan (RPS), Contextual Lesson Plan (SAP), Student Worksheet and Evaluation Sheet systematically.**

Keywords—Hydrology, Motivation, Evaluation, Unit Lecture Event (SAP)

I. Introduction

Hydrology subject at the Faculty of Engineering Department of Civil inundated the basic subjects that must be understood and mastered by students of a purely civilian and students PTB. Basically the science of hydrology is not an entirely exact science, but it is a science that requires interpretation. Jobs - jobs in hydrology experiments are very limited by the size of natural events and by research into things - certain things. Terms - a fundamental requirement that the need is data - the data observed in all aspects of precipitation, runoff (run off), stream-flow, infiltration, percolation, evaporation, and others. With these data and supported by experiences in much science related to hydrology, and then a hydrologist will be able to provide a solution in relation to the technical planning of the building - the building of water.

While teaching in the observations and experiences during this time, the learning process is generally centered on the lecturer (teacher-oriented). Students only heard faithfully and passive in the learning process that is in line with lectures alone. As a result, an understanding of the science of hydrology as an introduction to the basic science and civil engineering fields inundated more specific the basis for understanding. This case study was undertaken by the means of two directions using the video and power point.

Students' opinions are as follows: the delivery of content is boring and less able to understand and be understood, since the learning hour is at 13:00 implemented on a sleepy hour, they are exhausting because at the beginning of the course is starts with theory. Moreover, the lecturer is less friendly towards students' work. He/she only judged the group presentation display without any further explanation to be understood. The tone of his/her speaking to deliver the lesson is flat that it is difficult to understand. In short, these are some factors of the learning failure that causes lack of human resources lecturer of the course. Mastery of the material, availability and preparation of learning tools such as models of learning, teaching and learning interactions, field experience in taking the example application are needed. Lecturers should obtain a solution as a motivator for learning and seek to improve understanding of the students as the main goal in this hydrological study.

The implementation of PBL model will provide high motivation and more opportunities for students to learn independently or in groups in understanding the material. One way to the above problems is that it is necessary to study a class action in the Hydrology subject. This research will endeavor to increase the motivation to learn in studying and absorbing Hydrology subject, so the obtained understanding is used as the provision of courses and learning to be more readily, especially in irrigation engineering courses.

From the results, some problems that can be identified in Hydrology subject in the Department of Civil Engineering, Universitas Negeri Surabaya are as follows:

- Low yield Hydrology subject affects the understanding.
- The current emphasis on the teacher-oriented needs a touch and fresh initiative to make the learning be more interesting and meaningful.

- Hydrology subject students found difficulties in understanding the presented material.
- The response of students to learn is still low.
- There is still low in monitoring and evaluation of lecturers during the learning process.

The purpose of this paper is to improve the learning outcomes on hydrology subject in civil engineering students at Universitas Negeri Surabaya.

The purposes of this research are:

- to determine whether the application of the model of Problem Based Learning (PBL) can improve learning outcomes in Hydrology subject for civil engineering students at Technical Faculty of Universitas Negeri Surabaya.
- to know the advantages and disadvantages of the application of Problem Based Learning (PBL).

II. LITERATURE REVIEW

A. Assessment Theory

1) Learning and Teaching

Learning is the most basic activity in human learning process especially in achieving the institutional objectives of an educational institution or school. This suggests that the success or failure of an education goal depends on how the learning process experienced by individuals. According to [3], learning is a process of change in behavior due to their training and experience. Usman [5] argues that learning can be interpreted as a change in behavior of the individual, the interaction between individuals, and individuals with their surroundings so that they are able to interact well with their environment.

Based on some expressed opinions, the editorial of course is different from one another. However, all of the opinions refer to the goals, objectives, and the same concept and have the same elements as well, namely:

- the existence of individual learning.
- the existence of learning as a process.
- learning outcomes as a result of changes in behavior.
- the learning process occurs in the interaction with the environment.

2) Hydrology

The Civil Building Engineers are really interested in building the planning and exploitation of water resources, namely water for review control of the use of water, especially that regulate of the river flow, dam - reservoirs and irrigation channels. Therefore, they need to know the science of hydrology use widespread.

3) Problem Based Learning (PBL)

PBL engages students in the inquiry choices which enable them to interpret and explain real-world phenomena and to build understanding of the phenomena. Learning is not designed to help teachers convey large amounts of information to students who are more likely to direct learning and lectures. PBL is designed to help students:

- develop thinking skills, problem solving, and intellectual.
- studying the roles of adults with live up to these roles through situations of real or simulated.
- being independent, autonomous and students.

Here are described and discussed the three purposes above. PBL ultimately strives to provide and help students become independent and students are able to govern themselves (self-regulated students). Teachers/lecturers continuously guide the students by encouraging them to ask questions and provide rewards for weighty questions they ask. With the encouragement of the students to find solutions to real problems are formulated by themselves, then they learn to handle the tasks of finding these solutions independently.

TABLE I. TEACHER BEHAVIOR INDICATOR ON PROBLEM BASED LEARNING

Phase	Indicator	Teacher Behavior
1	Students orientation at issue	Explaining the purpose of learning, explaining the necessary logistics, and motivating students engage in problem solving activities
2	Organize students to learn	Helping students learn to define and organizing tasks related to the issue
3	Guiding experience of individual/group	Encouraging students to gather the appropriate information and carrying out experiments to get an explanation and problem solving
4	Develop and present work	Assisting students in planning and preparing the appropriate work such as reports and help them to share tasks with friends
5	Analyze and evaluate the problem solving process	Helping students to reflection or evaluation of their investigations and the process they use

PBL characteristics are as follows:

- problems are starting points in learning.
- the raised issues are problems that exist in the real world of unstructured.
- problems require multiple perspectives (multiple perspectives).
- problems, challenging the knowledge possessed by students, attitudes and competencies that then require the identification of learning needs and a new area of study.

- learning self-direction becomes the main thing.
- utilization of diverse sources of knowledge, use, and evaluation of resources is an essential process in the PBL.
- learning is collaborative, communication, and cooperative.
- development of inquiry and problem solving skills are as important as mastering content knowledge to find solutions to a problem.
- transparency in PBL processes include the synthesis and integration of a learning process.
- PBL involves the evaluation and review the student experience and learning.

4) Motivation

Motivation comes from the word "motive". It is defined as "the driving force that has become an active". Another opinion also says that motivation is "the state in the one who encouraged him to undertake activities to achieve the goal".

According to Mc. Donald [3], motivation is the energy change in a person characterized by the emergence of feelings and reactions to achieve the goal. In this sense, it can be said that motivation is complex. Motivation will lead to a change in the energy present in humans, so it will cling to the issue of psychiatric symptoms, feelings and emotions, to then act or do something. Thomas L. Good and Jere B. Braphy define motivation as a driving force and steering, which can strengthen and encourage someone to behave. It means the act of a person depends on the underlying motivations.

While the overall motivation to learn is the driving force both from within and from outside the student (by creating a series of businesses to provide certain conditions) which ensures continuity and provide direction on learning activities, so that the desired destination by a subject of study that can be achieved. Motivation to learn can also be interpreted as a series of businesses to provide certain conditions, so someone willing and wanting to do something, and if he does not like, it will seek to eliminate or circumvent the feeling did not like it.

5) Multimedia

Multimedia is a means of media in which there are a mix (combination) of various forms of information elements, such as text, graphics, animation, video, interactive and sound as a support to achieve its goal of conveying information or just provide entertainment for its target audiences. Multimedia is often used in entertainment such as games. Multimedia word itself is derived from the multi (Latin) which means a lot and media (Latin) means something that is used to convey something. Multimedia can be categorized into two kinds, namely linear multimedia and interactive multimedia. Linear Multimedia is a multimedia that is not equipped with any control device that can be operated by the user. Multimedia is running sequential (sequential / straight), for example: TV and movies. While a multimedia interactive multimedia is equipped with a controller (or aids, computer, mouse, keyboard, etc.) that can be operated by the user, so the user can choose what they want to proceed. Interactive multimedia combines and synergizes all media consisting of text, graphics, audio, and interactivity (draft).

B. Frameworks

One model of learning which typically plays the role of teachers/lecturers thrusting authentic problems, facilitates the investigation of students, and fully supports learning in achieving the goal of learning is the Problem Based Learning (PBL). The implementation of PBL model can provide more opportunities for students to learn independently and collectively pose a problem and question, do authentic research, and collaborate to find a solution in addressing the problems that exist with the best creative and full initiative.

C. Hypothesis Action

Based on the above framework of thinking, the research hypothesis of this class action is the adoption of a model with the use of multimedia integrated PBL and practical props can increase the motivation and the understanding of the Hydrology subject at the Department of Civil Engineering students Technical Faculty at Universitas Negeri Surabaya.

III. METHOD

A. Study Design

According to Kemmis and Taggart, action research can be seen as a spiral cycle of preparation of planning, action, observation, and further reflections may be followed by the next spiral cycle. Practice class act that was easily developed by Kemmis and Taggart can be described with a flowchart (Fig. 1).

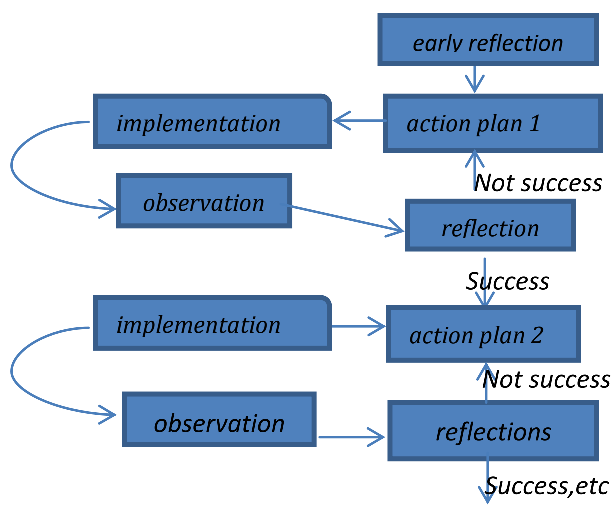

Fig. 1. Spiral Model of Kemmis and Taggar

In practice it is likely investigators already have a set plan of action (based on experience) so that it can directly start the stage action. There are also researchers who already have a set of data, so that they start the first activity with the activities of reflection. But in general, the researchers started from the initial phase of reflection to conduct a preliminary study as a basis for formulating research problems. Furthermore, the necessary planning, action, observation, and reflection can be described as follows.

1) Early Reflection

Early reflection assessments were intended to collect information on relevant situations to the research theme. The researcher and his team did a preliminary observation to recognize and know the true situation. The early reflection focused on problem and then was formulated into a research problem. Therefore, after the formulation of the problem is completed, further research is necessary to formulate a conceptual framework and can set research purposes. In the early reflection, the most prospective researchers examined the theories that are relevant to the issues to be studied.

2) Preparation of planning

All planning is based on the results of assessments of the early reflections. The detailed plan includes actions to be carried out to improve, enhance or change the behavior and attitudes of learners to be desired as the solution of problems. Be aware that this plan is flexible in the sense that can change according to the real conditions that exist. Early preparation is done in connection with a class action research including:

- determining the researcher/lecturer team to dig preliminary data on students characteristics formulates indicators for measuring the success of learning in accordance with the basic competencies that have been set.
- making learning quality assessment instruments faculty, student activities, student motivation, and skills of the students.
- preparing the teaching media materials in the form of handouts, video, active speakers, practical props (components engineering), handouts, and books diktat.
- validating and revising the instrument. Validation was done by the learning experts competent. Based on the expert input, then a team of researchers revise the instrument.

3) Job action

Implementation of stating what actions conducted by researchers in an attempt repair, improvement or change was implemented based on the action plan. The type of action that was taken in the practice class act should always be based on theoretical and empirical consideration for the results obtained in the form of improved performance and results of the program are optimal. In this study, the actions to be carried out are the use of multimedia and practical subjects props Hydrology. At the time of this action research, the team acted as lecturers and the other one acted as the observer.

4) Observation

In this activity, the researchers examined the results or the impact of actions taken or imposed on students. The observation was done by measuring the level of students learning motivation with the observation sheet filled out by the observer.

Fig. 2. Event examined the results of the action against learners

Fig. 3. Observation to measure students learning motivation level with the observation sheet filled out by the observer

5) Reflection

Reflection activity is an activity analysis, synthesis, interpretation of the information obtained during the action activities. In this activity, researchers examined, viewed, and considered the results or impact of the action. Any information collected needed to be studied linked with one another and their relation to the theory or research results that already exist and are relevant. Through a deep reflection, it can be concluded that it was steady and sharp. Reflection is a very important part of observation to understand the processes and outcomes that occur, namely in the form of change as a result of the action taken.

In essence of the Kemmis and Taggart model in the form of devices or strands with each device consists of four components, namely planning, action, observation, and reflection is seen as a cycle. The number of cycles depends on the problems that need to be solved, which is generally more than one cycle. Each cycle is expected to achieve the success at a certain level to really achieve the expected goals.

B. Research Subjects

The subjects of this study were the students of Civil Engineering Education class PTB-B as many as 36 students on the odd semester of 2015/2016 at the Department of Civil Engineering, FT UNESA on Hydrology subject.

C. Location of the Research and Study Time

This study was conducted in Civil engineering classroom of UNESA in A1O3O8 building.

D. Data Collection Techniques and Research Instruments

Data collection techniques in this study were interviews, observation, and questionnaires. The research instruments were in the form of guidelines for observation, questionnaire, student worksheets and texts/the test.

E. Data Analysis Techniques

To get the application of PBL model, there was a need to analyze the data. Data analysis is the process of simplification of data into a form that is more easily understood and interpreted. Data analysis in this research is the Qualitative Data Analysis Techniques which can be described as follows:

1) Each item is scored according to the answers grading scale that is in the observation sheets and students motivation questionnaires.

2) The total score then presented descriptively using a predetermined formula.

a) Analysis of Teaching and Learning Activities: Observation/observations were made every meeting by two (2) observers to fill in the observation sheet that is in accordance with procedures. Observations were made during the preparation, introduction, core activities, closing, time management and control of the classroom atmosphere. Grading in the observation sheet has a score that was converted in the form of a rubric (Table II). Then the average score of observation of each stage were already observed is described by a category which has also been determined (Table III).

TABLE II. VALUE SCORE CONVERSION

Score	Description	Criteria
1	Done, but not finished	not good
2	Do, is less appropriate, unsystematic	not good
3	Done, appropriate and less systematic	pretty good
4	Done, appropriate and systematic	Good

TABLE III. THE AVERAGE VALUE OF OBSERVATION

Average	Description
1,00 – 1,99	not good
2,00 – 2,99	not good
3,00 – 3,49	pretty good
3,50 – 4,00	good

Source: [2]

While data on the learning activities continued with a simple statistical analysis descriptive in terms of percentage (%). The number of values taken from each activity was divided by the number of observer and multiplied by 100% while using the same instrument. Observations were made every 10 minutes once for each SAP/cycle.

b) Analysis of Student Learning Motivation: To find out the result of increased students motivation to learn, use calculation of the percentage of questionnaires. Each item response corresponding statement lattice questionnaire described quantitatively into scoring. The results of the questionnaire are summed stuffing, starting the cycle all cycles 1 to i, then in percentage to obtain a picture of students learning motivation with Problem Based Learning (PBL) model and the prescribed method using the integrated multimedia as one of the supporting infrastructures.

TABLE IV. SCORING ITEM QUESTIONNAIRE STATEMENT

Scoring point statement	Description
1	strongly disagree
2	disagree
3	doubtful
4	agree
5	strongly agree

The data obtained from each cycle were percentage and analyzed using the following formula:

$$PA = \frac{Total\ Score\ Item\ of\ Questionnaire}{Number\ of\ Students} X\ 100\% \quad (1)$$

Information:
PA = Percentage Questionnaire

IV. CONCLUSIONS

Observations were made during the preparation, introduction, core activities, closing, time management and control of the classroom atmosphere. Then, the average score of observation of each stage that was already observed is described by a category which has also been determined. The number of values taken from each activity was divided by the number of observer and multiplied by 100% while using the same instrument. Observations were made every 10 minutes once for each SAP/cycle. To find out the result of increased student motivation to learn, use calculation of the percentage of questionnaires. Each item response corresponding statement lattice questionnaire was described quantitatively into scoring.

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The Effectiveness of Jigsaw II Model in Improving Students' Understanding of Citizenship Education

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***Abstract*— Growing learners' motivation to study through the use of learning model is relevant to the challenges for professional educators. Jigsaw II cooperative learning model was the result of developing Jigsaw cooperative learning pioneered by Aronson. Learning model was a model whose one of the goals is to improve motivation and learning achievements in depth through understanding of lecture matter to study with to be made in more specifically. The effectiveness of jigsaw II cooperative learning model in college was already investigated and analyzed by using a qualitative method. The focus of this research was the effectiveness of Jigsaw II cooperative learning model in improving students' understanding on course materials. The results of the analysis showed that Jigsaw II cooperative learning model was one of the models which was more effective in improving students' understanding on course material of citizenship education in higher education.**

Keywords—Effectiveness, Jigsaw II, Cooperative Learning Model, Understanding

I. INTRODUCTION

Education is an institution that serves as a place to improve the quality of human resources in a better direction and with quality. Through education, every learner is expected to get positive value in enriching scientific knowledge. Expectations through the world of education always soar in every nation including Indonesia. In relation to the learning process, it is better for every educator to use a learning model that is relevant to the material and learners.

Models are used to help clarify procedures, relationships as well as the overall state of what is designed. There are several uses of the learning models during the learning process which among others are: (1) clarify functional relationships among various components, elements or elements of a particular system; (2) provide procedures in the implementation of activities which can be identified appropriately; (3) With the model, the range of activities it covers can be controlled; (4) Models will make it easier for administrators to identify components, elements that constrain barriers if activities are ineffective and unproductive; (5) Correctly identify the ways to make changes, if the opinion of mismatch of what has been formulated exists; (6) Using the model, teachers can arrange student tasks into a unified form [1].

Learning model can be defined as a style or strategy undertaken by an educator in implementing the learning process. Certain procedure needs to be followed to achieve the desired goal. According to various studies, the use of learning models in a lecture can boost learners' understanding of learning materials and achievement. Learning models used by educators tend to vary, and one of the learning models used to improve student learning achievement is Jigsaw II cooperative learning model. Through the use of this learning model, learners are required to understand some lecture materials and then they will share knowledge with other students. Thus, there is a tendency that every student will learn from each other through the understanding they gain assisted by the educator as a facilitator. The uniqueness of Civic Education materials will be a challenge for educators in universities to prove whether through the use of Jigsaw II cooperative learning model can generate changes in understanding of students in college. Through this research, an analysis of the effectiveness of the Jigsaw II cooperative learning model in learning Citizenship Education in universities was presented.

II. THE MATERIAL CHARACTERISTICS OF CITIZENSHIP EDUCATION IN HIGHER EDUCATION

Citizenship Education is one of five traditions of Social Sciences Education on citizenship transmission, which has now developed into three aspects of Civic Education. They are academic, curricular, and socio-cultural aspects. Academically Citizenship Education can be defined as an area of study that focuses its study on all the psychological and socio-cultural dimensions of individual citizenship using political science and education as the basis of its study with its core discoveries enriched with other relevant disciplines and has useful implications for praxis instrumentation of education for every citizen in the context of the national education system [2].

Citizenship Education with a new paradigm is a field of scientific study on educational programs in educational institutions and is accepted as the main vehicle and the essence of democratic education in Indonesia It is implemented through: (1) civic intelligence, namely the intelligence and reasoning power of citizens in the spiritual, rational, emotional, and social dimensions; (2) civic reponsibility, namely awareness of their rights and obligations as responsible citizens; (3) civic participation, which is the ability of citizens to participate on the basis of their responsibility, both individually, social, as well as the future leader.

The Citizenship Education material should include three components, namely Civic Knowledge, Civic Skills, and Civic Disposition [3]. The first component, civic knowledge “relates to what content or value citizens should be aware of”. This aspect concerns academic-scientific abilities developed from various theories or concepts of politics, law and morals. Thus, the subject of Civic Education is a field of multidisciplinary study. In more detail, Civic knowledge materials include knowledge of the rights and responsibilities of citizens, human rights, democratic principles and processes, governmental and non-governmental institutions, national identity, rule of law and free judiciary and impartiality, the constitution, as well as the values and norms in society.

Secondly, Civic Skills include intellectual skills and participatory skills in the life of the nation and the state. Examples of intellectual skills are skills in responding to various political issues, such as designing a dialogue with the DPRD. The example is participating skills that use their legal rights and obligations by immediately reporting to the police for a known crime.

Thirdly, the Civic Disposition, is actually the most substantive and essential dimension in the subject of Citizenship Education. The character dimension of Citizenship can be viewed as the “estuary” of the development of the previous two dimensions. By observing the vision, mission, and objectives of Civic Education subjects, as well as the characteristic of subjects characterized by emphasis on the dimensions of character, attitudes and other potential affective, it is not surprising that the use of Jigsaw II cooperative learning model becomes a right solution.

III. THE JIGSAW II COOPERATIVE LEARNING MODEL

Ref [4] states that a learning model is a broad and comprehensive approach and can be classified based on learning objectives, syntax (pattern sequence), and the nature of the learning environment. Jigsaw II cooperative learning model was developed by Slavin with little difference. By using Jigsaw II cooperative learning model in learning process, in general learners are grouped based on heterogeneous ability. Students are given new material or the previous material to be studied. Each member of the group is randomly assigned to become an expert on a particular aspect of the material. After reading and studying the material, “experts” from different groups come together to discuss the same topics from other groups until they become “experts” on the concepts they study. Students then go back to the original group to teach the topic they are mastering to their group members. At the end, students are given a test or assessment for all the topics provided.

There are some fundamental differences between Jigsaw II cooperative learning model that has been developed by Slavin and Jigsaw I. In Jigsaw I, initially students only learn a certain concept that will be their specialization while the other concepts are obtained through discussion with their partners in the same group. While in Jigsaw II cooperative learning model each student gets the opportunity to learn as a whole the concept that will be discussed in the learning process before they learn their specialty to become expert. It aims to obtain a comprehensive picture of learning materials or concepts that will be discussed.

The use of Jigsaw II cooperative learning model will enable each student to join in a group of experts. The expert will collect all the information, concepts and other skills related to the topic being studied. Students who are members of expert group are also required to teach the topic to members of the original group. In Jigsaw II cooperative learning model students are given the opportunity to collaborate with peers in the form of group discussion to solve a problem. This is because each group consisting of 4 to 5 students has heterogeneous academic ability, so that in one group there will be a highly skilled student, two or three medium-skilled students and a student with low ability.

There are 5 stages of the implementation of Jigsaw II cooperative learning model as follows [5]:

Stage 1: Reading. Students are grouped into basic/origin groups. Each member of the group is given a different sub subject/topic.

Stage 2: Expert group discussion. Students who get the same topic discuss in expert groups.

Stage 3: Group Report. The students return to the base group and will explain what they get in the expert group.

Stage 4: Test. Students are given tests covering all topics.

Stage 5: Group awards. The group score is calculated in the same way as the group scores on the STAD model.

The role of educator in Jigsaw II cooperative learning model is to direct the discussion, both in expert group and base /origin group. It becomes important because students study material rather than learn with lecture methods. In the Jigsaw II cooperative learning model type, students actively build their own knowledge. Students, of course, need the direction of educators to learn the material, especially the new materials.

While applying Jigsaw II cooperative learning model, students are grouped into basic group and then each group member is given different learning material to be studied. Students from the original group will be gathered in the expert group to discuss the materials assigned to each member of the group of experts who will then return to their respective base groups and take a turn for explaining the topics they get to members of their group. At the end, each student will be given a test of the concepts or learning materials that have been studied/discussed in the base group and expert group for all topics during the learning process. The score obtained from the test is considered as group score. The resulting score for their group is based on an increase in scores of each student. Improved scores are based on initial scores and final scores.

The initial score is the score that the student has in the previous learning. The final score is the score that students get in the test given after the learning activities with Jigsaw II cooperative learning model. By comparing the two scores, teachers will get a progressive score of each student. These scoring criteria can be seen in Table 1.

TABLE I. MEASURES CALCULATIONS SCORE PROGRESS

Step 1 Determining the base score	Each student is given a score based on past scores (pre-test)
Step 2 Calculating the latest quiz score	Students earn points for quizzes related to current lessons
Step 3 Calculating the highest score	Students get the development points determined by the basic score and the highest quiz score

The individual progress score can be seen in Table 2 [5].

TABLE II. TABLE OF PROGRESS SCORING CRITERIA

No	Test Scores	Progress Score
1	More than 10 points below initial score	5
2	Between 1 to 10 points below the original score	10
3	Between 0 to 10 points above the initial score	20
4	More than 10 points above the initial score	30

Group awards are awarded based on the progress scores of each group obtained by summing up the progress of each group's score and the score is divided by the number of teams taking the quiz. The average score of this group is also called the achievement score of each group. Based on the achievement scores, teacher gives a prize to each group that meets certain criteria. The criteria are shown in Table 3.

TABLE III. TABLE OF PROGRESS SCORING CRITERIA [5]

No	Criteria	Title
1	$X < 15$	Without title
2	$15 \leqslant X < 25$	Fair Group
3	$20 \leqslant X < 25$	Good Group
4	$X \geqslant 25$	Very Good Group (super team)

For $X < 15$, the groups will not get any title. This will encourage the groups who have not achieved significantly to learn more optimally and be more motivated to study the material well.

IV. THE EXCELLENCE OF JIGSAW II COOPERATIVE LEARNING MODEL

Jigsaw Cooperative learning model learning is a cooperative learning model that focuses on group work in the form of small groups. Jigsaw II cooperative learning model assigns students studying in small groups consisting of 4-6 students who are heterogeneous and students work together to mutually create positive and responsible dependence independently. The steps of Jigsaw II cooperative learning model consist of: orientation, grouping, forming and coaching expert group, group discussion of experts in group, tests (assessment), and group recognition. One of the advantages of Jigsaw II cooperative learning model is to facilitate the work of educators in teaching. This is because there are already groups of experts assigned to explain the material to their peers. The distribution of material mastery can be achieved in a shorter time. This learning model can also be used to train students so they are willing to become more active in speaking and expressing their opinion. The weakness of this learning model is located on the main principle of this learning model, namely 'peer teaching'. This will be a constraint because the differences in perceptions in understanding the concepts discussed with other students can be understood differently by the other students. Learning will be less effective if students have no confidence in discussions or when delivering material to their friends in the original group. Students' understanding about the value, their personality and attention must be familiarized by educators which tend to take a long time in recognizing the types of students in the classroom. Preparation before implementing Jigsaw II cooperative learning model in the lecture process becomes very important for educators.

V. THE EFFECTIVENESS OF JIGSAW II COOPERATIVE LEARNING MODEL IN IMPROVING STUDENT UNDERSTANDING OF CITIZENSHIP EDUCATION MATERIAL

The cooperative learning model has advantages, especially in providing opportunities for students to deepen and understand the lecture materials independently. Through the process of learning independently, students are expected to have excessive desire to maximize their understanding themselves and to help their peers in understanding the material. The citizenship education material which tends to be narrative and needs insight in the form of knowledge of praxis and positive law regulation is considered difficult to be understood individually. Therefore, the use of learning model to help the mastery of the material in depth and thoroughly is needed as an effort to ease the burden of students in the lecture process. The results showed that the majority of students who are studying lecture materials, especially in civic education courses, tend to understand and master the lecture materials more easily. Students prefer Jigsaw II cooperative learning model because they are given an opportunity to explore important materials during lecture process and they also have obligation to convey the material to their peers. These findings are confirmed by [4] who states that a learning model is good in accordance with the following criteria:

The first criterion is valid. The aspect of validity is related to two things: whether the developed model is based on a strong theoretical rationale and whether there is internal consistency. Secondly, the practical aspect can only be met if the experts and practitioners state that what can be developed can be applied and the reality shows that what is developed can be applied. The third is effectiveness which relates to the judgement of experts and practitioners that the model is effective and relates to the desired results of the model.

Ref [4] provides a reinforcement that the Jigsaw II cooperative learning model used during the learning process, especially in the course of Citizenship Education tends to be effective considering the learning model is a learning model that can ease the burden of students in understanding the various materials. The use of this learning model during the lecture process can provide a significant impact on improving students' understanding of the lecture materials being studied.

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David Kolb Learning Styles Influence on the Achievement of Students at Midwifery Care in Pregnancy

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***Abstract*—Students who got the same treatment in the same environment do not always have the same understanding, thinking, and view of the lecture. Kolb divides learning styles into four combinations namely diverger as a combination of feeling and watching, assimilator as a combination of thinking and watching, converger as a combination of thinking and doing, and the last, accomodator as a combination of feelings and actions. Appropriate learning styles can improve students achievement because they will feel comfortable when they follow the course which matches their learning style. The research method used was quantitative with cross sectional study design approach. The population of this research was 153 students and 111 samples were selected using proportionate random sampling technique as well as in the regression analysis. The results of the learning styles from 111 respondents showed that the highest level was the diverger learning style indicated by 65 respondents (58,56%) and the highest educational achievement was the learning achievement B+ by 45 respondents (40,54%). The results of the analysis of regression test obtained diverger value (p=0,287) and assimilator value (p=0,561). Ho was accepted and Ha was rejected; therefore, there was no influence of diverger and assimilator learning styles on Midwifery Care students achievement in pregnancy. In addition, no influence of converger and accomodator learning styles on Midwifery Care students achievement in pregnancy at the Academy of Midwifery Sari Mulia Banjarmasin. Students themselves might be more appropriate in the condition of combining two of learning styles for instance converger and assimilator on Midwifery Care students achievement in pregnancy**

Keywords—achievement learning; David Kolb learning styles; midwifery care in pregnancy

I. INTRODUCTION

Achieving expected successful achievement of students needs careful consideration on several factors that influence it. Success in learning achievement itself is mostly influenced by one's inside and outside factors. The main factors that affect students achievement are internal factors and external factors [1]. Two individuals who grew up in the same environment and got the same treatment would not necessarily have the understanding, thinking, and view to the surrounding world [2]. Each of them has his/her own perspective on every event they had seen and experienced. This perspective is known as learning styles [3]. A phenomenon that occurs grounded that some students do not understand and comprehend the learning style they have. The learning achievement is the students achieved knowledge on a number of specific subjects that have been established every semester including attitude mastery of the material (cognitive, affective, and psychomotor) as a measure of students' success in completing the course. Learning style is believed to give effect to the students' academic achievement. In the reality, it is commonly found that students who learn with their preferred learning style are likely to get good results. The expert in this field named Kolb divides it into four stages of learning poles, the concrete experience (feeling), active and reflective observation (observing), conceptualization (thinking), and active experimentation (acting). The four poles on top form four combinations of learning styles namely diverger style as the combination of feeling and observing, assimilator style as the combination of thinking and observing, converger style as the combination of thinking and acting, and accomodator style as the combination of feeling and acting.

Evaluation is an activity that needs to be done to see how far the educational goals have been achieved by students in the learning outcomes form they showed after the learning process. Further, to determine the effectiveness of the learning experience in achieving optimal learning results, the evaluation is directed to determine the attainment of health professionals as required in the curriculum. Then, to determine the achievement of competencies, the healthcare professionals need to do continuous and constant assessments based on the demands of the competences in the curriculum. Learning is an activity or a process to acquire knowledge, develop skills, improve behavior and attitudes, as well as strengthen the personality. In the context of learning process on acquiring knowledge, according to the conventional scientific understanding, human contact with nature is termed as the experience. Experiences that occur repeatedly spawn the knowledge or body of knowledge. Learning can happen anywhere and anytime, not necessarily in a formal condition in the classroom, but may be informal, non-formal, and as stated above, students can learn from nature or any event.

According to Kolb, there is not any learning style absolutely dominated by any of the poles [3]. What usually happens is they are the combination of the two poles and form an inclination or orientation learning. Four poles on the top form four combinations of the learning styles.

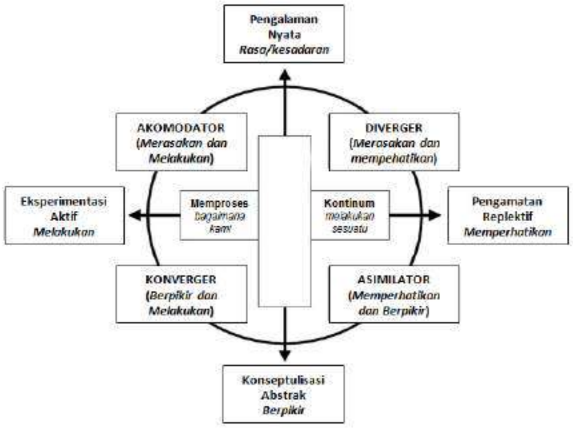

Fig. 1. The picture of David Kolb Learning Styles Inventory [3]

1) Diverger Style

Students with diverger type are superior in viewing concrete situations from many different viewpoints. The approach in every situation is "observing" and not "acting". Such these students like a learning task that demand to generate ideas (brainstorming), love cultural issues and love to collect a variety of information. This type of information is given to respond well if they are given time for reflection. To provide effective learning, teachers must play role as the experts.

2) Assimillator Style

Students with assimilator type have advantages in understanding the variety of offering things and summarizing the information in a logical, concise, and clear format. Usually these types of students pay less attention to other people and prefer abstract ideas as well as concepts. They also tend to be more theoretical. The conversation of these students is built in inductive reasoning way. In order to achieve effective learning, teachers must act as trainers.

3) Converger Style

Students with converger type excel in finding practical functions of various ideas and theories. They usually have good skills in problem solving and decision making. They also tend to prefer technical tasks (applied) than social or interpersonal relations. These students are skilled in implementing the practical application of ideas and using deductive logic to solve problems. Teachers must act as motivators to make the learning effective.

4) Accomodator Style

Students with accomodator type have a good ability to learn from the results of actual experiences they do by themselves. They like to plan and involve themselves in a variety of new and challenging experiences. They tend to act on intuition/instinct than by logical analysis. In an effort to solve the problem, they usually consider the human factors (for feedback/information) than technical analysis. They adept actively link to the real world by learning, by actively do something rather than just reading or learning it from a book. They are able to apply the learning material in real situations to solve everyday problems. To be effective in learning, teachers must provide flexibility and maximize students' opportunity to find something for themselves, and teachers serve as a facilitators.

II. Method

The research method of this study is quantitative method to find a phenomenon, formulate the problem, and connect one problem with another problem systematically. The aim is to develop quantitative methods and use mathematical models, theories and/or hypotheses pertaining to natural phenomena. Meanwhile, the study design approach was the cross sectional study conducted in one term (one-shot studies).

The population of this study was all students of level II Academy of Midwifery Sari Mulia Banjarmasin, a number of 153 students consisting of inasmuch 51 students in class A, 60 students in class B, and 42 students in class D. The samples in this study were 111 Midwife Academy Level II students of Sari Mulia College Banjarmasin. The formula used in determining the sample size in this study is as follows:

$$n = \frac{N}{1 + N\,(d^2)}$$

$$n = \frac{153}{1 + 153\,(0{,}05^2)}$$

$$n = 110{,}87 = 111$$

III. Results and Discussion

A. Results

In this study, both the independent and dependent variables were analyzed using univariate, bivariate, and multivariate analyses.

1) *Univariate Analysis*

Aiming to analyze the study variables based on pre-defined categories. The data processing was performed to determine the distribution of each variable from David Kolb learning styles and the learning achievement of Midwifery Care students in Pregnancy.

a) David Kolb Learning Styles

TABLE I. Frequency Distribution David Kolb Learning Styles

NO	Learning Styles	Total	
		N	*%*
1	*Diverger*	65	58.56
2	*Assimilator*	34	30.63
3	*Converger*	6	5.41
4	*Accomodator*	6	5.41
Total		111	100

b) The learning achievement on Midwifery Care students achievement in pregnancy

TABLE II. FREQUENCY DISTRIBUTION ACHIEVEMENT

No	Achievement	Total	
		N	*%*
1	A-	12	1
2	B+	45	2
3	B	30	3
4	B-	24	4
Total		111	100

2) *Bivariate Analysis*

It aims to select independent variables that can be used as candidates in the multivariate analysis. The influence of each of David Kolb's learning style in learning achievement of students at Midwifery Care in Pregnancy

TABLE III. THE ANALYSIS OF THE EFFECT OF DIVERGER LEARNING STYLES ON MIDWIFERY CARE STUDENTS ACHIEVEMENT IN PREGNANCY

No.	Learning Styles	Achievement				Total	
		A- and B+		*B and B-*			
		N	*%*	*N*	*%*	*N*	*%*
1	*Diverger*	27	24.32	38	34.23	65	58.56
2	No *Diverger*	30	27.03	16	14.41	46	41.44
Total		58	51.35	54	48.65	111	100
Chi Square : P = 0.014 α = 0.05							

TABLE IV. THE EFFECT OF ASSIMILATOR LEARNING STYLES ON THE ACHIEVEMENT OF STUDENTS AT MIDWIFERY CARE IN PREGNANCY

No.	Learning Styles	Achievement				Total	
		A- and B+		*B and B-*			
		N	*%*	*N*	*%*	*N*	*%*
1	*Assimilator*	23	20.72	11	9.91	34	30.63
2	No *Assimilator*	34	30.63	43	38.74	77	69.37
Total		57	51.35	54	48.65	111	100
Chi Square : P = 0.022 α = 0.05							

TABLE V. THE ANALYSIS OF THE EFFECT OF CONVERGER LEARNING STYLES ON MIDWIFERY CARE STUDENTS ACHIEVEMENT IN PREGNANCY

No.	Learning Styles	Achievement				Total	
		A- and B+		*B and B-*			
		N	*%*	*N*	*%*	*N*	*%*
1	Converger	4	3.60	2	1.80	6	5.41
2	No Converger	53	47.75	52	46.85	105	94.59
Total		57	51.35	54	48.65	111	100
Fisher's Exact Test : P = 0.679 α = 0.05							

TABLE VI. ANALYSIS OF THE EFFECT OF CONVERGER LEARNING STYLES ON MIDWIFERY CARE STUDENTS ACHIEVEMENT IN PREGNANCY

No.	Learning Styles	Achievement				Total	
		A- and B+		*B and B-*			
		N	*%*	*N*	*%*	*N*	*%*
1	*Accomodator*	3	2.70	3	2.70	6	5.41
2	No *Accomodator*	54	48.65	51	45.95	105	94.59
Total		57	51.35	54	48.65	111	100
Fisher's Exact Test : P = 1.000 α = 0.05							

3) *Multivariate Analysis*

After the bivariate analysis, only diverger and assimilator have a p-value ≤ 0:25 to proceed to a multivariate analysis that logistic regression analysis. It can be seen in the following table VII, The Regression Logistic Analysis Result.

TABLE VII. THE EFFECT OF LEARNING STYLES DIVERGER AND ASSIMILATOR TOWARDS ACHIEVEMENT SUBJECTS MIDWIFERY CARE IN PREGNANCY

No	Independent Variable	SE	Df	Sig.	Exp(B)
1	*Diverger*	.637	1	.287	1.970
2	*Assimilator*	.345	1	.561	.818

B. Discussion

1) *David Kolb Learning Styles*

As can be seen from the results of the questionnaires given to the respondents, the picture of the four poles of David Kolb learning styles shows the total numbers that can be entered so that it will form a person's learning style with the merger of the two poles of David Kolb. Thus, every individual has the four David Kolb learning styles but there is only one dominant learning style [3]. This can be seen from one column that is larger than the other three columns. Then, the column that the individual learning style. The results of this study indicated that most of the learning style was diverger in which the learning process takes place by feeling and observing [3] [4].

2) The achievement of the learning courses at Midwifery Care in pregnancy has shown the classification of students' achievement. The learning achievement is a change that occurs in individuals from the learning outcomes of four learning styles types of David Kolb students achieved after experiencing a learning process. The results have been evaluated at the end of the semester in the subject of Midwifery Care in Pregnancy. Differences in the number of classification results can provide an estimation of the extent of the learning materials mastery in Pregnancy given to students in a semester. From this study, the most obtained one was B + with the value range from 3:21 to 3:43.

3) The relationship diverger learning style influence on the students learning achievement in Pregnancy resulted the chi-square p value = 0 .014 with a 95 % level of significance or α

= 0:05, this means that Ho was rejected and Ha was accepted, then there is a relationship influence learning styles diverger on learning achievement of students at Midwifery Care in Pregnancy. Although the actual results of this study indicated that most learning styles namely diverger (58.56%) with the highest number of the academic achievement in grades B and B- (34.23%). Even though there is not any influence of the statistical tests, this study has the potential possibilities despite of its weak influence.

4) The relation of assimilator learning styles influence on the learning achievement of Midwifery Care students in pregnancy course.

The Chi-square test results obtained p = 0.022 with the confidence level of 95% or α = 0:05. It means Ho was rejected and Ha was accepted. There is a relationship of assimilator learning styles and the learning achievement of Midwifery Care students in pregnancy.

Although the actual results of this study indicate that most learning style after diverger namely assimilator (30.63%) with the highest number of learning achievement at grades A- and B + (20.72%). In addition, the dominance of students who entered the age of late teens is 101 (90.99%). Even though there is not any influence of the statistical tests, this study has the potential possibilities despite of its weak influence.

5) The relation of converger learning style influence on students learning achievement at Midwifery Care in Pregnancy test results Fisher's exact test obtained the p value = 0679 with the confidence level of 95% or α = 0:05, this means that Ho was accepted and Ha was rejected, then there is not any influence learning styles converger on Midwifery Care students achievement in pregnancy.

6) The relation of accomodator learning style influence on students learning achievement at Midwifery Care in Pregnancy resulted the obtained Fisher's exact test p = 1.000 with a confidence level of 95% or α = 0:05, this means that Ho was accepted and Ha was rejected, then there is not relationship influence learning styles accomodator on Midwifery Care students achievement in pregnancy. The results of this study showed that the learning style that is quite equal to converger is accomodator (5:41%) with a balanced amount of learning achievement at grades A- and B + (2.70%) as well as the B and B- (2.70%).

7) The influence of learning styles on learning achievement of the diverger of Midwifery Care students in Pregnancy result was p = 0287 with a confidence level of 95% or α = 0:05 (p> α). It indicated that Ho was accepted and Ha was rejected. There is not any influence of diverger David Kolb's learning style on Midwifery Care students achievement in pregnancy. Although statistical tests showed no effect, this study shows possible influence on the interpretation despite of its weakness. Because the style of learning is one of the factors that may affect the achievement of students.

8) Assimilator learning styles influence the learning achievement Midwifery Care in Pregnancy obtained the p value = 0287 while assimilator obtained p = 0561 with a confidence level of 95% or α = 0:05. The obtained p> α meaning that Ho was accepted and Ha was rejected, then was not any influence assimilator David Kolb's learning style on Midwifery Care students achievement in pregnancy. Although the results of statistical tests showed no effect of assimilator David Kolb learning style on learning achievement, learning styles also contributed to the academic achievement.

IV. CONCLUSION

Based on the study to 111 respondents regular level II students in the influence of David Kolb learning style on Midwifery Care students achievement in pregnancy, it can be concluded that the most dominant David Kolb learning style was diverger with 65 respondens (58.56). The conclusions of this study are presented as follow:

1) The Midwifery Care students achievement in pregnancy most was B + with 45 respondents (40.54%).

2) The bivariate analysis results showed that there was not any relationship on the learning style of diverger (feeling and observing) to Midwifery Care students achievement in pregnancy. The potential continued to multivariate analysis and obtained p ≤ 0:25. However, in the multivariate analysis result did not also show any influence on diverger David Kolb learning style on Midwifery Care students achievement in pregnancy.

3) The results of the bivariate analysis result showed there was a relationship on the influence of assimilator learning style (thinking and observing) on Midwifery Care students achievement in pregnancy. The potential continued to multivariate analysis for p ≤ 0:25. However, in the multivariate analysis the result showed no influence on assimilator David Kolb's learning style on Midwifery Care students achievement in pregnancy.

4) The results also showed that the bivariate analysis resulted no relationship of the converger influence on learning style (thinking and doing) Midwifery Care students achievement in pregnancy. The potential obtained the multivariate analysis for p> 0:25.

5) The bivariate analysis showed there was not any relationship on the learning styles accomodator (feeling and acting) to Midwifery Care students achievement in pregnancy. The potential proceeded to multivariate analysis for p> 0:25.

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The Differences of Students Learning Outcomes and Metacognitive Skills by Using PBL and Metacognitive-PBL

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Abstract— This study aims to determine the differences of cognitive learning outcome and metacognitive skills between class taught by using PBL and metacognitive-PBL model in salt hydrolysis material. This quasi-experimental research employed the nonequivalent control group design and was conducted at class XI-MIA of SMAN 1 Banjarmasin. The data were collected by using test, questionnaire and interview. They were analyzed using t-test and descriptive analysis. The result of this research showed that there are differences in cognitive learning and metacognitive skills significantly between students who learned by using PBL and metacognitive-PBL model. The students who learned by using metacognitive-PBL model cognitive learning achivement were better than those who learned by using PBL model.

Keywords— Cognitive Learning Achievement, Metacognitive-PBL Model, Metacognitive Skill, PBL Model, Salt Hydrolysis

I. INTRODUCTION

Education is the main capital of a nation in an effort to improve the quality of its human resources. Education should prepare graduates who have high-level thinking skills so that students can solve problems in daily life. High-level thinking skills can be trained with innovative learning to stimulate thinking and learning needs. This can be done in the latest approach that can be used to create a dynamic and active learning environment [1].

The observations and interviews to students and teachers of SMA Negeri 1 Banjarmasin, showed the students just memorized the concepts and did not have good ability to use these concepts when they have problems in real life in relation to the concept of salt hydrolysis. Consequently, the learning achivement achieved by students are beyond the expectations. The learning process should be able to lead the thinking of students so that they will not only remember and understand a variety of data, facts, or concept, but also understand the data, facts, and the concept that can be used as a means to train students' thinking skills in solving problems. According to M. P. Khairuna [2], a person will be successfull in solving the problems, among other things, depends on his awareness of what he has known and how he has done it. This is related to metacognition. Metacognition is a mental activity in cognitive structures that will be done consciously by a person to organize, control and examine the thinking process by himself.

One of the models of learning that can be applied by teachers is PBL or problem-based learning. PBL is a model of learning by getting students to form a knowledge with little guidance or direction of a teacher. PBL helps students to become the self-regulating learners. Teachers continually encourage and reward the students to ask questions and have solutions for real problems, and they will learn to accomplish these tasks autonomously in the rest of their lives [3].

The implementation of the PBL model will make students become actively involved in the learning process. This makes the knowledge becomes more meaningful and makes students easier in understanding it. Thus, the results of the model implementation can improve the student's learning. Problems in PBL will make the students motivated to do metacognitive thinking. By using PBL, the students can give a model of thinking, questioning, criticizing their own ideas and the others' ideas at the same time by exploring new things [4].

Learning process using PBL can make students experience the ambiguity of the problems and be able to find a solution to the difficulties they encountered. This can be overcome by providing questions that guide the students to clarify a problem and help students to solve the problems that they have faced. Through metacognitive questions, the teachers can help the students to be aware of the trending issues and to be able to organize themselves to solve the problems. According to some experts, the metacognitive questions play an important role in making the students' learning process more efficient. For example, questions can help students to: recall their prior-knowledge [5], increase the students' understanding to the task [6], improve their cognitive process [7], use of metacognitive skills [8], improve metacognitive skills [9], and be aware of the problem that they can solve [10].

The study will to determine the differences of cognitive learning outcome and metacognitive skills between class taught by using PBL and metacognitive-PBL model in salt hydrolysis material.

II. METHODS

A. *Research Design Selecting*

This research used the quasi-experimental method with the nonequivalent control group design and was conducted at class XI-MIA of SMAN 1 Banjarmasin Academic year 2014/2015.

B. *Sampling Technique*

The sampling technique used in this research is nonprobability sampling (purposive sampling) [11]. Sample chosen are the XI-MIA1 class as an experimental group and XI-MIA2 class as a control group, each class consists of 36 students.

C. *Instrument and Data Analysis*

The research instruments are tests and non-test. The tests are used for measuring the students' cognitive achievement. The tests are in the essay forms. Validity of instrument is determined by the judgment of six validators. Based on calculations using the equations CVR (Content Validity Ratio), the result is obtained = 1. This indicates that the instrument of cognitive learning is valid for knowing metacognition skills. The non-tests are questionnaire of metacognition skills and interview guides. The results of validation questionnaire on metacognition skills indicate that any statement on the instrument has the CVR that is equal to 1, so that the non-test instruments are feasible to be used as the instruments in this research.

The valid instruments are subsequently tested before being used in research to determine the level of reliability. Based on calculations by the Cronbach alpha formula, the obtained value of the degree of cognitive achievement test = 0.48l; metacognition skills test = 0.58 in the medium category, and the questionnaire on metacognition skills = 0.87 in high category.

Data were analyzed using descriptive and inferential analysis. Inferential analysis used in this research is a t-test. T-test term refers to the test of normality and homogeneity of data. This test aims to determine whether there is a difference is generated between the control group and the experimental group..

III. RESULTS

A. *Student Learning Achievement*

Students are given a pretest before learning to know their initial cognitive learning achievement. After learning process ends, the students are given a posttest to determine their cognitive learning achievements. Data of pretest and posttest of cognitive learning achievements can be seen in Table 1.

TABLE I. PRETEST AND POSTTEST RESULTS OF STUDENTS' LEARNING ACHIEVEMENT

Learning Result (%)	Category	Frequency Experiment Class		Frequency Control Class	
		Pretest	Posttest	Pretest	Posttest
100	Special	0	0	0	0
76-99	Very good	0	10	0	1
60-75	Good	1	7	0	7
< 60	Less	35	19	36	28
Total		36	36	36	36

Based on the data in Table 1 above, we can calculate the average value of a class that can be seen in Table 2 below.

TABLE II. AVERAGE VALUE OF STUDENTS' LEARNING ACHIEVEMENT

Value	Experiment Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
Lowest	0	10	0	0
Highest	70	90	50	80
Average	25,55	53,88	19,16	42,22

Data of cognitive learning results of the two subsequent classes are categorized based on the applicable standard of completeness. The data from Standard of Minimum Learning Mastery) (SKBM) can be seen in Table 3.

TABLE III. STANDARD MASTERY OF LEARNING

Value	Experiment Class	Control Class	Information
< 80	26	35	Not Complete
≥ 80	10	1	Completed

Data of cognitive achievement obtained from the pretest and posttest data is then processed into N-gain to determine the extent to students in each class that have increased cognitive achievement after participating in the learning on the salt hydrolysis material. The average N-gain obtained and interpreted in accordance with the criteria proposed by Hake [12] as shown in Table 4 below.

TABLE IV. INTERPRETATION OF N-GAIN STUDENTS LEARNING ACHIEVEMENT

Class	Average N-gain	Category
Experiment	0,40	Moderate
Control	0,29	Weak

Based on the calculation of normality and homogeneity test of pretest and posttest data, the data of students learning achievement was normal and homogen. So, analyze of the hypothesis can use t-test.

The t-test was used to determine the difference of students' learning achievements between experiment class and control class. The t-test result can be seen in Table 5.

TABLE V. THE RESULTS OF T-TEST OF STUDENTS COGNITIVE LEARNING

Class	N	Db	$\bar{X}$	S	t_{count}	t_{table}	Information
Experiment	36	35	53,88	524,72	2,29	2	H_0 rejected There is significant difference
Control	36	35	42,22	378,58			

B. *Metacognition Skills of Students*

TABLE VI. DATA FROM STUDENTS' METACOGNITION SKILLS GAINED FROM THE PRETEST AND POSTTEST CAN BE SEEN IN TABLE 6.

STUDENTS' METACOGNITION SKILLS

Value Inter-val	Category	Frequency Experiment Class		Frequency Control Class	
		Pretest	Posttest	Pretest	Posttest
0-20	Undeveloped	17	0	12	0
21-40	Still very risky	17	8	22	15
41-60	Began to grow	2	18	2	13
61-80	Already well developed	0	10	0	8
81-100	Developing very well	0	0	0	0

Based on data from Table 10, we can calculate the average value of a class that can be seen in Table 7.

TABLE VII. AVERAGE VALUE PRETEST AND POSTTEST IN METACOGNITION SKILLS

Value	Experiment Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
Lowest	0	29,16	0	24,99
Highest	45,83	79,16	41,66	79,16
Average	21,05	53,34	21,98	43,96

Overall, the percentage of posttest classification at each indicator metacognition skills experimental class and a control class contained in Fig 1.

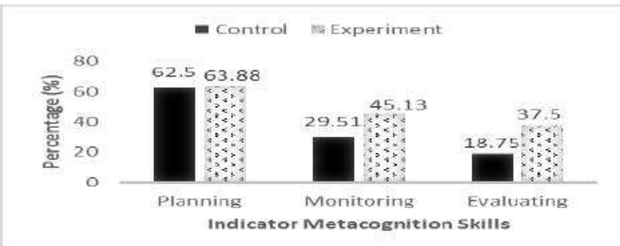

Fig 1 Percentage of the average results of the written test on every indicator of students' metacognition skills of experimental class and control class

Data of metacognition skills test obtained from the pretest and posttest data are then processed into N-gain to determine the extent to which students in each class increase metacognition skills after participating in the learning process on the material of salt hydrolysis. Average N-gain can be shown in Table 8.

TABLE VIII. INTERPRETATION N-GAIN STUDENTS' METACOGNITION SKILLS

Class	Average N-gain	Category
Experiment	0,40	Moderate
Control	0,27	Weak

The statistical test of homogeneity and normality of pretest and posttest 0n metacognition skills data show that the data of pretest and posttest on metacognition skills are normally distributed and homogeneous or similar. So, the further analysis can be done by using t-test.

The results of the t-test of students' metacognition skills in the experimental and the control can be seen in Table 9.

TABLE IX. THE RESULTS OF T-TEST OF STUDENTS METACOGNITION SKILLS

Class	N	Db	$\bar{X}$	S	t-count	t-table	Information
Experiment	36	35	53,34	155,16	2,72	2	H_0 rejected There is significant difference
Control	36	35	43,96	261,47			

C. *Questionnaire of Metacognition Skills*

Data Results of the questionnaire of students' metacognition skills acquired from pretest and posttest can be seen in Table 10.

TABLE X. LIST OF THE PRETEST AND POSTTEST QUESTIONNAIRE OF STUDENTS' METACOGNITION SKILLS

Value Inter-val	Category	Frequency Experiment Class		Frequency Control Class	
		Pretest	Posttest	Pretest	Posttest
0-20	Undeveloped	0	0	0	0
21-40	Still very risky	0	0	0	0
41-60	Began to grow	8	4	5	3
61-80	Already well developed	25	25	29	30
81-100	Developing very well	3	7	2	3

Based on data from Table 16 above, we can calculate the average value of a class that can be seen in Table 11.

TABLE XI. AVERAGE VALUE OF PRETEST AND POSTTEST QUESTIONNAIRE OF METACOGNITION SKILL

Value	Experiment Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
Lowest	50	54	49	53
Highest	93	93	86	92
Average	67,4	72,4	68,02	70,0

Overall, the percentage of posttest classification at each indicator of metacognition skills of experimental classes and control classes are in Fig 2.

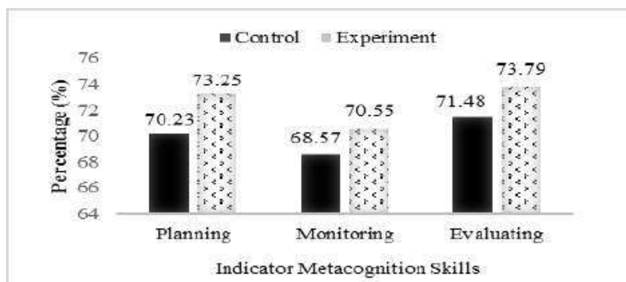

Fig 2 Percentage of questionnaire result in each indicator of students' metacognition skills of experiment class and control class

D. *The Average Value of Skills Metacognition*

The average value of each indicator metacognition skills can be seen from the results of written tests, and questionnaires of metacognition skills can be seen in Fig 3.

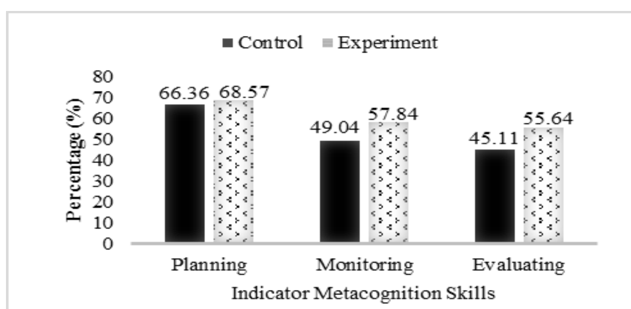

Fig 3 Percentage of questionnaire result in each indicator of students' metacognition skill of experiment class and control class

IV. DISCUSSION

A. Student Learning Achivement

Cognitive achievement tests are performed twice: before learning (pretest) and after learning (posttest). Based on the results of the homogeneity test, pretest results of students in the experimental class and control indicates as homogeneous. In addition, based on the results of inferential analysis using t-test on the pretest, students in both classes have no significant difference in cognitive achievements between experimental and control class students.

Based on the test results of inferential analysis using t-test, it can be said that there is a significant difference on the result between these two classes after being given the treatment. The difference is due to the learning achievement of the experimental class using metacognitive-PBL model, and learning achievement in class control using PBL model. Metacognitive-PBL model is able to create a conducive atmosphere of learning. This is because the students are more active, more likely to be enthusiastic in accomplishing the given tasks, and of course it will affect their learning achievements.

Comparison of improvement of students' cognitive learning achievements in the experimental class and control one can be known by determining the value of N-gain in both classes of the pretest and posttest for each class. The research showed the average value of the two classes of N-gain, then they are compared to determine which class whose cognitive learning achievement is better. The average of N-gain of experimental class is 0.40 and it is included in the medium category, while the average of N-gain of the control class is 0.29 and it is included in the weak category.It can be said that the metacognitive-PBL model is more effective in improving the students' cognitive learning achievements in this research.

B. Metacognition Skills

Metacognition skills tests are performed twice: before learning (pretest) and after learning (posttest). All the students in the experimental and the control classes still have the very risky metacognition skills. It can be said that the students in both classes have equal metacognition skills. This is in line with the results of t-test which is performed on the data of pretest results showing that there is no difference in the test of metacognition skills in the experimental class students from that of the grade control ones. Based on the inferential analysis using t-test on the posttest data from experimental and control class students, it is known that there is a significant difference in the test results.

The difference of metacognition skills results between two classes are because the experimental class was taught using the metacognitive-PBL model while the control class was taught using the model of PBL. In the PBL model, the teaching process still encounters obstacles such as: there are still many students who are difficult to understand the problem, they are still difficult to express ideas openly and freely, they are difficult to formulate hypotheses and determine the solution of the problem [10]. The use of metacognitive questioning helps students realize that the troubleshooting process can set their own progress in solving the problem. So, learning by using metacognitive-PBL model will facilitate students in solving problems. In addition, students will be encouraged to think and get more focused in solving problems so that metacognition skills will be more developed.

Implementation of learning in the experiment class by using metacognitive-PBL model is done by giving a problem to students in the form of student's worksheet (LKS). Each metacognitive-PBL model activity is linked to the students' metacognition skills so that there is a difference in posttest performance between the two classes of the samples of research. The first stage in the metacognitive-PBL model can directed to the students to solve the problem. Students are expected to understand the problem that are presented in an authentic discourse and answer comprehension questions. Indicator of metacognition skills in this first stage is planning.

The second stage is to prepare the students to learn. The ability to be expected at this stage is that they begin to gather and discuss with each group and are asked to answer the question. Indicators in this second phase are still related to planning skills.

The third stage is to assist independent and group research. At this stage, the students are expected to be able to carry out an investigation to find solutions to the problems that they have faced and the students are also asked to answer strategic questions and reflective questions (skills related to monitoring). Indicators of metacognition skills in this third stage is monitoring. After investigating, the students are expected to check back on their results.

The fourth stage is developing and presenting the artifacts and a displayed objects. The students are expected to present the results of their discussion in front of the class and answer comprehension questions, which is related to the intent of the problem and understand the answers of reflective questions (skills related to monitoring) in order to check the submitted answers.

The fifth stage is to analyze and evaluate the problem-solving process. The students are expected to see the steps that are used from the beginning to the end in solving the problem, whether it is appropriate or there are still shortcomings (not optimal) by answering the questions (skills related to evaluation). Indicators of metacognition skills that illustrates this is the evaluation.

Students are required to solve the problem by answering questions related to metacognition skills such as planning, monitoring and evaluation. Students in high category have been able to explain the problem. They write data to know how to overcome the problem. Data written are complete and correct. Higher level students have been able to explore their knowledge to solve the problems, because they are already skilled in the use of planning skills for those who have understood the content of the questions well. They explore their mind to recall their background knowledge that will help them to complete the task, and they know what to be done first to complete the task [13].

Students have a good knowledge so that they can solve problems by applying the good strategy. This is in relation to [2] that a person's success in solving the problem depends on his awareness of what he has known. However, on questions, related to the monitoring skills when students are asked to check the results obtained, they have not been able to reveal the reasons why the strategy adopted is right or not. According to [14], the students have limited ability to express ideas or thoughts, but they may also be able to explain ideas in a different way, so they only give reasons as what comes from mind.

Questions related to the evaluation skills ask the students to see whether the measurement from beginning to end have been appropriate as it was previously planned. However, in answering the questions, the reasons are linked with strategies implemented using a planned strategy to resolve the problems.

High category students have not been able to answer questions related to the evaluation skills well because they are not familiar to answer the questions on evaluation skills as the test item. They are still not trained optimally and only have a small quantity in the learning process. Questions pertaining to the evaluation skills need to be trained regularly to develop their evaluation skills. The students who are included in the category of metacognitive skills are already well developed.

The students in moderate category answering the questions related the planning skills on the first question indicate that they are able to reveal problems in the right ways. The written data are also appropriate. But they do not have a good ability to determine a strategy to solve the problem as expected. They are only able to write a general strategy in which they do not mention the details of the steps that will be used to solve the problems. This is because they have difficulties in revealing a strategy or a plan for solving the problem. This is in line with [15] that the respondents find it difficult to make a planning to solve the problems.

Furthermore, based on the students' answers to questions related to planning skills, in other questions the students have been able to mention the application of these questions, but the their answers are incomplete. Then when they are asked to identify the data, they are able to mention them, but there are mistakes in writing the chemical formula for the compound. They do not mention in detail what steps that should be done in solving the problems. This is because they have never encountered such problems. According to Polya, at the stage of thinking of a plan, the student must be able to think about what steps are important and support each other in order to solve their problems. He also says that the ability to think in right way can only be done if the students have previously equipped with the adequate knowledge in the sense of the issues that they have faced, not new at all but a kind of approach [16].

Students are trained in monitoring or examining the results of problem solving so that they are less precise in the disclosure of the reasons of why the answers given are appropriate. They do not have the skills of a good monitoring in solving this problem because they do not determine and understand the right strategy to solve the problem. They need to monitor their understanding of the main ideas. However, the monitor is not appropriate if they do not understand what the main idea is or how to find it [17]. They are not accustomed to and trained in skills of evaluation. They are not able to give exact answers as expected. They do not disclose the reasons for linking the strategy adopted by the strategy that has been previously planned. Thet also provide answers to the other questions through the strategy that has been applied in accordance with the planned strategy, but they do not mention in detail of the strategy that will be done in solving the problem. The strategy adopted is not proper to assess the students' answers on the skills of evaluation. They are included in the category of metacognition skills for starting to develop.

Low category students' answers to questions related to planning skills on the first question shows that students are able to reveal problems with the right, the data is also right, but the strategies was mentioned to solve the problem was considered inappropriate because it is still very general. Students have not been able to write a problem solving strategy as expected due to the low level of students who do not know what they needs to be written in making the settlement plan.

The students' answers to questions related to planning skills in other questions showed that the students have not skilled in the use of good planning skills when they asked to explain problem, they said the data that was known the matter and when they asked to determine the strategy in solving the problem. This caused the students do not understand the problem fully. Student is said to understand the problem if students are capable to understand and asked the answers of the given problem [18]. Based on these opinions, it is normal that students have not been able to reveal the appropriate strategies to solve problems because the students themselves do not understand the problem well.

Students feel that they have answers in right way, but truly, it is not appropriate because the students still do not understand or less mastered with the material that being tested. Refer to [19], which stated due to lack of mastery of the concept of prior knowledge, the students did not realize that they did not know. It appears that the self-efficacy or students' own estimates about themselves less. Students did not have the right strategy to solve the problem so it can be said that the students have not been trained in the use of monitoring skills. One reason is that students have not been able to make plans that define the right strategy in solving the problem. There is a strong relationship between the success of solving problems with a person's ability to monitor the process of thinking [20].

According to the students, the strategy that has been applied in accordance with the planned strategy is appropriate, but students do not mention the detail of the strategy that will be done in solving the problem, but the strategy that was adopted was not proper. Students have not been trained in the use of skills evaluation. Furthermore, the other students did not answer questions related to the evaluation skills. Students are not skilled in the use of planning skills and also monitoring properly. The skills of planning, monitoring and evaluation are related to each other in solving problems. So, three components of metacognition, which are planning, monitoring and evaluation as a series of interrelated in metacognitive activities [21]. Students in low category of metacognition skills are still very risky.

Overall, interviews showed that students from the lower class and middle-class is still less skilled in the use of metacognition skills of planning, monitoring and evaluation in problem solving, so the skill category metacognition is still very risky for students of lower class and began to develop for middle grade students. Basic knowledge of the material that being tested is also an important factor in the use of components of students' metacognition skills. Lack of knowledge of students about the material that being tested will impact the students but also decision to solve the problem.

The success of metacognition skills in the experiment class can only be seen by the results of the written test, but can also based on the results of questionnaires metacognition skills. The average results of the questionnaire showed that the experiment class and control class are equal in the category and already well developed, but the average value of the experiment class is higher at 72.47, while the control class is 70.02. This happens because the *metacognitive-PBL model* is applied to the experiment class that had a positive impact on learning, including the metacognition skills of students. The results are consistent with the results of research according to [10], that the granting of questions of metacognitive gave a positive impact on learning, among others, (1) make students more cautious in making decisions, (2) make students more courageous in expressing opinions, (3) make students more passion for achieving results better, and (4) raises the curiosity of students. Learning that utilizes metacognitive question is able to create an atmosphere conducive to learning. This is because students are more active, more likely to survive in the given tasks.

The results of the written test in experiment class and control class indicates that the indicator of metacognition skills achieved by the student with the highest percentage, medium, and lowest in succession are the skills of planning, monitoring and evaluation. This is in contrast to the results of the questionnaire metacognition skills, where skills indicators achieved by the student with the highest percentage, medium, and lowest in a row is a skill evaluation, planning and monitoring.

The big differences of sequence metacognition skills student achievement indicators caused when filling questionnaires disadvantaged students to assess themselves. Students having difficulty in conducting self-assessment of what they have done to resolve the problems contained in the problem so that in filling out the questionnaire used as an instrument of self-assessment showed that students have a good self-assessment against the use metacognition skills in solving problems. This resulted in the achievement indicator of metacognition skills based on questionnaire results that are not in line with the results of the written test. Refer to [22] that people generally choose the option that they think is reasonable and is the optimal choice in the self-assessment, so that there is a failure to recognize that a person has the skills or abilities are weak and will produce the opinion that a person has the skills or abilities are good.

The result of the calculation of the average of each indicator skill of students' metacognition in experiment class and control class can be seen by the results of the written test and the results of the questionnaire skills of metacognition that indicates the skills of the students in planning is the monitoring. While the lowest percentage achieved by the students is the skill of evaluation. The results of this study are consistent according to Dignath et al. [23], based on the results of investigating studies, the effect of self-regulation training on learning and strategy used among the students in grade 6 indicates that the metacognitive strategy training in planning and monitoring are more successful than metacognitive strategies in the planning and evaluation. The average result shows that the metacognitive strategy training in the planning and monitoring is 1.50, while the average result of the training of metacognitive strategies in the planning and evaluation is 1.46.

C. *Relationship Between Metacognition and Cognitive Learning*

Metacognitive skills are believed to have an influence on the students' cognitive learning outcomes. It can be seen that the higher class students having the metacognitive skills have already well developed (score of 79.16). Seen from the cognitive learning, they are in a very good /optimal level (score of 90) and have reached SKBM (minimum standard of learning mastery). It can also be seen from the lower class students. The lower class students who have metacognitive skills are still highly at risk (score 37.49), when the cognitive learning is at a low level (score of 10) and have not reached SKBM. The students with high metacognitive skills, also have high learning achievement and so on.

According to [24] metacognition especially has an important role in improving the ability to learn and solve problems. There is a very close relationship between learning outcomes and metacognitive skills, and both are an integral unit. Efforts to improve the person's cognitive abilities should be supported by increasing metacognitive skills, and vice versa. In implementing the problem-solving activities, cognitive and metacognitive processes can take place in tandem, and mutually support each other.

Middle class students have started to develop metacognitive skills (score 58.33). Seen from the cognitive learning, they are in a very good/optimal level (score of 80) and has reached SKBM. Based on the result, it seems that the cognitive learning achievement is better than that of metacognitive skills. That is because the students have not been trained in the use of metacognitive skills when solving problems. The metacognitive development is not an automatic process, but is the result of a lengthy development process of the cognitive system [25].

Based on observations and discussion, the findings obtained are:

(1) Metacognitive-PBL model can facilitate the students' learning to develop skills such as metacognitive skills of planning, monitoring and evaluating to facilitate students in solving problems.

(2) Students can establish the facts and concepts through the provision of supported problems with questions guiding the students to clarify a problem and resolve the issue so that they do not only develop their cognitive abilities but also develop their metacognitive skills

V. Conclusions And Recommendations

Based on the results of research and discussion, we can conclude that: (1) there are significant difference in cognitive learning outcomes between the students who learn the material of salt hydrolysis using metacognitive-PBL models and those who learn the material of salt hydrolysis using PBL models, and (2) there are significant difference in cognitive learning outcomes between students who learn the material of salt hydrolysis using metacognitive-PBL models and those who learn the material of salt hydrolysis using PBL models.

The suggestions are: (1) the teachers of chemistry can consider to implement a metacognitive-PBL model to improve learning outcomes and students' metacognitive skills of, (2) teachers and others who will use the metacognitive-PBL model in the learning activities, should set the time precisely because this model requires more time, (3) the teachers should provide more guidance to students when giving a training of metacognitive skills in the learning process of metacognitive skills so that the students can develop better.

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Profile of Students' Thinking with High Achievement in Solving Mathematical Problem Based on Reasoning in Gender

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***Abstract*—Curriculum 2013 appointed by the government since 2015 uses a scientific approach to the mathematics learning in the classroom. The scientific approach is used to introduce students to the variety of mathematical problem to be solved. It makes students to be familiar in reasoning to solve mathematical problem. Based on this consideration, the aim of this study is to find out students' who have high learning achievement thinking profile in solving mathematical problem based on reasoning in terms of gender. This study was conducted by using explorative qualitative method. The sample of the study were students of SMPN 13 Banjarmasin. The result of this study indicated that (1) the male subject can understand the problem, devise and implement a plan to solve a problem poorly, not look back and has a give up sprit; (2) the female subject can understand the problem, devise and implement a plan to solve a problem very well, looking back, and structure thinking perfectly.**

Keywords*— *High Achievement, Mathematical Problem, Profile, Thinking, Gender

I. INTRODUCTION

Mathematics is one of the basic sciences that can be applied to other fields of science. For example, in the health field, mathematics is used to find a mathematical model of a disease, while in the engineering field, mathematics is used to design a building that is strong and stable. In order to create it, a person requires special ability that is problem solving. Problem solving is one of the important skills [1], [2], [3]. Therefore, the problem-solving ability needs to be instilled as early as possible through learning in school.

The concept of mathematical abilities is not something that is frequently discussed [4]. In language, ability can be defined as potency to do something [5]. It means, mathematical ability is the potency to do math. Mathematical ability is a human construct which can be defined as cognitive or pragmatic, depending on the purpose of the definition [6]. Mathematical ability contains some standards such as problem solving, reasoning, communication, connections and representation [7]. Therefore, the mathematical ability highlighted is potency to solve problem involving reasoning.

The problem usually contains a situation that encourages a person to solve it, but he/she does not know directly what should be done to it [8]. [9] argues that not every problem can be called as a problem. The characteristics a question referred to the problem contains at least two things: question challenging the mind and question is not automatically known way to resolve it. Mathematical problem by [10] is divided into two kinds that is the problem to find and the problem to prove. In the problem to find, the students are expected to find a solution to the problem. The problem to prove, the students are expected to show the truth of a theorem or statement. Mathematical problem that is truly problematic and involve significant mathematics have the potential to provide the intellectual context for students' mathematical development. In addition, one kind of mathematical problem is word or story problem. The story problem is not problematic enough for students and hence should only be considered as exercises for students to perform [3].

Furthermore, mathematical problems have benefits with criteria: (1) the problem is important, useful mathematics embedded in it, (2) the problem requires higher-level thinking and problem solving, (3) the problem contributes to the conceptual development of students, (4) the problem creates an opportunity for the teacher to assess what his or her students are learning and where they are experiencing difficulty, (5) the problem can be approached by students in multiple ways using different solution strategies, (6) the problem has various solutions or allow different decisions or positions to be taken and defended, (7) the problem encourages students engagement and discourse, (8) the problem connects to other important mathematical ideas, (9) the problem promotes the skillful use of mathematics [3].

Students have their own way to solve mathematical problem. Problem solving is an effort to find a way out of a difficulty for reaching a goal which is not so easy to immediately achievable [10]. The problem solving refers to mathematical tasks that have potential to provide intellectual challenges that can enhance students' mathematical development [3]. Problem solving is a complex cognitive activity, as a process to fix a problem which encountered and required a number of strategies to solve them. Training students to solve the problem in mathematics learning does not solely expect students to complete a given question or problem. However, it is expected to become a habit in problem solving process and make it able to live a life of the complexity of the problem [11]. Based on these definitions, we can conclude that problem solving is an attempt to find a solution that involves complex cognitive activity to determine the result.

A complex cognitive activity in solving problem needs to describe the process. Thinking process is a step of students thinking to determine the intended results. A student's thinking needs to be visible for a teacher to identify misconceptions or to decide how to move the student's thinking forward [12]. Therefore, student's thinking processes in solving mathematical problem need to be described through thinking profile.

All this time, student's thinking processes described for solving mathematical problem through problem-posing [13], using the strategy of working backwards which in terms of achievement [14], based on the step Polyain terms of adversity quotient [15], based on linguistic, logical-mathematical, visual and spatial [16]. Based on the studies that have been done about the thinking process, the researcher is interested in investigating profile of students' thinking that have high achievement in solving mathematical problem based on reasoning in gender.

Gender difference has become a hot issue being discussed in several research topics. The performance of male students are better than female students in solving problems a graph at the age of 9-12 years in Australia [17]. There was no significant difference in the ability of students mathematics in terms of gender in the field of geometry [18]. There was no significant difference in the student's ability to solve mathematical problems in terms of the overall gender differences in TIMSS 2011.

However, there are 20 of 42 countries that participated in TIMSS 2011 showing that there was significant differences in the ability to solve mathematical problems in terms of gender. One of them was Indonesia. Results of the research conducted by TIMSS 2011 showed that students of Indonesian women are better than male students in solving mathematical problems. It can also be seen from the acquisition of the average score of female students at 392 points and the male students at 379 points [19].

SMPN 13 Banjarmasin is one of schools that implements the 2013 curriculum as appointed by the government. Curriculum 2013 uses a scientific approach to the mathematics learning in the classroom. The scientific approach introduces students to the variety of mathematical problems to be solved. It makes students to be familiar in reasoning to solve mathematical problems. Based on these condition, this article describe profile of students' thinking that have high achievement in solving mathematical problem based on reasoning in gender.

II. Method

This research is a qualitative descriptive with explorative approach. The subjects were students that have high achievement which consists of 1 male (S1) and 1 female (S2). The subjects selection was based on the results of the middle test.

The instruments of this study were the researchers themselves, problem solving ability test, and interview guidelines. The problem solving ability test was adopted from TIMSS. Guidelines for the interview consisted of questions that were used to clarify data from the results of problem-solving ability test. Guidelines reference to Polya steps is understand the problem, devise a plan, carry out the plan, and look back in details can be described as follow:

TABLE I. INDICATORS OF PROBLEM SOLVING

Polya Steps	Indicator
Understand the problem	Students can specify the available information given to questions.
Devise a plan	Students have a problem-solving plan which he/she used and reason for it.
Carry out the plan	Students can solve the problem with the steps that he/she uses.
Look back	Students check his/her written work

Data analysis was done by reducing the data, presenting the data, and drawing conclusions. The validity of the data was done by triangulation between the data from the students' written work and interview.

III. Result And Discussion

Student 1 (S1) could mention things that are known and asked the problem. The following are some excerpts of the interview:

Researcher	:	*Try to explain what do you know on this problem, S1?*
S1	:	*Teachers and doctors each has 45 books. 4/5 of the books belongs to the teacher and 2/3 books that belongs to the doctor is novel.*
Researcher	:	*Asked the problem?*
S1	:	*Which novels at most, teacher or doctor? How much difference does the novel that belong to teacher and doctor?*

S1 devised a plan by looking at equivalent fractions from the known book. Following is some excerpts of the interview:

Researcher	:	*How do you solve this problem?*
S1	:	*Equalizing the denominator 4/5 and 2/3.*

S1 could carry out the plan, but it was still not perpect. S1 felt difficult to determine the final result. Following are some excerpts of the interview:

S1	:	*4/5 is equal to 2/3.*
Researcher	:	*Then?*
S1	:	*(be quiet)*
Researcher	:	*How?*
S1	:	*It is this way.*

S1 did not look back to his works because he constrained to solve this problem. Following the structure of S1 thinking:

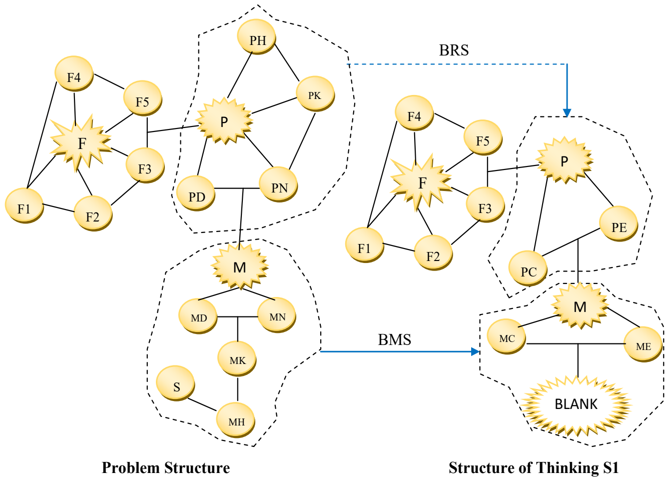

Fig.1 The Structure of S1 Thinking

TABLE II. INFORMATION FOR STRUCTURE OF THINKING S1 DAN S2

Code	Information
F	problem
F1	knowing that teachers and doctors each have 45 books
F2	knowing that 4/5 of teacher books is novel
F3	knowing that 2/3 of teacher books is novel
F4	asking about the book which is more novel.
F5	knowing about the difference between novels that belong to teacher and doctor
P	making a devise plan
PD	making a plan to create multiplication operation between part of teacher books and all of books.
PN	making a plan to create multiplication operation between part of doctor books and all of books.
PK	making a plan to compare teachers and doctors books
PH	making a plan to determine the difference between teacher and doctor books
MD	carrying out the plan 'PD'
MN	carrying out the plan 'PN'
MK	carrying out the plan 'PK'
MH	carrying out the plan 'PH'
S	completing and true
PC	making a plan to looking equivalent fractions from teacher books
PE	making a plan to looking equivalent fractions from doctor books
MC	carrying out the plan 'PC'
ME	carrying out the plan 'PE'

Furthermore, Student 2 (S2) could mention things that were known and asked of the problem too. Following are some excerpts of the interview:

Researcher	:	*Try to explain that is known on this problem, S2?*
S2	:	*Teacher and doctor each have 45 book. If 4/5 of teacher book and 2/3 doctor book is novels.*
Researcher	:	*Asked the problem?*
S2	:	*Which most novels, teacher or doctor? How much difference novels have teacher and doctor?*

S2 can make a perpect plan indirectly. She can explain the steps to resolve in accordance with problem structure.Following are some quotes of the interview:

S2	:	*4/5 multiplied by all of books. 4/5 mutiplied by 45. 45 divided by 5 is equal to 9. Then, multiplied by 4 is equal to 36.*
Researcher	:	*Then?*
S2	:	*2/3 multiplied by 45. 45 divided by 3 is equal to 15. 15 multiplied by 2 is equal to 30. So the teacher has 36 books and The doctor has 30 books*
Researcher	:	*Then?*
S2	:	*Teacher's books are more than the doctor's books. The difference of teacher and doctor book is 36 minus 30. The result is 6.*

S2 looked back to see her works to confirm the result. Following are some excerpts of the interview:

Researcher	:	*Did you check it?*
S2	:	*Yes.*

Then, the following is the structure of S2 thinking:

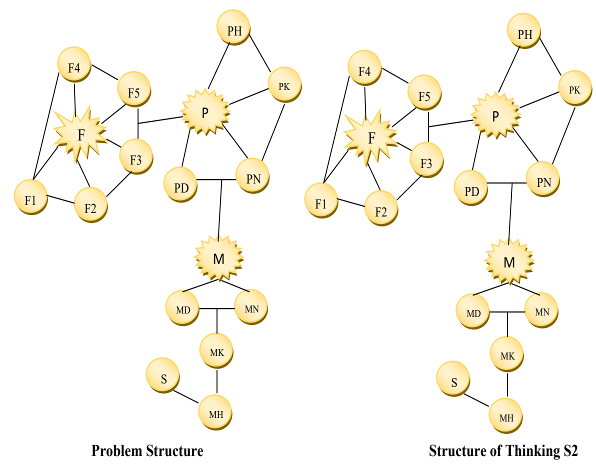

Fig.2 The structure of S2 Thinking

Based on the research results, S1 and S2 could understand the problem well, because he/she could mention what was known and asked on the problem. S1 and S2 could devise a plan, but S1 devised a plan that leads to the wrong answer. S1 and S2 could carry out the plan, but S1 constrained that has an impact on blank thinking. S2 looked back to his work. S1 did not look back because he felt unsuccessful in solving the problem. In fact, problem solving requires a never gave up spirit to complete [20].

Teaching problem solving in the classroom has a positive effect in developing students' mathematical thinking skills [21]. They will be familiar reasoning to solve problems. Students do not often solve similar problems, make the students a bit of experience and meaningful to the students themselves. Finally, the structure of the students' thinking becomes difficult to form in accordance with the structure of the problem they have encountered previously.

IV. Conclusion

The conclusions of this research are (1) the male subject can understand the problem, devise and implement a plan to solve a problem poorly, not look back and has a weak sprit; (2) the female subject can understand the problem, devise and implement a plan to solve a problem very well, look back, and has perfect stucture of thinking.

Acknowledgment

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Senior High School Physics Teachers' Ability to Apply the Learning Models of 2013 Curriculum

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***Abstract*—This research aims to describe the ability of Physics Teachers of Senior High Schools in Sleman in planning and applying lesson and material by using the models that have been provided in 2013 curriculum. This research was survey design and it was conducted by using descriptive quantitative approach. The result of this research showed that the ability of teachers in planning and applying or implementing the lesson and the material is on good category.**

Keywords—Teachers' Ability, Instructional Planning, Implementation Of Learning, 2013 Curriculum

I. INTRODUCTION

The Government of the Republic of Indonesia through the Ministry of Education and Culture improves and renews the educational system in Indonesia in the form of curriculum renewal, teacher arrangement, improvement of education management, as well as the construction of educational facilities. This renewal is expected to improve the quality of education in Indonesia. The improved quality of education will be achieved if the teaching and learning activities in the classroom are conducted effectively. Teacher's role of paramount importance in achieving this improved quality of national education, attention and analysis also need to be directed to the teacher in implementing the learning task.

An educational component that will determine the implementation process with a good education is the teacher. In line with these opinions, in all systems of education the teacher's performance is one of the determining factors of school effectiveness and learning outcomes [1]. Not many teachers are able to carry out the role and function adequately. Problems faced coming out of the facility, the social culture of the local schools, and the educational system. Teachers are required to be able in managing the teaching and determining the strategy, planning and assessing. Ref. [2] states that teacher is a person who has the ability to design learning programs and be able to organize and manage the classroom so that students can learn. According to [3] teacher can be defined as a person whose job related to making national life in all of its aspects, both spiritual and emotional, intellectual, physical, and other aspects. From the above discussion, it can be concluded that teacher is a profession that is legally formally or informally assigned life by his/her ability to design learning programs that are used to carry out the primary task of educating, teaching, guiding and evaluating students both in the classroom and outside the classroom.

Teachers are the first and foremost responsible in transferring knowledge to students. Teachers are the dominant determinant in education in general because they play a role in the learning process, where the learning process is the core of the educational process as a whole [4]. Success in achieving the goal of education is largely determined by the role of teachers [5].

In the theory of education production function, teachers, curriculum, and educational facilities are included in the category of instrumental input. Meanwhile, the students are included as raw input that will be processed using the input instrumental. Implementation of education production function theory in Indonesia is considered too concerned with instrumental input, and less focus on the problem of learning process in the classroom. The quality of education is still the concern because it is too oriented to instrumental input, and no or little concern for teachers designed the learning process in the classroom. The process of learning in the classroom is actually a black box that needs more serious attention from the teachers, without ignoring the instrumental input [3].

One of the factors that affects the learning objectives and education in schools is teacher competence. As for the kinds of competencies that must be owned by teachers, among others are pedagogical competence, personal competence, social competence, and professional competence. Pedagogical competence includes teachers' understanding of the learners, the design and the implementation of learning, evaluation of learning outcomes, and the development of learners to actualize various potentials [6].

In addition to competence, teachers are also deploying a variety of basic teaching skills. According to [7] there are seven teaching basic skills to master the teaching ability, namely: (1) the ability to ask; (2) skills provide reinforcement; (3) hold a variety of skills; (4) the skill to explain; (5) opening and closing skills lessons; (6) the skills to guide the discussion; and (7) classroom management skills. Teaching basic skills that have been outlined above is the provision of teachers as leaders in the classroom. In the context of the classroom, a teacher as a leader or manager acts as the manager of learning. There are four components of classroom management skills, namely: (1) personal approach skill; (2) organizational skill; (3) guide and facilitate learning skill; and (4) plan and implement teaching and learning skill. In managing the learning process, the teachers ability is closely related to three managerial functions of planning, implementation, and evaluation. Some competencies, skills, and abilities of teachers who have been mentioned above, teachers ability in planning the lessons is the ability in designing the learning to understand the educational foundation. In designing the lesson plans, it includes: (a) identity of the school; (b) identity the subjects or themes / sub-themes; (c) identify the class / half; (d) identify the subject matter; (e) identify the time allocation; (f) identify the learning objectives formulated by basic competence; (g) identify the basic competencies and indicators of achievement of competencies; (h) identify teaching materials; (i) identify methods of learning; (j) identify a medium of learning; (k) identify the learning resources; (l) identify the measure of learning; and (m) identify the assessment of learning outcomes.

The ability of teachers in implementing the learning is the teachers ability to organize the background of the overall learning process of learning and competence planned formation including: (a) managing the space and learning facilities; (b) implementing the learning activities that include preliminary activities, core activities, and the activities of the cover; (c) managing classroom interaction; (d) demonstrating special skills in teaching subjects; and (e) carrying out an assessment in a scientific study.

Tools to achieve the goal of education are the curriculum. As we know, the Indonesian education system has set the Curriculum 2013 in July 2013 and, in the meantime the Regulation No. 159 of 2014 on Curriculum Evaluation of 2013 Curriculum, after three months of 2013 conducted throughout Indonesia, the Indonesian Minister of Education decided to suspend the implementation of 2013 Curriculum in school applying the new school semester and continue to implement 2013 Curriculum at schools that have implemented 2013 Curriculum for three semesters.

The implementation of 2013 Curriculum is something new for teachers including science teachers. Teachers must have knowledge of the curriculum and understand the process in which the curriculum could be developed [8]. The emergence of 2013 Curriculum requires an adjustment of teachers in the learning package in accordance with the curriculum set out in 2013. A number of teachers preparation should be done for preparing a lesson plan, learning resources and assessment instruments with appropriate implementation strategies. This is consistent with the opinion of [9] that if the decision is to engage in curriculum development or adaptation, they have to make sure that teachers have the content knowledge needed to translate reforms into specific and coherent ideas curriculum, and that they have a sample time to develop, test, and refine the curriculum materials. Therefore, based on that opinion when teachers are given the opportunity to develop and adopt the curricula, the government or a team of curriculum developers must ensure that teachers have the knowledge needed to translate ideas into specific and coherent curriculum and give the opportunity to develop, test and refine curriculum materials. Therefore, teachers are required to have the ability to both conceptually and practically to carry out the steps in curriculum development.

The curriculum emphases must be in concert with local needs and reflective of students' attitudes and aspiration [10]. The curriculum must involve teachers and the community; curriculum emphasis should be in accordance with local needs and reflect the attitudes and aspirations of learners. Because of this importance, each of curriculums is evaluated and then adapted to the development of science and technological progress.

Any changes in the curriculum of course can bring its own characteristics; likewise, on the model of applied learning in the new curriculum. One of the major issues in the implementation of 2013 Curriculum is how the teacher is able to apply a scientific approach with a learner-centered and emphasize learning of active learners namely with the implementation of learning discovery learning model to strengthen the scientific approach and integrated thematic. To encourage students to produce creative work and contextual, either individually or in groups, it is advisable to produce work based problem-solving (project based learning).

The research conducted by [11] drew conclusion that (1) the cognitive abilities of primary school teachers in Medan pedagogical abilities in implementing 2013 Curriculum, the overall obtained indicator was an average value of 2.70 which was good. The results obtained by the ability of teachers to indicators of the ability to understand learners, develop a curriculum or syllabus, learn to design, implement and learn dialogical educate and develop students to actualize their potential is on both categories. The indicator of the ability to evaluate learning outcomes is on good enough category. While the indicators of the ability to utilize instructional technology is on less well classified category; (2) Primary School Teachers in Medan in practice has the average of relatively good pedagogical ability to implement the 2013 Curriculum. The results obtained on the indicator pedagogic ability of teachers to plan and implement programs and learning activities is on a good category. Meanwhile, the indicator to evaluate the learning ability is on good enough category.

All in all, this study aims to describe the ability of the Senior High School Physics teachers in Sleman in applying the models of 2013 Curriculum.

II. Methods

This study was a survey research using descriptive quantitative approach. The research was conducted at Sleman Regency in the odd semester of Academic Year 2015/2016. The schools that were involved have been continued the 2013 Curriculum including SMA Negeri 1 Godean, SMA Negeri 1 Kalasan, SMA Negeri 1 Pakem, SMA Negeri 1 Prambanan, SMA Negeri 1 Seyegan, and SMA Negeri 1 Sleman.

The population of this study was physics teachers in senior high schools in Sleman implementing 2013 Curriculum in a number of 18 students. Sixteen teachers are certified and two teachers are noncertified. The sample selection was done by simple random sampling, the population was with a heterogeneous population members. It was obtained that 10 certified teachers and one uncertified teacher.

The research was conducted in several activities, namely: (1) pre-survey to the school to determine the number of teachers who studied; (2) the preparation of research instruments; (3) research data collection; (4) The data obtained are collected, compiled, analyzed, and interpreted; and (5) the preparation of the research reports.

The data of this study were observational data of teachers' ability to plan and implement the learning. The instruments used were teachers observation sheet to plan the teaching and teacher in implementing learning ability. The data collection techniques used were observation and documentation.

Validity and Reliability Instruments

In terms of the content validity, the expert validators have mentioned that the observation sheet and questionnaire were fit to use. In terms of the empirical validity, the Rasch model was used to see the validity of each instrument. The validity test of this instrument was done with QUEST program. The QUEST program decided an item is fit or not according to the Rasch model when the magnitude INFIT t has a value of < -2.0 or > +2.0.

Based on the results of the validity testing, the teachers observation sheet instrument in planning the physics learning showed that there was one invalid item among the 23 items that were tested. The invalid item was on number 20. On the results of the validity testing of the observation sheet instruments in implementing the learning ability, it showed that there were two invalid items among the 29 items that have been tested. They were on numbers 11 and 25. These invalid item were not used in the calculation of the data analysis.

The QUEST program also presented the results of the reliability test according to classical test theory namely in the form of internal consistency index (internal consistency). The value of the internal consistency data analysis used politomus Alpha Cronbach index [12]. Based to the analysis by using the QUEST program, the obtained internal consistency observation sheets of teachers' ability to plan and implement individual learning of 0.93 and 0.89.

The data including the teachers' ability to plan and implement Physics learning in this study were analyzed. The data were obtained in the form of quantitative data. Therefore, the analysis of the data used descriptive quantitative. The quantitative analysis was done by determining the categorization ability of teachers to plan and implement the physics learning and provide answers to the research questions. Steps that need to be done are to determine the first idea mean (Mi), ideal standard deviation (SBI), the highest score and the ideal lowest score with each variable as the criterion. To describe the teachers' ability to plan and carry out physics learning to use the average score is ideal as a norm comparison with the five criteria as shown in Table I.

TABLE I. IDEAL ASSESSMENT CRITERIA

No	Score Criteria	Range
1	$X > Xi + 1.8\ Sbi$	Very Good
2	$Xi + 0.6\ SBi < X \leq Xi + 1.8\ SBi$	Good
3	$Xi - 0.6\ SBi < X \leq Xi + 0.6\ SBi$	Moderate
4	$Xi - 1.8\ SBi < X \leq Xi - 0.6\ SBi$	Poor
5	$X \leq Xi - 1.8\ SBi$	Very Poor

On these measures, the assessment criteria obtained the teachers' ability to plan and implement physics learning are shown in Table II below:

TABLE II. CRITERIA FOR DATA OBSERVATION RATE CAPABILITY MASTER PLAN AND IMPLEMENT THE LEARNING PHYSICS ASSESSMENT

No	Score Criterion	Range
1	$X > 85$	Very Good
2	$70 < X \leq 85$	Good
3	$55 < X \leq 70$	Moderate
4	$40 < X \leq 55$	Poor
5	$X \leq 40$	Very Poor

Based on the observation data obtained by the teachers' ability to plan and implement the learning. Description of the teachers' ability to plan and implement the learning is shown in Table III and Table IV.

The percentage of the sub aspects is judged on the ability of teachers to plan learning has a value that varies. The teachers ability in planning lessons have a percentage of 82.99% in both categories. In sub-aspects of the lesson plan identity made by teachers have been already completed which included the identity of school, educational unit level, subject, class/ semester, the subject matter and the allocation of time describing the lesson plan targets to be implemented. In sub aspects complement lesson plan identity is categorized very well with a percentage of 95.45%.

TABLE III. DESCRIPTION OF THE MASTER PLAN LEARNING ABILITY

No	Sub Aspects	Percentage (%)
1	Completing the lesson plan identity	95.45
2	Mapping the basic competence and indicator	72.73
3	Identifying, developing and organizing materials, instructional media and learning resources	85.00
4	Developing scenarios learning activities	75.00
5	Planning procedures, type and prepare an assessment tool	82.27
6	Displaying lesson plan document	87.50
Average of planning aspects		82.99

In addition, to equip the identity of the lesson plans, teachers map out the learning objectives. The learning objectives have been formulated in accordance with the basic competencies specified in the 2013 curriculum. The core competencies of spiritual attitudes, social attitudes, knowledge, and skills have been published in full, but the elaboration of indicators on the skills are still not appropriate, i.e. the operational verb used yet achieving specified on the basis of competence. On the map the sub aspects of basic competence and indicator are included in both categories with a percentage of 72.73%.

In identifying, developing, and organizing the materials, the instructional media and learning resources are good. Teachers identify and develop teaching materials, choose the media that match the characteristics of the material being taught, develop instructional media that use more than one medium, choose the learning sources as well and not just rely on one book or other resources. However, in substance teaching, all teachers have not done the preparation and development of teaching materials in accordance with the potential of learners and the development of science and technology relating to such materials. Teachers only include the name of the material in the lesson plan. In the sub aspect of identifying, the developed and organized materials, instructional media and learning resources was categorized in both categories with a percentage of 85.00%.

The learning activities organized by curriculum-based activity in 2013 should be implemented with emphasis on active learners and self-learners in accordance with the development of learners. Therefore, to achieve the expected learning activities, teachers should prepare the learning activities with a good scenario, but the teachers have not yet determined the existing learning model on the Curriculum 2013 (PPA, PBL, and Discovery Learning).

In the lesson, the teacher compose and design stages of learning that teachers planned from the beginning to the end of the preliminary study to show activities, core and closing activity, with the division of time for each activity. Teachers also have compiled learning steps in accordance to the scientific approach that consists of activities to observe, ask, gather information, associates, and communicate. Every step of the activities has been designed coherently. However, the teacher did not design the syntax of the learning model learning activities specified in the 2013 Curriculum. In the preliminary activities, most teachers prepare learners to design such as checking attendance, passing the competency to be achieved, outlining the material and activities, as well as the planning the motivation. However, no teacher planned to convey the scope and assessment techniques to be performed. In the closing activity, teachers plan a summary/concluding lesson, feedback, and submit a plan for the next lesson. However, teachers rarely plan to reflect or follow up such as the provision of remedial and enrichment tasks. In designing the learning steps, inquiries/orders preparation that delivers to students in learning should be prepared. Question/command that is planned by the teachers was mostly a question of analysis and/or synthesis. In a scenario of sub aspects of learning was in the category of well with the percentage of 75.00%.

Assessment of learning outcomes by the teachers to monitor the process, the learning progress, and improvement of learning outcomes of students is on an ongoing basis. 2013 Curriculum requires the use of authentic assessment that includes competency attitude (spiritual and social), knowledge, and skills. In the sub-aspects of planning procedures, type and prepare an assessment tool, they categorized in both categories with a percentage of 82.27%, but the attitude of competency assessment document was incomplete and teachers rarely prepare remedial and learning enrichment.

The display of lesson plan document in general is very good. The writing can be read easily, look clean and quite interesting. However, there are some posts that were less consistent or not in accordance to the EYD, such as foreign language, which is not italicized, but in general the structure of sentence used the raw phrase. The sub aspect of lesson plan document was in the category of very well with the percentage of 87.50%.

TABLE IV. DESCRIPTION ON TEACHERS ABILITY IN IMPLEMENTING THE LESSON

No	Sub Aspects	Percentage (%)
1	Managing space and teaching facilities	79.92
2	Implementing learning activities	62.41
3	Managing classroom interaction	92.05
4	Being open and flexible and to help develop a positive attitude learners toward learning	76.52
5	Demonstrating special abilities in teaching subjects	62.50
6	Assessing the scientific learning	68.18
7	The general impression of the teacher performance	75.57
Average of implementation aspects		73.88

The percentage of the sub-aspects judged on the teachers ability to implement the learning has a value that varies as shown in Table IV. The ability of teachers implement instructional obtained the percentage of 73.88% in both categories.

The sub aspects of managing the learning space and facilities are good. It has a good category with a percentage of 79.92%. Before started the learning in classroom, teachers carried out daily tasks such as checking the attendance of learners, checking the availability of stationery, cleanliness and tidiness of the board, as well as checking the readiness of students follow the lessons. In preparing the learning resources that were utilized in the classroom, teachers are using more than one source.

In sub aspects of implementing the learning activities, the category was quite well with the percentage of 62.41%. This sub-aspect consists of several observed indicators. At the beginning of the learning activity, the teacher motivated students by asking questions which were challenged or recount events in context and giving apperception or associating learning materials with the students experience. However, teachers rarely delivered the learning competencies that must be achieved and the benefits in daily life as well as outline the materials and activities to be implemented. These activities need to be done by teachers to prepare students physically and mentally. They also give an overview on the students competencies they need to optimally. The indicator of the teachers ability to start the learning was categorized good with a percentage of 75.00%.

In the ability to master the subject matter, teachers always adapt the competence to be achieved and link the material with other knowledge, science and technology development, as well as real life. They always present the material in a systematic from easy to difficult. The indicator of the teachers ability to master the subject matter included in very good category with a percentage of 87.50%.

In the 2013 curriculum, the teaching and learning approaches as already stated in Ministry of Educational and Culture Rules on Number 22 Year 2016 about the Standard Process of Primary and Secondary Education is using the scientific approach/process-based approach to science. To strengthen the scientific approach, it is integrated with the thematic and thematic disclosure needs to be applied based learning/research (discovery/inquiry learning). To encourage students ability to generate a contextual work either individually or in groups, they are strongly encouraged to use learning approaches that produce work based problem-solving (project based learning). In the previous discussion about teachers ability in planning the lessons, teachers have been preparing the learning steps in accordance with the scientific approach, but at the time of implementation, very few teachers used the scientific approach as stated in lesson plan designed by teachers.

Generally, teachers use the lecturing method and PowerPoint as a learning medium. Therefore, the learning is not interactive, inspiring, less motivating and less independent. In the observing activity, it is included in the category of less well with the percentage of 52.27%. In general, teachers present a learning device in the form of media such as video, images, miniature, impressions, or a real object, after which the teacher encourages students to make observations. Besides these activities, when they observed the students, they also described/wrote the results. However, it was rarely used by the teachers. Teachers then expressed their opinion in front of the class with the object of being observed, but it was rarely done by the teachers. At that time, there was only one group which was asked to come forward due to insufficient time. In that activity, the category was less well with the percentage of 53.41%. Teachers commonly asked and direct the students with questions so that students understand the material to achieve the competence. It is advisable on learning that students ask questions about the information that is not understood from what was observed. By asking the students were expected to have opportunity to develop competence and curiosity to make the learning processes have a high significance. Teachers should be able to inspire students to be willing and able to ask, in this case, students found it was not easy to ask if they are not provided with an interesting medium. The information gathering activity was categorized on the category of less well with the percentage of 46.59%. There are some teachers who did not carry out these activities, and some other teachers who just opened wide opportunities for students to seek information through various sources such as books, internet, or practicum. However, teachers rarely divided the students into groups to facilitate the collection of information. This was due to only a few teachers conducting scientific approach to split the group. At the entrance to associate activities unfavorable category with the percentage of 47.73%, this part of learners prepare/organize the information they have gathered was limited both from the activities of collecting/experiment as well as the results of the activities to observe and collect information activities has been directed by teacher. At the activity to communicate the activities, it was categorized as the fair category with a percentage of 45.45%.

Teacher rarely use learning models in the 2013 curriculum such as PBL, PPA, and discovery learning. Teachers ability to use appropriate learning model in 2013 Curriculum was in the category of less well with the percentage of 42.05%. The observation showed that only two or three teachers who modeled appropriate learning curriculum with the problem based learning as the dominant model. As teachers apply the model of problem based learning in the classroom, the steps are in accordance with what was planned in the lesson plan. Teachers informed the learning objectives, motivated students, organized the students to learn, assisted in the investigation at the time the students in group discussion, helped students to plan and prepare the results of the investigation and then presented the results of each group, as well as helped and guided the students to reflect on what has been investigated. As the PBL was in progress, teachers acted as presenters, counselors and negotiators. The roles of the teachers have been done well. But teachers experienced problems when organizing the students due to the division of groups so that the number of groups would be many. The social system when PBL was going was well. The students were active in learning, but their performance was still less in expressing their opinions. The supporting systems used by teachers when implementing PBL were namely demonstration equipment, teaching materials and students worksheets.

The teachers ability to use instructional media, utilize instructional media, and close the learning was in the category of quite well with each percentage was 64.77%, 65.91% and 69.32%. The observation results showed that most teachers used the media and they were in accordance with the material as well as the students needs. In this case, the teachers used the LCD media display video or powerpoint presentation only. Teachers have shown the ability in using the learning resources and instructional media, but the media have not shown interesting message as well as teachers rarely engaged the students in the use of instructional media. At the closing stage, teachers generally only carried out a follow-up activity to provide direction next activity. They seldom reflected or summarized and gave oral or written test. During the learning activities that took place, learning was not implemented according to the details of specified time, but teachers have started and closed the learning on time.

The sub aspect of teachers' ability to manage the classroom interaction was in the category of very well with a percentage of 92.05%. Teachers' ability to communicate with the students has been very good. The teachers talked fluently and understood by learners, the material was written on the board or other media can be read clearly, as well as gestures and body movements. During the interaction in the classroom, the teacher maintains students engagement well such as helping students to recall the experience or knowledge that has been gained, encouraging passive learners to participate, and asking questions that can dig reaction learners. However, there were only a few teachers who responded positively to the students who participated. In sub aspect to be open and flexible and to help develop a positive attitude toward learning, the students got both categories with the percentage of 76.52%. Each teacher showed a friendly attitude to students and appreciated any dissent. Teachers approached the students and paid attention to things that the students did and provided assistance to students in need. However, teachers rarely gave praise to students who were successful and gave encouragement to students who have not succeeded. Teachers rarely encouraged students to express their own opinions. During the observation, teachers have shown enthusiasm to teach well.

The sub aspect of demonstrating special skills in teaching of Physics was in the category of quite well with the percentage of 62.50%. When teachers delivering the Physics materials, teachers should not only give an example of the application of the concept of physics in everyday life, but teachers also encourage students to give examples of the application of these concepts. However, in reality, there were only a few teachers who gave the example of the application of the concept. In addition, the learning material must be controlled by the teachers. Physics subject includes the concepts, principles, theories, and laws. The observations showed that the teachers mastery of the materials physics has been very good.

The sub aspect of conducting the assessment in scientific learning was in the category of quite well with the percentage of 68.18%. In the process or skill assessment, there were teachers who simply asked questions or assigned tasks to students. There was also a judge mastery of students through the students performance. Assessment of this process or skill can be done through observation when students work in groups, individual work, discussion, and presentation by using the observation sheet work. In the product assessment, the observation results showed that most teachers did not give written tests/assignments at the end of the lesson. In the assessment of attitudes, teachers only see the attitude of the students but not logged. Assessment was done through observation attitude when students worked in groups, individual work, discussion, and presentation using observation sheet attitude.

Sub aspect of the general impression of the performance of teachers was in the category well with the percentage of 75.57%. In managing the learning quite well, teachers are successful in controlling the learning so that learning takes place smoothly. The teachers ability in using the Indonesian language was good with a clear and easy to understand utterance. The results of the observations also showed that the overall appearance of teachers in managing learning (physical, teaching style, and firmness) has been excellent.

Based on the results of the research on the ability of science teachers of SMP in Banjarmasin in applying the learning models specified in 2013 Curriculum (1) the ability of Physics teacher of SMA Negeri in Sleman Regency in planning the learning with learning models specified in 2013 Curriculum into good category, (2) the ability of Physics teacher of SMA Negeri in Sleman Regency in implementing learning with the learning models specified in 2013 Curriculum in good category.

According to [13] result, teachers competency were the pillar for practical implementation of a safe and effective science experiment. Students' positive attitude and their motivation to learn and provide appropriate feedback to the learning activities is significantly depending on how teachers influenced them. On the other hand, teachers need to have a high capability and competencies in developing laboratory instructions, lesson planning, preparing and documenting laboratory equipment, implementing and translating the process in the form of continuous assessment throughout the teaching practice in laboratory.

III. CONCLUSION

Based on the research results on the ability of senior high school physics teachers in Sleman Regency in applying learning models specified in the 2013 Curriculum (1) the ability of the Senior High School Physics teachers in Sleman in the learning planning with learning models specified in the 2013 Curriculum was in the category of good; (2) the ability of the Senior High School Physics teachers in Sleman in implementing the learning with the learning models specified in the 2013 curriculum was in the category of good.

Based on the findings, it can be suggested (1) the physics learning plan with the models of learning specified in the 2013 Curriculum has been good, but it needs to be optimized on the planning and mapping the sub aspects of the basic competencies and indicators. The selection of instructional media and learning resources construct scenarios of learning activities and prepare an assessment tool. Given that to carry out the study with a well needed good planning; in addition, by performing authentic assessment, it was able to describe the attitudes, skills, and knowledge of what have or have not owned students; (2) the implementation of learning requires the teachers to create a program of learning activities which need to be optimized again in the implementation by using the models of learning specified in 2013 Curriculum.

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Bridging Students' Learning Achievement

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Abstract**—– This paper discussed the ways teachers create an atmosphere of teaching and learning so that they are able to develop the utmost of their potential. The theoretical approach was used to provide an analysis on the process and the learning outcomes as well as the factors that influence it. Learning outcomes is meant as a tool to maintain the dynamics of life in the face of accelerating change both psychologically and economically. The ability to adjust to changes is indication of the performance levels of education. Several views about the concept of learning including the theory of stimulus-response, trait theory, the theory of the constitution, the theory of factors, the classical theory and the theory of reinforcement-operand shared the point that the process of learning requires a condition that allows learners to develop their potential to be able to adjust to the demands and needs. Learning difficulties occurs when self-weakness is assumed and beyond learner circumstances. Teacher behavior, the learner external factor, is a key factor in the creation of learning atmosphere. Teacher's expertise in understanding individual learners and directing them to accept, understand and reach the full potential, help learners determine the level of the atmosphere created in learning. Diagnosing learners' difficulties are also necessary in accordance with the stages so that learners are able to make adjustments on the tasks of development. In conclusion, attitudes and behavior of teachers play an important role in creating a learning environment that supports the development of students' utmost potentials.**

Keywords— Guidance, Learning Difficulties, Learners' Potential, Teacher Behavior

I. Introduction

Education is defined as a conscious and deliberate effort to create an atmosphere of learning and the learning process so that learners are actively developing their potential to have the spiritual power of religion, self-control, personality, intelligence, noble character, and skills needed him, society, nation and state. The main phrase in the definition is 'create an atmosphere of learning and the learning process', which means how important the role of teachers in education and the learning process are to create a learning atmosphere supportive of the learning outcomes expected. Harmonious, comfortable and fun atmosphere is a prerequisite for the occurrence of a quality learning process.

Learning is a process of behavior change as a result of the experience, which includes knowledge, attitudes and skills. Learned behavior is a provision to maintain a person's survival, armed with the knowledge, attitudes and skills, humans are expected to meet the demanding needs and maintain its survival. We often get caught up in assessing learning outcomes by looking at other educational institutions and the achievement of value for graduates, but we never went deeper into the three domains of learning outcomes (knowledge, attitudes and skills). The main task of teachers and educators is to change the existing potentials of learners into competence, so that graduates are ready to compete in various arenas of life.

The teacher behavior, however, often made the students feel uncomfortable in the learning environment. This is caused by the behavior of teachers that are too high in setting learning goals without seeing the potential and characteristics of learners so it is difficult to achieve. Teachers also look at students' mistakes, pessimistically interpret the learning outcomes, compare students with the other ones, help learners exceedingly, and label learners who are less able to achieve the learning objectives. In this article, I would attempt to describe how teachers behave in creating a learning atmosphere that nurture learners' potential.

II. Literature Review and Discussion

A. Educational Outcomes

Reference [1] argues that the output of education is graduates, while its outcome are the values of individual and social. Positive values of the individual include (1) pleasure or psychological values, (2) economic value including opportunities to get a job (job opportunity), develops a personality (personality) that impact on the alignment of the way it reacts and interacts with the environment, as well as higher revenue (income), (3) social strata, namely the award of the public. Reference [2] argued that the development of quality human resources is the process of contextual, and thus the development of human resources through education is not limited to preparing people who master the knowledge and skills that not only fit the world of work at the moment, but also human beings who are able, willing and ready to learn throughout life.

According to [3], there are two requirements so that we can achieve a success, namely, rational intelligence and emotional intelligence. Both of these intelligences controlling influence each other in performing an action. We often boast rational intelligence to achieve a college degree, but we forget a lot of scholars who do not have emotional intelligence. He further explains that the progress of modernization spurs people to high levels of depression. Many people are unable to control their emotional intelligence that leads to anarchists, offensive manners, blaming others. They always think that failure is due to the actions of others.

For depressed people there are only two choices: fight or flee. When this happens constantly in ourselves, then the social and cultural order which we maintain will be shattered, and there was just chaos in life. We often witness the emotional deterioration that occurs in our young generation, which is characterized by (1) withdrawing from the association, (2) anxiety and depression, (3) having a problem in terms of attention and thinking, and (4) naughty or aggressive behavior [3]. Student brawl, fighting between villages, the use of narcotics is wrong, violent, head-to-quarrel between rival groups, promiscuity, anarchic demonstration, happens in society as a result of the lack of conversation in controlling emotions.

Reference [3] offers a “prescription”, that is, think for a moment before acting in response to a threat. Since man has been given by God a complete anatomical structure of the brain, in contrast to reptiles (a type of snake), which is only given weevil brain or mammals (breastfeeding) by hump-limbic brain and simple limbic. Reptile is able to think only for survival, so that in case of attack, instinctively, he attacks or flee. Mammal is able to maintain viability and was also given a sense of compassion but was limited to her cub. But people are given by God a brain structure called "neo-cortex", which is used to process the message into a response action. Therefore, if any of us were eating their children in many ways, that's the "reptile". If being very protective of the children and descendants, that is "mammals", and if there is no prudent and wise in all his actions, taking into account the benefits of the world and the hereafter that is "man". Because by nature, man is "nature" of the brain that is perfect instrument, and placed in the highest degree. Life is a choice; either we are reptiles, mammals or appropriate disposition, that is, man.

For human, when there is a threat of "emotional hijacking", the threat message coming from the outside is not processed through the neo-cortex, but directly through the shortcut entry in the brain that ordered the hump and resulted in a physical reaction to perform an action out of control. If this is the case, then what happened is "escape or fight". Both of these conditions equally benefit humans, and can cause humans become incompatible (maladjustment). It also can cause physical damage primarily to the structure of the brain, one of which is the "symptoms of a stroke", and thus we should slow down in response to a threat.

The dynamics of social change is now so out of control. Turbulence (chaos) occurs in many areas of life and sometimes makes us confused to respond. Reference [4] found that the change is permanent with different pace from time to time, whereby the pace is getting faster as the time flows. This is caused by the progress of science and technology, where technology changes over time and continues to grow rapidly, so that the technology cannot be measured through the life of its technical (life time), but measured by its generations, and consequently change the way things work in a revolutionary way [5], [6]. It then raises a question: how do we respond to changes in the revolutionary way of working? Reference [4] conveys the three pillars of change, namely; (1) clarity, that is, we should know clearly where we are going, (2) commitment, which clings to the goal we want to achieve, and (3) capability, which requires skills. We often see the brightest and the best, but not always successful. This is because one does not realize something has happened, that is, change. Therefore we have to be smart in making the best choice in the work and follow its changes. To understand what makes the best of success, we need to understand what they are doing, as well as the thoughts and feelings that gave birth to the action. Regarding the thoughts and feelings that gave birth to the action, according to [4], it was called competence. The underlying elements are not easily seen, but directing and controlling behavior are observable. Social role and self-image lie at the level of one's consciousness, but the character and motives is much below one's consciousness. Therefore the key to the success of a competency will depend on the one’s character and motives.

Reference [7] initiated the seven habits of highly effective human (the 7 habits of highly effective people) namely; (1) be pro-active, (2) goal-oriented, (3) set priority, (4) think win-win, (5) try to understand first, understandably, (6) achieve synergies and (7) develop your chainsaw. Pro-active is the opponent of reactive; pro-active is an action (response) and is done on a stimulus that is processed through a process of self-awareness. Reactive, on the other hand, is not based on self-awareness. Reactive people will be very much influenced by the physical environment. For example, when the weather is nice then they are fun. Meanwhile, pro-active people can set their own weather, whether it rains or shines, there is no difference for them. They are driven by value, so that he can produce quality work. Pro-active people will always take the initiative, because our nature is to act and not be the subject of. Taking initiative does not mean urgency, annoying or aggressive, if not destructive. Pro-active indicates intelligence, awareness and empathy, and they put feeling on the second priority after value, so that they can listen to our language.

Advances in science and technology, particularly the field of information and communication technology (ICT), has propelled us into the era of globalization, characterized by a perception that as if the world has not had state borders (borderless line state). With technology, we can know what has happened in other parts of the world in real time. According to [8], the process of globalization moves in line with three areas of human life, namely, economics, politics and culture. Globalization affects the economy in the form of the arrangements for production, exchange of goods, distribution and consumption in the form of goods (goods) and services (services). Globalization in political field is related to the concentration and power applications. The globalization of culture and expression includes the exchange of symbols of the facts, understanding, confidence, tastes, and values.

The process of globalization in these three areas, according to Waters [8], is formed on the dimensions and patterns of ideal. The process of globalization of economics includes the dimension of trade, production, investment, organizational ideology, money market, and the labor market. These dimensions has spawned patterns: (1) absolute freedom in trade, services and commodities symbolic; (2) the production of a balance determined by the geographical advantages; (3) foreign direct investment; (4) flexible ideology of organization of the global market; (5) the money market with a decentralized pattern, directly and without national boundaries; and (6) the labor market with workers' freedom of movement patterns.

Globalization in political field includes the dimension of state sovereignty, focus on problem solving, international organizations, international relations, political culture. Political dimensions has spawned pattern of loss of national sovereignty; local issues are always in the global context; very powerful international organization; smooth and multi-centric international relations, political and cultural transcendence with estate values-centric.

Globalization of culture includes the landscape dimension of trust (sacriscape), ethnic landscape (etnoscape), the economic landscape (econoscape), the media landscape (mediascape), and the landscape of relaxation (leisurescape). These dimensions give birth to the pattern: (1) territorial mosaic of religions, (2) territorialism, cosmopolitanism, and ethnic diversity, (3) consumption simulation and representatives of the economy, (4) the distribution of the image (image) and global information, and (5) global tourism.

Communication plays a very important role in the current era of globalization. We need to continue to learn and develop in order to have competence in communication, whether direct communication or indirect communication, body language, and gestures as a determinant of the success rate of direct communication. Mastery of information technology is a decisive factor in the indirect communication. These factors should be mastered in order to increase their capacity to face the competition of life. Communication is a process by which a message is delivered from the source to the receiver. Related to communication, [9] points out the communication model by using the S-M-C-R. A source (Source/S) sends a message (Message / M) through a specific channel (Channel / C) to individual recipients (Receiving/R). The implication is how we do a communication to get the message that we expect, to the recipient with full understanding, and the recipient to perform an action in line with expectations.

Advances in technology only provide a means of more efficient way to move forward or backward. Change is inevitable with a speed that has never been seen by humans. The competition was getting tougher, and thus we should think as "winners" by removing unfounded fears and building confidence and self-image, and digging the greatest abilities and achieving the highest goals [10]. Plato argues that "the first and best victory is self-defeating; defeated by oneself is the most embarrassing thing, and least of all things [10]. Consequently, we have to build self-confidence from now through the ten steps of thought, as [10] noted, namely, (1) winner was not born, but made; (2) the main force of existence is that you are thinking that you have; (3) you are able to create a reality of your own; (4) there are certain benefits which are found in every misfortune; (5) every belief you have is an option; (6) you never defeated, until you accept defeat as a reality, and decided to stop business; (7) you have to have the ability to excel, at least in one of the major areas of your life; (8) the only restrictions of what you can accomplish in your life is a restriction that you apply yourself, (9) there will be no great success without a great involvement; and (10) you need the support and cooperation with others to achieve quality goals.

B. *Teacher Behavior*

The warmth of the teacher-student relationship in the learning process not only can provide motivation and foster a desire for success. But it also will improve the social and academic skills [11] [12]. Students' perception of teacher behavior largely determines their self-esteem [13]. The behavior of the teacher in the learning process and learning affects the learning outcomes of students [14]. Unconsciously teacher has behaved differently as perceived by learners (Rosenthal; Karabenick in [14]. Pygmalion effect occurs on students as a result of the imaging of teachers to students, where students who perform well get praise while students who do poorly received reproach. This will demotivate learners instead of encouraging them to learn. More teachers have high expectations of the children who are good, and gave a bad labeling on children who are slow in learning (Myers in [14]. The teacher's task is nonetheless to create an atmosphere so that students develop a superior potency [15].

Ki Hajar Dewantara initiated a short sentence related attitudes and behavior of a teacher namely: *Ngarso Ing Sung Tulodo, Madyo Ing Mangun Karso, Tut Wuri Handayani*, meaning that a teacher should be *in front by example, are central to the creation, at the rear provide motivation* [15] Teachers should be role models for their students; they must be ready and willing to sacrifice, and to avoid acts reprehensible. Teachers as educators need to imitate the behavior of the Prophet in preparing future generations, with magnanimity and moral glory, have patience and sincere nature of the act of education and learning .[16]

Reference [17] points out the role of the teacher in the learning process and learning, such as (1) The conservator (custodian) value system and innovator (innovator) science, (2) transmitter (successor) system value to learners, (3) transformer (translator) system value personal development, and (4) the organizer (organizers) educative process. Teachers produce a social work major, fundamental and far-reaching impact in the life of society, nation and state including (1) fundamental, because it helps find the meaning of life, patterns of behavior, patterns of cultural value corresponding social demands; (2) development of learners that includes cognitive, affective and psychomotor; (3) The continuous self-development, where teachers help improve consistency, activities and supporting facilities; (4) controls the negative factors affecting the life, both internal and external; (5) to help the maturation process of self; (6) developing creativity; and (7) a balancing of social and cultural situations [18]

Every teacher hopes that learners acquire satisfying and good learning outcomes. But such expectations often run aground and could not be realized. Many students who have failed in learning are characterized by symptoms such as low learning achievement, low learning results, unacceptable behavior, lying, laziness, and bullying. Those students need guidance in terms of tutoring, social assistance and personal counseling [15]. Winkel in [15] states that the guidance is given so that learners are able to know themselves and understand how to overcome personal problems that interfere with learning.

C. Learning Difficulties

Some learning theories advanced by experts, including Dollar and Miller's Stimulus – Response theory (S-R), Gordon Allport's trait theory, Sheldon's theory of the constitution, factors of Cattell's theory and the theory of Skinner's operant reinforcement. Dollar and Miller's Stimulus-response theory purports that learning takes place under certain psychological principles; the study should want something, pay attention to something, do something, and gain something. Brief factors in the study were the impetus, cues, responses, and gifts [19]. Conflict occurs when the response away from the goal (Dollar and Miller in [19]. Learning has meaning when teachers set a too high goals while student response is too low. This will cause conflict and demotivate students. Thus, teachers must understand students' readiness for entering the material to be studied (the entry behavior). Before learning, teachers must first conduct preliminary tests, to determine the readiness of student learning. Thus, the target learning outcomes is relevant to the students' learning ability.

Gordon Allport's theory of nature, gives us that humans are a very unique and different from each other. One's personality structure and dynamics are driven by the disposition of the cardinal, central and secondary. This theory says that what one does is the key to an important clue how people behave today. Intention is the expectations, desires, ambitions, aspirations and plans of anyone. Consider that the functional autonomy of adult's multifarious motives and behavior of a person can be an end in itself, although it was originally done for other reasons. Expressive and consistent behavior are important because they show the embodiment of personal deepest layers. There are two components in any human response, namely, adaptive component and expressive component. Adaptive component concerns the value or benefit of action, the impact and the goals to be achieved. Expressive component is a force in the commission of that [19].

The theory of the constitution thinks that the psychological aspects of behavior is associated with morphological and physiological human. Individual aspects are relatively fixed and unchanging including morphology, physiology, endocrine function, and can be contrasted with those aspects that are relatively unstable and easily change due to environmental stresses, such as customs, social attitudes and education [19]. Sheldon classifies human nature into three types, namely, viskerotonia, somatotonia, and serebrotania. Viskeratonia have characteristics like comfort, relationships, food, people and affection. Somatotonia have a physical adventure that trait, likes to take risks, aggressive, insensitive to the feelings of others, like a fuss. The important thing for him is action, strength and power. Kretschmer in [19] as a precursor to Sheldon, classifies human physical type that characterizes behavior into four types, namely, aestenis type, athletic, piknis and dysplastic. Aestenis with frail and linear posture is a combination of physical with less fat and an average height of tall, skinny thin and seemed higher than actual, narrow shoulders with thin arm muscular thin, a long, narrow, flat chest, and sharp ribs and thin belly. Athletic has the physical characteristics such as muscular and powerful, of medium to high, very broad shoulders and jutting, strapping chest, a strong stomach, torso tapered at the bottom, hips and legs look lovely with wide shoulder. Piknis mode characterized by enlargement of the head, chest and abdomen, medium stature with a round body figure, short necks and huge, curved in the chest and lower body width. Dysplastic type shows a strange posture of body.

Factor theory of Cattell assume that human behavior consists of common factors and special factors. Common factors includes fluency, general intelligence, and education. Special factors such as visual memory, perception of space and specialized information. According to this theory personality is something that allows predictions about what someone needs to do in certain situations. Personality serves as a structure of complex traits and is distinguished, whose motivation depends on the dynamics of its group (dynamic traits). Personality is a mental structure that infers on the basis of observable behavior that explains the order and the provisions in the act [19]. The dynamic nature can be classified into natural ability and temperament characteristics. Personality traits is the ability that determines the effectiveness in achieving goals. While the nature of the response is determined by the temperament of the constitutional influences such as speed, energy, or emotional reactivity. The dynamic properties include attitude, ergs and sentiments. Attitudes of individuals in certain situations show interest with particular intensity to perform a series of actions on an object. Erg is a biological drive, whereas sentiment is a learned attitude structure.

Three types of learning studied by Cattell consist of classical conditioning, instrumental conditioning and learning integration. Classical conditioning tries to associate a response to environmental cues, while the instrumental conditioning is a means to the satisfaction of the erg. In other words, it explains how to build dynamic relationships between attitudes and sentiment in order to satisfy the erg to build dynamic grating or confluence learning. In this type of learning integration, individuals learn to maximize long-term total satisfaction with a number of erg channel at a given time, while restrain suppresses or sublimates others [19].

Skinner's theory is operant reinforcement. Skinner assured on the assumption that human behavior runs according to law. Thus, he seeks how to manipulate the conditions that affect or result in changes in behavior. Skinner developed the functional analysis of behavior based on the analysis of causality. Human behavior is in order and the main purpose of our control. The best control is to find the relationship between the devout hope of independent variables, the dependent variable of the organism then takes control by manipulating the same input in order to obtain a specific output [19].

Burton in [17] identifies students who are suspected of having learning difficulties, as indicated by the failure of students in achieving the learning objectives. Students are said to fail in learning when (1) do not reach the size of a minimum success rate within the time limits prescribed; (2) cannot do or achieve when compared with the ability, talent or incorporated intelligence (under-achiever); (3) cannot realize the development tasks; and (4) did not achieve the required mastery as prerequisites for next level (prerequisite).

D. Guidance

Some of the factors that affect the teaching and learning process by Loree includes (1) the stimulus or learning variables, (2) organismic variables, and (3) response variables [17]. Stimulus includes a learning experience and environmental variables. Learning experience variables include methods and task variables. Method variables concerning the motivation to learn, intensive guidance of teachers, the opportunity, and strengthening (reinforcement). While the task variables include interest, meaningfulness and appropriateness. Organismic variables include characteristic of learners, mediating processes, and response variables. Characteristic of learners consists of intelligence level, age, level of maturity and readiness to learn. Mediating processes includes perception, motivation, fear, anxiety, physical, psychological stress and the like. While in the response variables formulas include objectives that include domains of cognitive, affective and psychomotor.

Burton in [17] points out some weaknesses in the study which includes two factors, namely, weakness on students and situations beyond the student. Weakness on students include physical weakness, mental weakness, emotional weakness, and the weakness of attitudes and habits. Physical weakness consists of nervous system function resulting in emotional disturbance, senses that makes it difficult to interact, the balance that causes developmental and reproductive disorders, disability, often leading to less stable emotions, and chronic diseases that hamper efforts to learn. Emotional weakness include discomfort (insecurity), one custom (maladjustment) against the people, the situation, the demands of the task and the environment, phobias which consists of hate, fear, antipathy as a self-defense reaction, and immaturity. The weakness caused by the attitudes and habits include low interest, too much activity outside the context of learning that leads to unwillingness to learn, failure to concentrate, less cooperative and avoid responsibility, unmotivated learning, ditching, and nervous. The situation outside the student in school and community environments include, among others, curriculum uniformity which denies individual differences, administrative standards, assessment, and learning experiences, teachers' teaching workload, class population, the condition of the family, extracurricular activities and the adequacy of food.

Ross and Stanley in [17] developed five questions in performing diagnostic learning difficulties, namely, (1) who are the pupils having trouble?; (2) where are the errors located?; (3) why are the errors occur?; (4) what remedies are suggested?; And (5) How can the errors be prevented? Thus the steps that can be done are (1) identification of cases, the marking of students suspected of having learning difficulties, (2) the identification of the problem, namely the mark and localize where lies the difficulty of learning, (3) identification of the causes of the difficulties, which marks the types and characteristics of trouble and a contributing factor, (4) prognosis, the conclusions and decisions and foresee the possibility of a cure, and (5) recommendations to make suggestions for solution.

Robinson in [20] suggests that failure of students in learning is caused by the inability to know himself, to understand himself, to accept his situation, to direct himself, to realize all its potential, and the behavior of one custom (maladjustment). Sensory signification of a phenomenon that can be understood can lead to the effect that elicits courage, chivalry, fear and gentleness clamp. Therefore the service can be provided in the form of gathering information about students, providing information about the students, the placement in the appropriate position (subjects, study groups, other activities), information to build understanding and confidence, and continued efforts for the betterment of the students [17].

Schnieders in [18] defines adaptation as a process of mental and behavioral responses of individuals in addressing the needs, tension, conflict and frustration. According to him, one type of adjustment includes adjustment of personal, social and vocational. Social adjustment was strongly influenced by physical condition, development and maturation, psychological, environmental, and cultural.

Some of the principles that form the motivation according to Newcomb [21] is (1) the perceived behavior associated with the creation of encouragement, hungry for seeing the bread; (2) after having something, the willingness to have another as part of previous successes such as feeling hungry after looking bread and want to drink milk after eating bread; (3) a new motive appears after the encouragement is obtained, for example, after seeing the bread, one continues to drink milk to reduce hunger; the desire to obtain bread also appears.

The main task of the teacher is to create an atmosphere of learning so that students are able to develop their potential. To achieve that, teachers need to have the ability to understand the circumstances of his students, so they can provide service in accordance with the conditions and the ability of his students. Preventive activities in anticipation of failure would be better than curative activities to resolve the problem. To develop services, teachers need to understand the strengths and weaknesses of their students so as to put the students in the appropriate position and is able to develop the potential optimally.

III. CONCLUSION

Learning is a process of personal change in behavior or a person based on practice or experience. Many factors affect the success of learning such as internal and external factors. The internal factor is a physiological and psychological condition of the students. External factors are classified based on the environment and learning situations. Environmental situations consist of physical and social environment.

Teachers are part of the social environment that affects the learning interactions.

Learning difficulties occur when learners are not able to adjust themselves to the situation and the demands of learning. Factors causing incorrect behavior treatments (maladjustment) of learners come from themselves or the social environment (including teachers). The phenomena appear as fear, anxiety, and decreased interest in learning, ditching, or not doing their jobs. The teacher's task is to create an atmosphere that encourages interest, meaningfulness, and appropriateness. Behaviors and patterns of action in relation to learning from a teacher will determine the success rate of student learning adjustment.

Counseling begins with diagnosing the causes of children's learning difficulties. Furthermore, students are facilitated to understand themselves, accept themselves and actualize the potential optimally, so that the achievements are relevant with the demands of learning objectives and the potential of the students.

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Integrated Reading Strategy

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***Abstract*—Based on preliminary reflection, it was found that integrated reading learning strategy which was implemented in school was not optimal especially in conference model development. Therefore, it requires a strategy that is able to optimize learning reading by using conference model to achieve learning objectives in the curriculum. This study employed qualitative method which used Classroom Action Research design. The sample consisted of the 7th grade students of Junior High School. Data analysis was conducted by using flow data model analysis (reduction stage, data presentation, and conclusion drawing). Peer-discussion and triangulation method were also conducted to ensure the validity of the data. The result of this study showed that reading strategy at pre-reading stage was able to develop schema and students' reading interests. At whilst reading stage, the students' skill in comprehending the text can be developed. At post reading stage, the students' skill in responding the text through conference activities can also be developed. Integrated reading learning strategy covers three stages. Those are (a) Pre-reading stage: Introduction activity, (b) whilst reading stage: individual reading, and (c) post reading: having conference activity.**

Keywords— Conference Model, Integrated Reading

I. INTRODUCTION

In the "whole language" oriented curriculum, reading is required to be integrated with listening, speaking and writing. One of the learning models that can integrate reading and those three other skills is conference model. Through conference model learning strategy, the students' ability is not only oriented in developing moral values and comprehension skill of the text content, but also in developing students' ability in responding the text. The opportunities in responding the text are provided during reading and conference activity between teacher and students so that students get opportunities to interact and transact towards texts as the main reading activities.

Based on this framework, it is necessary to have reading model that can provide reading activity in dynamic interaction. One of alternative learning models that can meet this expectation is conference reading learning model. In order to achieve this learning model, it is necessary to conduct a research on integrated learning strategy.

Based on the preliminary study, integrated reading learning is less optimal. Based on the result of observation on teaching and learning activities and interview with the teacher and students, some considerations were found as follows: (1) Reading sources in the school library are not utilized well yet; (2) Reading activity is only oriented on developing the ability to comprehend literal aspects; (3) Four language skills do not seem to be integrated optimally; (4) In reading instruction, students are not involved actively in choosing reading sources that can make the students happy to read so that they can be more active to interact with reading texts; (5) Intensive interaction between teacher and students less happened. In reading instruction, the students are only asked to (a) read by turns, (b) read and summarize the texts, or (c) read and answer questions by turns in front of their friends; (6) Some students' quite high reading motivations are less developed

Based on the preliminary reflection, it can be interpreted that integrated reading instruction is not yet implemented optimally. The learning target in the curriculum leads the students to be able to give impression on the story, tell the content of the story, or tell the interesting parts of the story. Therefore, it is necessary to use a strategy that can optimize integrated reading instruction through conference model to achieve learning objectives that is proposed in the curriculum. One of the alternative strategies is integrated reading learning strategy through conference model. Empirically, the problems that are necessary to answer in implementing this strategy are: (1) at pre-reading stage, how is the integrated reading strategy through conference model that can develop students' scheme and motivation towards fiction prose by conference model, (2) at whilst reading, how is the integrated reading strategy through conference model that can develop students' ability in comprehending and responding by conference model, (3) at post reading, how is the integrated reading strategy through conference model that can develop students' response and socialization by conference model, (4) which learning strategy is appropriate to be the integrated with reading strategy through conference model?

Regarding the research questions, this study aimed to create integrated learning strategy dealing with this following concerns: (1) integrated reading strategy through conference model that can develop schema and students' motivation through conference model at pre-reading stage; (2) integrated reading strategy through conference model that can develop students' comprehension on the text content through conference model at whilst reading stage; (3) integrated reading strategy through conference model that can develop students' ability in responding the text content and students' socialization through conference model at post reading stage; (4) appropriate learning strategy for integrated reading strategy through conference model.

Theoretically, the result of this study is expected to contribute a theory of integrated reading strategy that is achieved empirically based on observation and positive feedback towards learning activities. The findings of integrated reading strategy is expected to be able to be basic theory in developing students' moral values in the future.

II. Bases of Integrated Reading Learning

The development of cultural and character education is strategic for the national sustainability and merits in the future [1]. This development should be carried through good planning, appropriate approach, and effective learning method. In accordance with the character values, cultural and character educations are conducted together by all of the teachers and the school stakeholders, through all of the subjects, and being integrated part with the school culture.

The bases on integrated reading learning consist of (1) operational base, namely curriculum, (2) theoretical base that covers approach base, student development theory, and reading strategy. Integrated reading is oriented on integrated approach and communicative approach.

Integrated approach orientation is found in these criteria: (1) In learning implementation, language components, comprehension and usage are delivered integrally but in learning activity, teacher can focus on one of the components; (2) Language learning covers listening, speaking, reading and writing aspects. These four aspects should have equal portion. It should be done integrally in the implementation, for example: Listening---Writing---Discussing; Listening---Speaking---Writing; Speaking---Writing --- Reading; Reading---Discussing ---Role Playing; Writing---Reporting --- Discussing; (3) Integration of language learning and literature should be balanced and able to be delivered integrally. For example, discourse literature can be used as language learning sources all at once; (4) Vocabulary learning is delivered in discourse context and it is integrated with learning activities such as conversation, reading, writing and literature learning; (5) Language and literature learning can be integrated with other subjects to develop moral values.

Reading objectives that are integrated with literacy critical imaginative mode in reading instruction can be oriented on reading story. The taken story should be based on students' thinking level, fictional imagination of the story, interesting aspect of the story that students can respond critically and imaginatively. This selection is in line with the result of study by Van Klinken [2] which shows that reading source that students are interested in is story.

Discourse literacy in this context is in line with the concept of discourse literacy [3]. It is critical and imaginative mode Discourse literacy. This discourse literacy can also be oriented on expert or advanced literacy level after beginning, basic and intermediate level. Expert literacy level is indicated by ability in comprehending, summarizing, and explaining information in the text, while advanced literacy is indicated by ability in synthesizing and taking lesson from the content of the text [4] .

III. Method

The method of this study was qualitative research design through classroom action research. The procedures of this study covered preliminary study, planning, action, observation, and reflection. Preliminary study was conducted at observed integrated reading learning strategy through conference model to get preliminary reflection. Planning stage was conducted by designing action procedures, searching for source of data, determining the action sources, and determining observation form of the action. Action was done by observation and followed by reflection on action implementation [5].

This study was conducted in the 7th grade of Junior High School by using three action cycles. It was selected 32 students as the sample of the study. The data of this study were process and result of activity data from the results of observation, interviews, and notes collection on each revised action of integrated reading strategy through conference model. Observation in general was conducted for all of students that represented high group, average group, and low group. The main instrument of this study was the researchers themselves who played as data collector through observation, interviews, and documentation. Data analysis was conducted by using flow data model analysis starting from data reduction stage, data presentation, and conclusion drawing. Peer-discussion and triangulation method were also conducted to ensure the validity of the data.

IV. Findings and Discussion

Most of the activities in integrated reading strategy through conference model were conducted well in general. The absent activities were group conference and sharing the result of reading by the students in front of the teacher and their friends. Those two activities were not conducted because both were group activities that needed habitual process through special research.

The results of this study showed that learning strategy that can develop schemata and students' motivation at pre-reading stage was indicated by the role of teacher as facilitator and motivator in students' learning activities. In implementing the activities, teacher (1) prepares several books, (2) shows the books, (3) gives guided question to raise knowledge and experience about the books and content prediction, (4) gives question models to comprehend and respond, (5) explains the purpose of reading, (6) explains how to fill in the reading journal, and (7) gives the students opportunity to choose books. The learning outcome at pre-reading stage is the development of students' scheme towards the book and motivation to read. Students' scheme towards the book was indicated by making prediction of the beginning and the ending of the book, describing pictures, telling the title and author. The development of students' motivation to read was indicated by students' activity in searching, choosing, borrowing, and reading books which were very high for observed students whereas other several students were quite high.

Integrated reading strategy through conference model at whilst reading that can develop students' ability is comprehending the book contents indicated by the role of teacher as facilitator, monitor, and participant in learning activities. Teacher's activities are (1) giving opportunity for students to have silent reading, (2) participating in reading, (3) monitoring students' reading activity, and (4) telling the students to prepare and fill in the reading journal. The learning outcome at whilst reading is the development of students' ability in comprehending the book content that is indicated by describing the content, identifying the main character, describing the character, explaining important events, and telling the plot. The level of ability qualification in comprehending the book content of the three observed groups was quite high.

Integrated reading strategy through conference model at post reading stage that can develop students' ability in responding the book and socialization of the students was indicated by the role of teacher as motivator, facilitator, and counselor by conducting activities such as (1) preparing conference schedule and notes, (2) calling the students to have conference by discussing and questioning & answering on students response toward the content of the story, pictures and characters in the book, (4) giving opportunity for students to read aloud the book that students like and planning the following reading activity, (5) giving attention on student who is having conference by observing, showing positive reaction, motivating students, and (6) taking notes conference results, students' strength and shortcoming, and general evaluation. The learning outcome at post reading stage was the development of students' ability in responding the book indicated by stating impression and empathy towards the main character, correlating content of the book to their own experiences, and stating impression on the story illustration. Besides, it also developed socialization ability which was indicated by bringing the reading journal in the conference, speaking actively at the conference, actively listening to the speaker, and being able to answer questions during the conference. The qualification of comprehension and socialization ability of the observed students was in high average. The results are consistent with the concept of discourse literacy [3].

V. CONCLUSION

From the findings, it can be concluded that (1) Reading strategy that can be used as integrated reading learning model covers three stages, namely (a) pre-reading (introduction activity), (b) whilst reading (individual reading activity), and (c) post reading (conference activity). (2) Integrated reading strategy can develop schemata and students' motivation at pre-reading stage. (3) Integrated reading strategy through conference model can develop students' ability to comprehend the book contents at whilst reading, (3) Integrated reading strategy through conference model can develop students' ability in responding the book and socialization of the students at post reading stage.

Based on the findings and conclusion, it is suggested for experts to utilize the result of this study as theoretical reference in developing integrated reading strategy that concerns on integrated reading strategy through conference model. It is also recommended for other researchers to transfer this study into other schools by conducting similar research issues.

It is suggested for teachers to optimize the process and results of integrated reading through conference model by utilizing integrated reading strategy through conference model in the classroom. Teacher is expected to develop his or her roles as facilitator, motivator, participant, monitor, and counselor in integrated reading learning through conference model in the classroom. Besides, teacher is also expected to improve students' activity by stimulating involvement in students' emotion, cares, motivation and perseverance in integrated reading through conference model. It is suggested for parents to give scaffolding reading activities for their children at home by providing reading sources and getting involved in reading activities to create and develop students' motivation and interest well.

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Correlation between Logical Thinking and Understanding of Science Concept

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***Abstract*—The cognitive development of students of elementary teacher education consists of their acquisition of knowledge and formation. Meaningful science encompasses scientific concept and cognitive skills. Having logical thinking abilities can be helpful for understanding the concept in science. Based on data of formative test, most studentst got bad examination results in the last semester. Some students think that learning science is very difficult. This study aims at describing a correlation between the logical thinking abilities and understanding of concept in science for the students of elementary teacher education. The 30 students chosen randomly are observed during the learning process in science. The result shows that there is a significant correlation of logical thinking and understanding of concept in science. A contribution logical thinking to understanding of concept in science is only 18.9%; this is a low contribution. According to the scores on Test of Logical Thinking (TOLT), there are only 23.3% of the students who have reached the concrete stage; 53.3% of the students who have reached the transitional stage; and 23.3% of the students who have reached the formal stage. The other factor can influence to maintain their understanding and reasoning about the specific concept in science.**

Keywords—Logical Thinking, Science Concept, Student Of Elementary Teacher Education

I. Introduction

The importance of learning in science for the students of elementary teacher education is to understand about concept and their thinking, that a science processes skill and develops a positive attitude. However, science perspective as one of subject matter is required in the education. In fact, our education is lack of giving the students changes to develop their holistic, creative or logical thinking and it does not make an attempt for mastery learning in the individual. Learning science does not only transfer knowledge from teacher to student, but also it is about knowledge construction through student thinking activity involving the processes and activities of scientific work. Commonly science in schools of Indonesia is more theoretic than inquiry, so the students are unable to solve the problems in daily life [1]. This condition takes the students to the university. Cognitive development of the student of elementary teacher education consists of their acquisition and formation of knowledge. Explanation on how human being to create knowledge has been influenced by four factors; there are language skill, logical thinking ability, experience, and interest [2]. Another has considered at that time we analyze data or process information to find the truth, surely we require of thinking skill.

Thinking process like capturing a reality, formulating into a sense, two or more understandings can be arranged into a decision. Finally the decision is assembled into a conclusion. The assertion of decision is expected to be a truth. The object observed requires a sensory experience directly in the surrounding environment and the activity of thinking is to generate ideas. Concept is one from of the ideas. Concept is an abstract and general representation of something. In science, concept is a basis for higher mental processes to formulate principles and generalizations [3]. The concept is a description of the characteristics of an object that may distinguish from the other object [4]. In accordance with Berg, concept is an abstraction of characteristics about something that facilitates communication among humans and allow humans to think [5]. It can be concluded that concept is an idea to describe certain characteristics of an activity that has meaning in order to facilitate communication. Usually learning concept in science becomes a serious problem, because every student has a different stimulus. Understanding concept must be appropriate to the rules based on which the concept is obtained

Piaget's theory on cognitive development involves a proper equilibrium between assimilation and accommodation [4]. That means, for this equilibrating process the students are active simultaneously to assimilate a piece of the environment and accommodate mental structures to understand better or adapt to the piece of the reality. Mental structures and schemas develop continuously. Furthermore, since the students have entered the school age, the cognitive development has evolved. Piaget divides the logical thinking stages into sensory-motor (ages 0-2 years), preoperational (age 2-7 years), concrete operational (age 7-11 years), and formal operational (age 11-16 years).

Based on data of formative test, most students got bad examination results in the last semester. Some students think that learning science is very difficult. However, the students comes into our classes with a range, prior ideas, or conceptions on the physical world. They are not 'empty vessels' [6]. The process to understand the concept enables every student to have different conceptions from the others based on their experiences of discovery on learning in science. Along with their age, learning in science encourages curiosity to investigate, predict, control variables, interpret data, formulate hypotheses, and communicate. Scientific knowledge takes the form of system of concept and theories [7].

Conceptual understanding involving the logical thinking helps the students to identify and correct their misconception. Meaningful science encompasses the scientific concept and cognitive skill. Having a logical thinking abilities can helpful to understand the concept in science. With logical thinking the students solve the problem by conducting the various mental practices, or reach principals or rules by executing some abstraction and generalization [8]. In accordance with Hackling, to be successful in science and in understanding the concepts of science are directly associated with formal reasoning skills [9].

II. METHOD

In this study, the researcher analyzes the data quantitatively. The samples of this study are 30 students chosen ramdomly; they were observed during their learning in science. Data were collected at two different ways. The students' logical thinking ability is measured by the Test of Logical Thinking (TOLT). This test was developed by [10] according to Piaget's cognitive developmental phase. TOLT consists of 10 items designed with multiple-choice format to measure variables of controlling, proportion, probability, correlation, and combination with reasoning. The students took the TOLT translated into *Bahasa Indonesia*. Classification of test scores is as follows: 0-1 is concrete, 2-3 are transitional, 4-7 are formal, and 8-10 are highly formal [11]. Assessment for understanding the concept of science was developed with the concept of science selected according to Bloom's Taxonomy. Students take the test using a paper-and-pencil essay test format. This test consists of 75 questions.

III. RESULTS AND DISCUSSION

The result based on descriptive statistics (Table 1) indicates that the logical thinking student of elementary teacher education to have influence to understanding of concept in science.

TABLE I. MODEL SUMMARY

		Model
		1
R		,435
R Square		,189
Adjusted R Square		,160
Std. *error* of the Estimate		13,953
Change Statistics	R Square Change	,189
	F Change	6,517
	df1	1
	df2	28
	Sig. F Change	,016

a. Predictors: (Constant), X

According to table of Model Summary, the correlation between logical thinking and understanding of concept in science was low, namely: (r_{xy}) = 0.435 and F_{change} = 6.517 with p-value = 0.016 < 0, 05. Whereas, the determination coefficients from table is R Square = 0.189, the result indicated that contribution of logical thinking is only 18.9% to the understanding of concept in science. Most students used their thinking discrepancy between fact and concept. In fact, each student of elementary teacher education have conceptions different from the scientists' conceptions. Commonly these are called misconceptions [12], [13], [14]. These conceptions are similar in age, gender, abilities and culture [3]. Piaget has shown that some children begin to reflect an ability to engage in formal, abstract thought. As we have known that the cognitive development has a permanent and hierarchy stage, maturity, experience and social transmission. Naturally, in accordance with [15] intellectual development stage is hierarchy. The structure that seems in each stage is integration from the previous one, and consists of initial awareness and mastery periods. Transition of both periods continuously happen. Each of people follows the same sequence. That means, each of them has the same intellectual development since their infancy to adolescence.

However, most students of school elementary teacher education at Unisma Bekasi have a low understanding on science concept. Therefore, the students are not accustomed to using their thinking. That is the other factor than can influence to maintain their understanding and reasoning about the specific concept in science. Hence, planning and implementing a science program also requires a thorough understanding on students' characteristics. But, but in this study the consideration is in relation the curriculum, teaching effort and text book that can influence how the students contract their knowledge. In accordance with [5] that the nature and structure of science have often been presented as a set of fact, concept, and principles "given" to us by someone else. The matter that must be considered at this point is knowledge on what the students think about, because misconceptions on the part of the teacher can result a negative effect in the students' prior knowledge and deficiencies of understanding [16]. For example, a large proportion of many textbooks on science often present concept of science requiring a type of abstract thinking in the elementary grade, which is not provided for the students. Moreover, this problem ensures as a practical application for understanding functional characteristics on abstract and concrete thought. The development of an operational understanding of concept of classification, serration, number, space, time, weight, and other that have been considered is said to be necessary prerequisites to the later abstract thinking [5].

The abilities of the students' logical thinking can provide information about the cognitive level (Table 2). In accordance with Demirel, logical thinking includes effective use of numbers, finding scientific solutions to problems, realizing differences among concepts, classification, making generalization and calculations, and providing hypotheses [9].

TABLE II. FREQUENCY DISTRIBUTIONS OF SCORES FROM TOLT

Interval Score	f	%	Cognitive Level
0-1	7	23.3	Concrete
2-3	16	53.3	Transitional
4-7	7	23.3	Formal
8-10	0	0	Rigorous formal
Total	30	100.00	

Description on the students' logical thinking abilities of school elementary teacher education at Unisma Bekasi is almost in a transitional level. The results of Test of Logical Thinking (TOLT) are only 23.3% of the students reaching the concrete stage; 53.3% of them reaching the transitional stage; and 23.3% of them reaching the formal stage. That means that each of the students have different cognitive levels. Reference [5] cognitive development is a continuous process and shows a remarkably similar sequence among individual. The concrete students can also be identified that they are probably rather difficult to develop their thinking. In accordance with [17] concrete students can be instructed with instructional materials that provide first-hand experiences and concrete problems. To be able to promote meaningful learning, teacher should help students to construct abstract key concepts, to realize the interrelationships among the concepts, transfer and integrate what they learn in one course to another and to their daily lives. The formal students should be able to perform: hypothetical-deductive reasoning, probability, combination, identifying and controlling of variables, proportions and correlations, eliminating experimental contradiction, propositional logics [5]. And, the students of school elementary teacher education in concrete and transitional levels should be able reach the logical or abstract thought due to their thought development potency.

There are many ways to provide a rich learning environment facilitating the students to increase their knowledge; these are inquiry methods with constructivist approach [18], PBL approach [10] and conceptual change [19], [20], [21], [22].

IV. CONCLUSION

Science should be facilitating the students to understand of science concept and their thinking. The students' conceptions from useful prior knowledge can build on [6]with logical thinking abilities that should be given new emphasis in the teaching and learning of science [23]. Thus, this is an attempt of educators to ensure of the students' optimum development toward logical or formal operations.

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Students' Difficulties on Science Learning with Prototype Problem-Solving Based Teaching and Learning Material:

A Study Evaluation of Development Research

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Abstract*—This research intended to develop a prototype of teaching and learning materials on natural science topic of junior high school. The development of learning materials was conducted by using Dick and Carey's Research & Development model. Teaching and learning materials are included syllabus, lesson plan, worksheet, student's book, test of learning outcome. This study is a deep evaluation to find weakness of prototype from the student's perspective and enhancements to make it better. Research subjects were 32 junior high students taken by simple random sampling. Data collection technique was observation of student's activity and evaluation of worksheets. The instruments included questionnaire, observation sheets and students' worksheets. The result showed that the semi-summative evaluation of the prototype was success to create a feasible prototype. Teachers can apply well, but students had a bit of difficulties. It was concluded that the weakness of the teaching and learning material prototype from the viewpoint of the students are activities work to do problem solving strategies on the experiment. The teaching and learning material prototype still needs to be enriched in terms of operational definitions of concepts, the tools, and tool laboratory functions as well as a glossary.

***Keywords*— Problem Solving, Science Education, Teaching and Learning Material, Students' Difficulties**

I. INTRODUCTION

Research and development is intensively engaged experts in an effort to solve the problems in education. Great zest by experts is due to research and development has an advantage rather than other type of research design. The main advantages of the development of research is the findings of the study, which is a product. This product is a concrete response to the gap between everyday educational issues with the desired expectation [1].

Today has been widely circulated reports of research and development to improve students' 21st century skills. Development research on model development research on media, development research on the material, and development research on assessment crammed into table of contents of education journals. The trending topic is a product development aims to enhance students' problem solving skill.

All kinds of study lead to the product in the form of teaching and learning material. Each of these researchers claim that product development is a reliable product. Theoretically, the quality of a product development results judged by the validity, practicality, and effectiveness [2]. Education experts began to be skeptical. The problem that arises is the result of the development of product quality is often questionable [3]. Concrete problem is the product of development tends not as good as the quality of the test results. Especially when used by other users, in addition to researchers. The result of the use not uncommon to have a gap between the qualities of the test report with the results of user satisfaction.

This is a real indication that the product research development though it was classified as valid, practical and effective, still have weakness. There are weaknesses of prototype that misses from researcher's view. The weakness could also not be detected by the reviewer, both at the time of the validation test or try out phase.

Referring to the fact, the best evaluator of a product is the consumer. The main consumer in the world of education is students. Opinion Students are very necessary to be considered. The response can describe the problems, obstacles or weaknesses of a product that may miss from investigators or expert assessment. This can happen because the reality can be very different at field, between theory and practice, as well as between one place and in other places.

One of the many results of the latest development is teaching and learning material for [4]. This teaching and learning material is still a prototype. The products were declared valid, practical and effective. As with other products of RnD this science material of teaching and learning needs to be evaluated in more depth from a consumer standpoint.

Solutions in response to public skepticism, more in-depth study needs to be done on the weakness of products. More in-depth evaluation study is intended to find a weakness of teaching and learning material that may not have been discovered during the creation of the prototype.

Based on the above illustration, the problem of the study is stated as “What is the weaknesses of teaching and learning material prototype from the students’ perspective?

II. METHOD

The development of teaching and learning material was conducted by using Dick and Carey’s R & D Model. This study is a follow-up evaluation studies to find the weaknesses of teaching and learning material prototype that may not be detected before. Evaluation study was conducted in class VII B SMPN 1 Banjarmasin consisting of 32 students. Data collecting instruments of this research are observation sheets, evaluation of worksheet and questionnaire.

Purpose of this study is to find weakness of the prototype from the student's perspective and enhancements to make it better. As explained [2] :

> *“Formative evaluation serves different functions, or – in other words – is aimed at different quality criteria (or combinations of these) in the various development cycles, each being a micro cycle of research with its specific research/evaluation question and related research evaluation design.”*

The development research incorporates systematic educational design processes, as illustrated in Fig. 1.

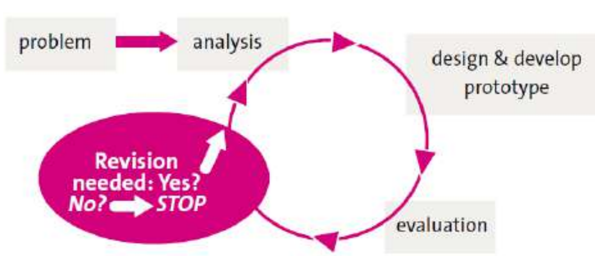

Fig. 1 Iterations of systematic design cycles

Investigations were carried out from the standpoint of students through observation toward student's activity and opinion.

III. RESULTS AND DISCUSSION

The observation toward the teachers’ and students’ activities during the learning process generates the percentage of achievement of activities for each step of the students’ learning activities. The results are used to determine students' learning activities by using teaching and learning material for students. Results of the assessment of students’ activities through observation sheet are shown in Fig. 2.

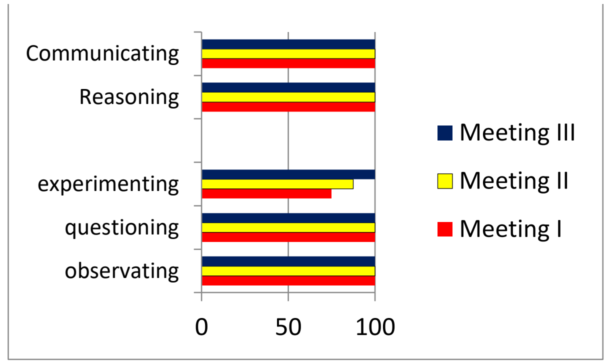

Fig. 2 Students’ activities

Fig. 2 shows that the students are still having difficulties in conducting experiments. The contents of the experimental activities refer to conducting problem-solving. Based on field observations, the students are often not confident or not confident at the time they wanted to do the experiment or solve problems. They tend to hesitate and often ask questions.

This phenomenon occurs naturally in the learning environment of problem-solving. A research report by [5] on the activities of students' problem solving, shows that the studets are often found to be passive and hesitate in trying to solve the problem. The students became silent and did not know what to do. This is exacerbated by passive students who were slightly embarrassed to ask the teacher when they did not understand about the learning activities. They tend to be asked by a friend in the group. Passive students are more open to the group of their friends. This passive behavior makes experimental activity not run smoothly.

A cause of the students’ passive behavior during this experimental activities is due to their weak ability in cognitive process. They have difficulties in carrying out the planned activities. They still seem not to be familiar with the problem-solving plans on grains of certain knowledge. Problem-solving experiment activities rely on the students' cognitive process. They need cognitive process in order to conduct experiments.

According to Gagne’s theory, the students solve problems through several stages of cognitive processes. Phases of cognitive processes include *discrimination, concrete concept, defined concept, and finding the rules of problem* [6] Discrimination, concrete concept, defined concept, and setting of rules are requirements for someone to solve the problem.

The process of linking knowledge occurs at the stages of making the concept concrete, discriminating, defining concept of the problem and finding of the rules of the problem on the students periodically at each meeting. The first two abilities of the students to solve the problem are the making the concept concrete and discriminating. Discriminating is the ability to provide inter-stimulus responses that are same or different. An example of discrimination is that the hard object is different from soft one. making the concept concrete is the ability to show visible properties of an object. An example of concrete concept is color of wood.

Ability in making the concept concrete and discriminating occurs when students understand the problem in steps of identifying the problem. Both of these abilities do not make students' difficulties due to take place automatically when they are exposed to the object or matter. The result of the ability of making the concept concrete and discriminating is a form of factual knowledge and some knowledge on the concept.

A ‘rule’ is a regularity in special situations. This rule is a kind of provision that connect objects to other objects. These objects have properties of interdependence. The process of finding the rule of the problem requires upon ability to connect knowledge. The process of linking knowledge occurs more actively when the students apply the rules. Examples of rules, if the fire is ignited dry wood will burn. Objects that are connected to those rules are dry wood and fire. Rules or provisions that connects the two objects is: if it is burn if fire is ignited fire toward dry wood.

In order to sharpen the analysis of the weaknesses of the experimental activities, supporting data are presented. Based on the following data, cognitive process skills still shows the students’ weaknesses. Supporting data and cognitive assessment data of the students in problem solving process are presented in Figure 3.

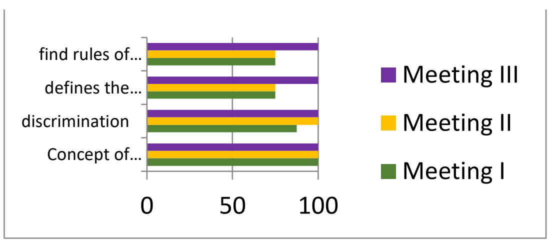

Fig. 3 Students’ cognitive process

The Fig. 3 shows indeed the students still have difficulties to define concepts in problems of learning. The weak concept of prerequisites dominated by students led them to be difficult in determining the steps to be taken in the experiment.

Reference [7] found out that the understanding of prior knowledge can help the students to accurately construct knowledge. Combination of prior knowledge and conceptual knowledge can support the students' scientific activity. Investigations can only be done if they understand what they want to investigate. The combination of prior knowledge and conceptual knowledge, enables the students to understand the problem. Furthermore, provide more opportunities for them to conduct a series of investigations. This is because a key aspect of the investigation is that the students understand the question tested [8]

Beads of knowledge that has not been understood by the students relates to the information in the lab equipment and concepts of prerequisite. Class VII is an amateur practitioner, even than the interview obtained information that the majority of students stated that for the first time officially in a lab practicum. This situation makes students not familiar with lab equipment.

Another obstacle is that the prerequisite concepts are still weak. Prerequisite knowledge or prior knowledge is still insufficient such as in knowledge of the physical and chemical properties and the introduction of practical tools and functions.

Components of teaching and learning materials that interact directly with students in which the definition of the concept is related to the students’ book. So this weakness becomes the aspects that needs to be corrected in the prototype. Deficiencies found in this study is the content of students’ book and students' worksheets. These learning and teaching materials still need to be enriched in terms of operational definitions of concepts, and equipment and its functions within the lab.

Based on a review on the students’ book and worksheets, not many operational definitions are found. Then the improvements that can be done is to add information about the operational concepts, and equipment and its functions in the form of a glossary. Based on Indonesian dictionary, word ‘glossary’ is a list of words and their explanations.

In fact, the operational definitions of the prior knowledge are sufficiently covered in the students’ book. This is in contrast against the results of the evaluation that the students are still difficult to understand the concept of prerequisite. It makes sense that it can happen due to the words and information about the prior knowledge within the resource remains elusive for the students. Furthermore, it is because the students still have poor vocabularies, insufficient knowledge from elementary education. Seventh grade junior high school students have just graduated from elementary school, and therefore the words presented should be those that are appropriate with their age.

Revision on the content of students’ book is conducted by adding information on the operational concepts, equipment and its functions in the lab, and improving the sentence structures on the content of the prior knowledge. Improvements are covering blended words and brief words, unambiguous words and standard words. Not a word absorbed from a foreign language was vain.

Words absorbed from foreign language is difficult for students. Reference [9] analyzes that when students are dealing with unfamiliar words they will experience double troubles. If the language used is difficult to understand, they will interpret it in two stages. The first stage is to understand the language and translate it into an understandable language. The second stage is to interpret it. Words such as centrifugation, evaporation, sublimation and chromatography are unfamiliar words for the students and should be changed into the more familiar ones. For example, 'a centrifugation method of separating a mixture' is more easily understood by the students if it is referred to rotation

Other improvement includes the writing of teaching material and content. This improvement covers the writing of chemical symbols made according to the rules of scientific writing, the establishment of foreign terms to be replaced with the appropriate Indonesian rule terms. Fixed content includes the explanation on separation of mixtures made simpler, addition of images in accordance with the concept of separation of distillation, examples of distillation solution made more easily recognized by the students in everyday life

This revision is a highly recommended treatment. Reference [10] in a research report, treatment with enriching the content of a book can stimulate students' interest in reading. When the students' reading interest increase, they can more easily build understanding and compile the necessary information.

When a qualified student understands he will know what to do and realize what is being done. This will reduce the intensity of asking and improve performance in learning activities. The next effect is that students can overcome difficulties in experimental activities.

IV. CONCLUSION

The most problems in learning process using this teaching and learning material prototype were in the students' activities. Most students are still passive when doing experimental activities. Based on the result and discussion it can be concluded that the weakness of teaching and learning material prototype is in the content that still needs to be enriched in terms of operational definitions of concepts, the laboratory equipment and its functions as well as the word glossary.

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Anisotropic Mechanical Harmonic Oscillator In Lissajous Curve 3D Using Spreadsheet Excell :

A New Aproach To Visualize Three Dimensional Optical Instrument

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***Abstract*— It is proposed a new approach of three dimensional optical instrument using spreadsheet excell by which ray trajectories or anisotropic mechanical harmonic oscillator form Lissajous curves. An important property of this curve is that a three-dimensional region of space can be portrayed stigmatically with perspective projection both azimuthal rotation and altitude rotation. The results present not only a plentiful lisajuos curve as long as the ratio of those frequencies of oscillation is rational, but also a deeper understanding for students in superposition wave concept. Even more, simulation of ray trajectory or anisotropic mechanical harmonic oscillator with spreadsheet excell simplify students to explore the problem solving in optical wave. In addition, because analogy of the property of light emerged from one point then converges to another in the lisajous curve is the same as the light property emanated from any point within the Lissajous lens, this approach is considered as an optical instrument.**

Keywords*— *Lissajous Curves, Spreadsheet Excell, Optical Instrument

I. Introduction

The simulation using spreadsheet excell is conducted with the purpose to overcome the material of physics learning such as the superposition of waves having perpendicular harmonic oscillation. This material is considered to be difficult for the students. The use of highly specialized software without sufficient understanding of the underlying methods may at times impede development of the students' skills. Therefore, using spreadsheets in education, besides accessing to computers can be improved, there is a potential way to enhance the quality and experience of learning offered to the students [1]. Spreadsheets may be considered as a viable alternative for enhancing education in electrostatic problems and engineering fields [2]. The use of a spreadsheet as a computational interactive simulations and numerical approach to support the mathematical modelling of physical phenomena such as in the mass spring system case can improve skills for a better understanding and be useful to support the interpretation of the modelling results [3]. In physics, harmonic oscillation is a type of periodic motion where the restoring force is proportional to the displacement. The patterns formed when two harmonic oscillation along perpendicular lines are superimposed has been known as Lissajous Curves or Lissajous figures. Some conditions will be presented in curve if degeneracy and even space of the spectrum is perfect, and never spread out but periodically oscillating in shape. The occurrence of the harmonic oscillation wave in mechanics and efforts to figure Lissajous Curve of 2D and 3D in non-Euclidean geometry have brought high attention to the field describing analogy with a ray trajectory lissajous lens in certain refraction index to be considered as an absolute optical instruments [4]. An absolute optical instrument is a region of space filled with an optical medium where all points and light rays emanated from a single point anywhere in space will, at some other time, all converge to a single point in space [5]. The interest on developing computational tools using a spreadsheet due to the fact that it allows to do the numeric representation, using symbolic expressions as well as the visual representation, the possibility to do so in a dynamic way makes an essential tool to support the modeling and the analysis of the results oscillatory waves. This paper presents a simulation of anisotropic mechanical harmonic oscillator for a long time in non-Euclidean geometry as physics modeling approach based on the use of computational tools for numerical simulations. It originates from choosing the spreadsheet Excell to show that lissajous curve of 2D and lissajous spot of 3D to be used as the tracer of light rays in optical instruments. Nonetheless, there are still many open questions for example, is there a formulaic way of spreadsheet excell to construct its trajectory?

II. Method

A. *Using Spreadsheet of EXCELL to Obtain Lissajous Curve in 2D*

In Cartesian coordinates, the independent harmonic oscillations spread in the three spatial directions. The combination of the two harmonic motions results in a trajectory with the form of a two-dimensional (2D) extension of the well-known Lissajous curve. Lissajous figure is also called Bowditch curve, pattern produced by the intersection of two sinusoidal curves the axes of which are at right angles to each other [6], to describe superposition processes from two waves function where they are perpendicular each other, the waves function formulated with [7]:

$$x = A\cos(\omega t + \phi)$$

$x(t)=A_x\cos(\omega_x t - \phi_{0x})$, , and ω_x is frequency in x propagation, $y(t)=A_y\cos(\omega_y t - \phi_{0y})$, where A_x, ϕ_{0x}, A_y and ϕ_{0y} are constants depending on the initial conditions, ω_x, ω_y is frequency propagation of those waves respectively.

The following is the organization of dataset lissajous 2D in the spreadsheet:

B3 : the cell contain value of frequency of wave fx

B5: the cell contain value of frequency of wave fy

B7: the cell contain value of fase ϕ_{0x}

B9: the cell contain value of fase ϕ_{0y}

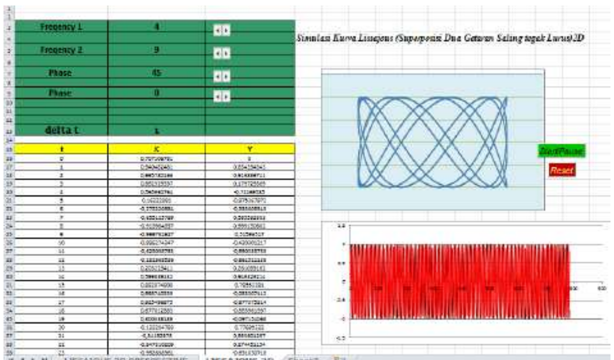
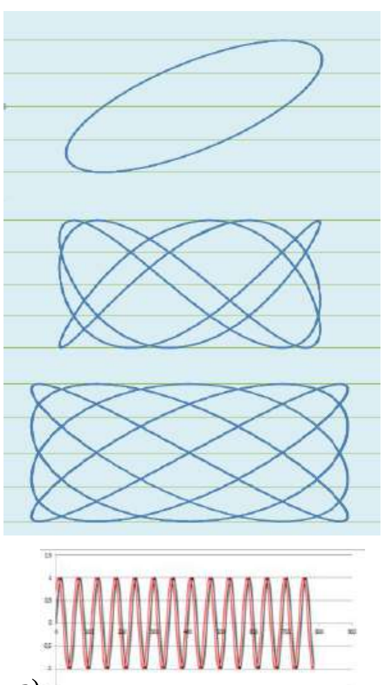
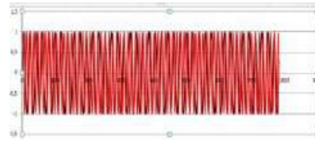


Fig. 1. a) Displays of spreadsheet excell simulation processes in two Dimension (2D) $f_x = 5/3,\ f_y = 2$, $\phi_{01} = 0^0, \phi_{02} = 45^0$ b) oscillation in x time

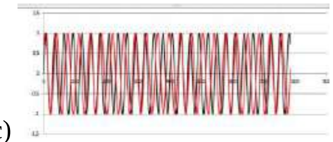
Plot those formulation to the Spreadsheet excell in XY Scatter Chart , $\phi_{0x} = 0^0$ and $\phi_{0y} = 45^0$,$A_x=A_y=1$, with some ratio frequency ($f_x : f_y$) , 1: 1, 3 : 5, and 5/3 : 2 in following figure respectively:



a)



b)



c)

Fig. 2. a)Lissajous curve with $f_x : f_y = 1:1$ $\phi_{01} = 0^0, \phi_{02} = 45^0$ and oscillation its in time, b) Lissajous curve with $f_x : f_y = 3:5$ $\phi_{01} = 0^0, \phi_{02} = 45^0$ and its oscillation in time, c) Lissajous curve with $f_x : f_y = \frac{5}{3} : 2$ $\phi_{01} = 0^0, \phi_{02} = 45^0$ and its oscillation in time

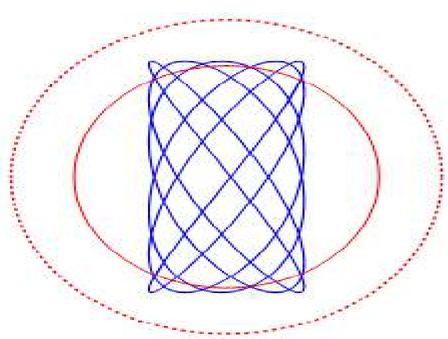


Fig.3. Ray trajectories in a Lissajous lens with $a = 5/3$, $b = 2$. The solid simple curves represent the line on which $n = 1$ in the optical case, and the outer dotted lines represent the $n = 0$ lens boundary [8]

Compared from a lissajous curves in fig. 2c and fig.3 enhanced assumption that simulation with spreadsheet excell yield is the same as lissajouse lens 2D. In analogy with mechanics it then immediately follows that the ray trajectories in this index also given by Lissajous curves. Figures. 3 show an example of ray trajectories in two two-dimensional (2D) lenses for two different *a*-to- *b* ratios [8]. It can be seen clearly in Fig.3 that light emerges from one point then converges to another, and this property is true for light emanating from any point within the lens, so long as the ratio of *a* and *b* is rational.

B. LissajousCurve 3D using Perspective in Spreadsheets Excell

In the case of the 2D Lissajous curve, an effective non-Euclidean geometry for light rays can be visualized by embedding a certain 2D non-Euclidean surface into 3D (3 Dimension) space. The superposition processes from three wave's function where they are perpendicular each other, the wave's function is formulated with [7]:

$$x = A\cos(\omega t + \phi)$$

$x(t)=A_x \sin(\omega_x t - \phi_{0x})$, , and ω_x is frequency in x propagation, $y(t)=A_y \sin(\omega_y t - \phi_{0y})$, $z(t)=A_z \sin \omega_z t$ where A_x, ϕ_{0x}, A_y, A_z and ϕ_{0y} are constants depending on the initial conditions, ω_x, ω_y, ω_z is frequency propagation of those waves respectively.

Perspective on ray trajectories are then represented by geodesics on this surface. Perspective defined as the technique or process of representing on a plane or curved surface the spatial relation of objects as they might appear to the eye. Figuring out of a lissajoaus curve 3D needs to present a fixed axis with an azimuth rotation or altitude rotation from other axises. In this paper, it is selected an azimuth rotation with z axis fixed whereas x, y ordinate is rotating with angle of rotation α. If x', y' and z' are vector of waves before rotation, the formulation after α rotation is

$$\begin{pmatrix} x' \\ y' \\ z' \end{pmatrix} = \begin{pmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} \qquad (1)$$

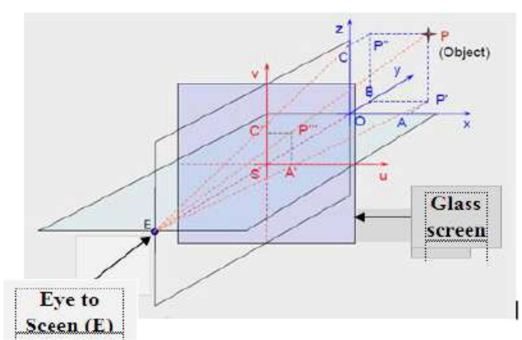
The other cases on altitude rotation, selected x axis as a fixed axis and y, z coordinate is rotating with angle of rotation β, we get the formulation

$$\begin{pmatrix} x'' \\ y'' \\ z'' \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos\beta & -\sin\beta \\ 0 & \sin\beta & \cos\beta \end{pmatrix} \begin{pmatrix} x' \\ y' \\ z' \end{pmatrix} \qquad (2)$$

Specifically, to represent a drawing of parallel lines as converging y axis in order to give the illusion of depth and distance where the segment of Eyes to Screen (ES) and Screen to Object, (illustrated in horizontal and vertical in figure 2(a) and 2(b)), the relation between those segments by vertical and horizontal perspectives respectively,

$$\frac{ES}{EB} = \frac{SA'}{AP'} \rightarrow u = \frac{x.ES}{ES+SO+y}, \qquad \frac{ES}{EB} = \frac{SC'}{BP''} \rightarrow v = \frac{z.ES}{ES+SO+y} \quad (3)$$

a)



b)

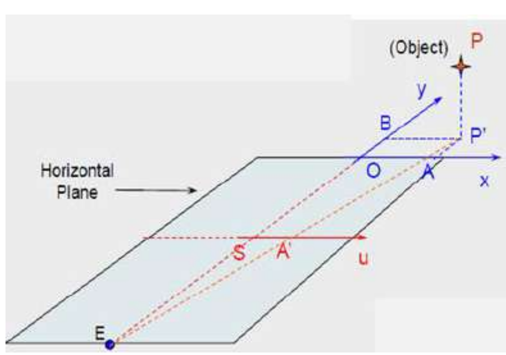


Fig. 4 a) vertical perspective and b) horizontal perspective spreadsheet excell simulation in Three Dimension (3D)

Figure 4 (a) and (b) shows an example of a horizontal perspective *u* and vertical perspective *v* with the formula $u = \frac{x'' \; ES}{ES + \; SO + \; y''}$ and $v = \frac{z \quad ES}{ES + SO + \; y''}$

The following is the organization of dataset lissajous 3D in the spreadsheet:

- B1 : the cell contain value of frequency of wave f_x
- B3 : the cell contain value of frequency of wave f_y
- B5 : the cell contain value of frequency of wave f_z
- B7 : the cell contain value of fase ϕ_{0x}
- B9 : the cell contain value of fase ϕ_{0y}
- B11 : the cell contain value of azimuth rotation α
- B13 : the cell contain value of Altitude rotation β
- A17 : the cell contain value of time
- B17 : the cell contain the calculation of oscillation in *x* component
- C17 : the cell contain the calculation of oscillation in *y* component
- D17 : the cell contain the calculation of oscillation in *z* component
- E17 : the cell contain the calculation of oscillation in *x*' component
- F17 : the cell contain the calculation of oscillation in y' component
- G17 : the cell contain the calculation of oscillation in z' component
- H17 : the cell contain the calculation of oscillation in x'' component
- I17 : the cell contain the calculation of oscillation in y'' component
- J17 : the cell contain the calculation of oscillation in z'' component
- K17 : the cell contain the calculation of azimuth perspective *u*
- L17 : the cell contain the calculation of altitude perspective *v*

To build the graphic using the values calculated in columns A17 to L17 , we should select cells A17 to A 802 , B17 to B 802, C17 to C 802 and so on L 17 to L802, choose Chart Wizard button. Inside we should pick a type XY scatter plot graphic. Then it is essential to format the graphic paying special attention to the scale. Figure 4 shows the lissajous curve in 3D for the parameters and initial conditions previously defined. Plot those formulation to the Spreadsheet excell in XY Scatter Chart, $\phi_{0x} = 30^0$, $\phi_{0y} = 45^0$ $A_x = A_y = A_z = 1$, with some frequencies $f_1 = 2,\ f_2 = 2{,}9, f_3 = 4{,}9$ in following

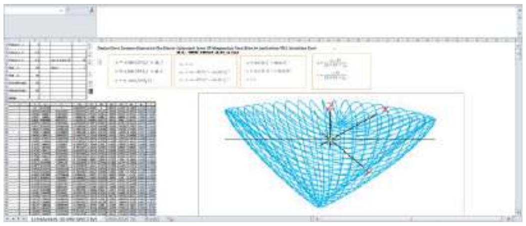


Fig. 5. Displays of spreadsheet excell simulation in Three Dimension (3D) $f_x = 5/3,\ f_y = 2,\ \phi_{01} = 0^0, \phi_{02} = 45^0$

III. Results

The outline of spreadsheets excell in education, one of our principal aims has been to provide a useful of spreadsheet excell in display of oscillator of mechanics waves where in CRO views was very limited. A description of a cathode ray oscilloscope (CRO) visual display should be sufficiently detailed to enable a reader to produce a visually equivalent display, either on a CRO or by other means [9]. There is no longer a need to question the potential for spreadsheets to enhance the quality and experience of learning offered for students. The merrier of facilities to use spreadsheets in assessment contexts either by ensuring that access to computers is improved or by changing assessment methods. Further expansion is completed to develop of the display the oscillator of mechanics waves in three dimension (3D) where they cannot show in Chatode Ray Oscilloscophe (CRO) that can be effectively covered by spreadsheet simulation. Students can engage in explorative activities resulted from changing the values of parameters and the initial conditions within the representation, using scrollbars made by using Macro Visual Basic for Application. VBA is a programming language embedded in Excell. VBA manipulates objects, and each application has its own unique object model. The actions are executed after running the VBA code. Using VBA students can present some interesting lissajous curves with the ratio of constant frequencies and shift their initial phase and rotation such as following figures:

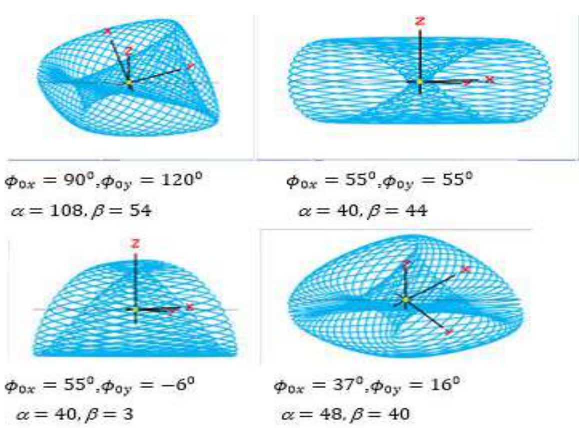


Fig. 6. Displays of spreadsheet excell simulation in Three Dimension (3D) if the ratio of frequency 4,3 : 3,2 : 1,1 was constant and shifted its initial phase , azimuth rotation α and altitude rotation (β)

The Lissajous curve in 2D and 3D with some frequencies and initial conditions can be compared with CRO displays in fig. 4 where it showing more figure and a comprehension understanding for student in superposition concept.

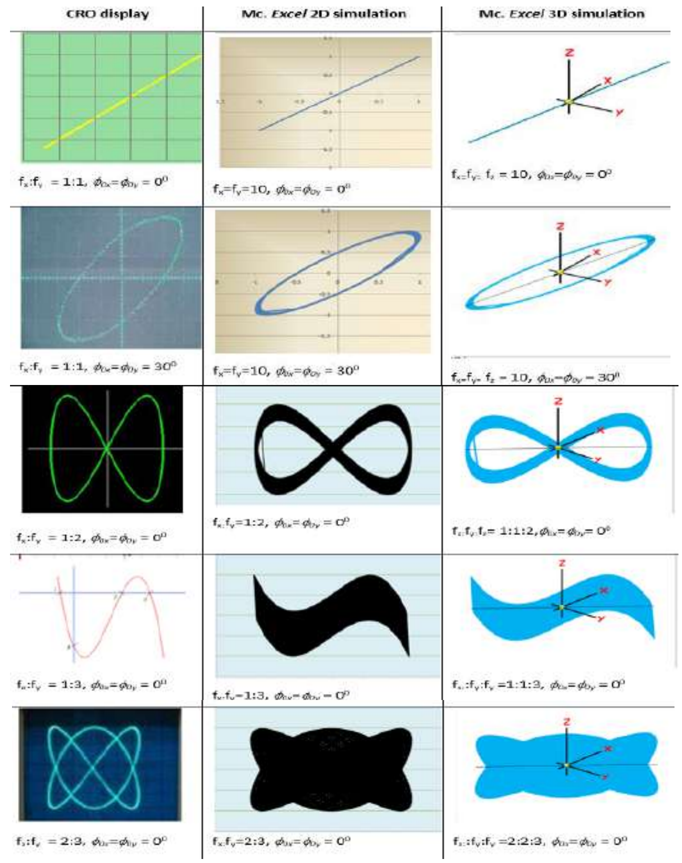


Fig. 7. a) The comparison of CRO display, simulation with spreadsheet excell in 2D, simulation with spreadsheet excell in 3D Simulation with some ratio of frequencies and initial phase.

IV. Discussion

The superposition three frequencies of oscillation harmonic waves in 3D Plot of spreadsheet excell make very interesting lissajouse curves. Special regular curve traces are famous and named in honor of the French physician Jules Antoine Lissajous [10]. These figures show illustration more about the ray trajectory in in the three Cartesian directions. This leads to independent harmonic oscillations in the three spatial directions where the oscillation is not independent from each other. The combination of the three harmonic motions results in a trajectory with the form of a three-dimensional (3D) extension of the well-known Lissajous curve. Lissajous curve as Lissajous lens or as an optical instrument with employ the close relationship between classical mechanics and geometrical optics and analogue of an anisotropic mechanical harmonic oscillator [8]. To explain the properties of the lens, make a starting with the oscillator and then proceed to the optical case as a mechanics analogy, in which its harmonic oscillation in this plane is analogical with the ray trajectories in certain index, the Lissajous curves show example ray trajectories in three -dimensional (3D) lenses for three different f_x f_y and f_z ratios. It can be seen clearly that light emerging from one point later converges to another, and this property is true for light emanating from any point within the lissajous lens, as long as the ratio of f_x f_y and f_{yz} is rational. Note that the image points do not have to lie on a straight line with the center of the lens], a property is likely unique to this lens (excepting conformal inversions of other reported lenses). Figure 7(a) shows an example of a 3D Lissajous lens and again illustrates its unique imaging property. Figure 7(b) shows an example lens where ray trajectories become helical if one of the parameters *a*, *b* or *c* goes to infinity.

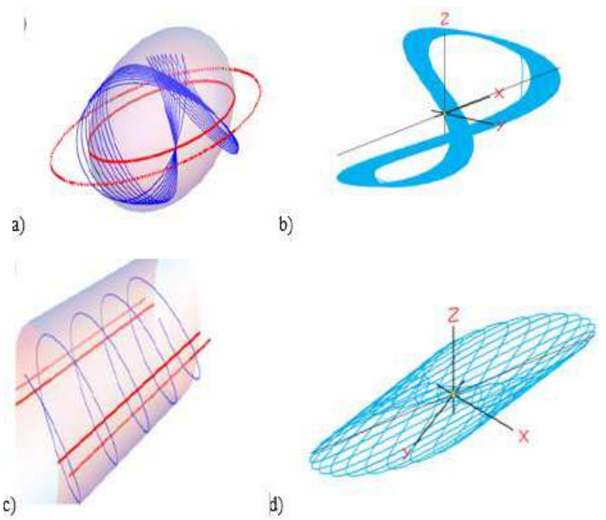


Fig. 8. a) Lissajous lens with $a = 1$, $b = 2$, $c = 1$,c) Lissajous-like lens with $a = 1$, $b \to 8$, $c= 1$. The surface plots are the surfaces of unity index. The full red lines mark intersections of these surfaces with the *xy* plane while the dotted red lines mark the places in this plane where $n = 0$ (Daner, 2015). b) Simulation with spreadsheet excell with $f_x = 10,\ f_y = 20, \text{dan}\ f_z = 10$, dengan $\phi_{01} = 30^0, \phi_{02} = 45^0$ and d) $f_x = 1,\ f_y = \infty, \text{dan}\ f_z = 1$, dengan $\phi_{01} = 30^0, \phi_{02} = 45^0$

V. CONCLUSION

In conclusion, the use of a spreadsheet allowing the construction of computational interactive simulations in mechanical wave oscilation, is useful to display the of lissajous curve in 2D and 3D. This paper intends to show the interest of spreadsheets excell in order to support the experience of learning and to enhance the quality of students in understanding the physics phenomena where they can engage in explorative activities with spreadsheet simulation. Furthermore, lissajouse curve can be presented as a an absolute optical instruments where light rays traceout Lissajous figures and imaging is stigmatic everywhere within the lenses. Whether the lenses properties is unique or whether this aproach with spreadsheet simulation can be true to describe trajectory of light remains an open question.

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Moral Development of Junior High School Students about Environmental Issue of Riverbank by Problem Solving

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***Abstract*—Nowadays, human's life cannot be separated from value, morality, and norm. Where there is human's life, there are value, morality, and norm included. Environmental issue in the riverbank is appointed as dilemmatic morality case and it can be used to find the characteristic of student's moral progress based on problem solving. The purpose of this research was to describe (1) students' moral progress levels on environmental issue in the riverbank by problem solving and (2) the characteristic of students' moral progress level on environmental issue in the riverbank by problem solving. Qualitative approach and descriptive research were used as the methods. The results of this research showed that students' moral progress levels on environmental issue in the riverbank by problem solving were categorized as level 2 and 5. The characteristics of junior high school students' moral progress level on environmental issue in the riverbank by problem solving were that the subjects in level 2 are likely to prioritize the real importance of each individual, but also respect the others' importance. The subjects in the level 5 of moral progress relatively hold the high esteem for the rule to regard the importance and the prosperity for all.**

Keywords— Moral, Moral Development, Problem Solving.

I. Introduction

Moral issues, as well as moral teaching, or moral character today seem to be much talked about, especially in relation to the quality of human's moral character in this reformation era. Indonesian moral quality levels, in addition to facing the problem of ambiguous moral values that occur in the community, is also suspected toward the lowest level in the life of the nation [1].

The word moral always refers to the good and bad deeds of human as person. Moral is a belief about right and wrong, good and bad, in accordance with the social agreement, which underlies the actions or thoughts. Thus, the moral is associated with right and wrong things, good and bad things, belief, oneself, and social environments.

Moral development is divided into three levels: (1) pre-conventional, in which judgment is based solely on the needs and perceptions of one's own, (2) conventional, where the expectations of society and laws are taken into account, (3) the post-conventionally, where consideration is based on the principles of abstract and more personal and should not be determined by the laws of society [2].

Although the moral development is not determined by age, the rate of progress of human moral development at each stage can be qualitatively different [3]. Children who have stepped on puberty made a moral judgments based on equity, which is based on the ability of individuals to take responsibility for their behavior. Teens are no longer fixated on the fact that is concrete but have been able to consider the various possibilities that exist [4]. Science/IPA learning (including biology) has a large social and moral implications, which means no longer moral free, but rather tied to the moral [5].

Due to population growth that is increasingly out of control, an increase in the intensity of space causes an imbalance of structure and function, as well as disorganization of urban space. The city government of Banjarmasin since the end of 2014 until February 2015, is in full swing of demolition on the riverbanks, and also Tampekong River in Banjarmasin Veterans Road near to SMPN 6 Banjarmasin. Government's effort is certainly a real dilemma because on one hand, the aim is to restore the condition and function of the river around Banjarmasin city in relation to environmentally sustainable development. On the other hand, the riverbanks have been converted into a densely populated residential area. Even along the river is also polluted due to garbage that was discarded by people who are not responsible for it.

Many problems that ware caused by human activities and have the effect on the human themselves, such as environmental issues in river banks area. Those problems are one of the examples that need to be concerned on its solution

The completion of the problem always involved every corner of human activity, both in the fields of science, law, education, business, sports, health, industry, literature, and so on [6]. If there is no problem solving activity which is considered sufficient in professional and vocational life of our life, we can do a wide variety of repairment.

Problem solving is a basic process to identify problems, consider and determine problem solving options [7]. Therefore, there are steps in the process of problem solving. The steps of problem solving are as follows:

A. Understanding the problem

Understanding the problem can be seen from how someone explains or defines the problem in their own words. Understanding the problem is initial activity to identify problems. In this step, people can list what is known and unknown in the problem, what is trying to be found or done in the matter, and any information that is relevant to the problem.

B. Brainstorming all possible solutions

After understanding the problem, someone can think broadly and creatively about ideas to solve problems and write down all the ideas that have been thought.

C. Devising a plan

At this stage, one has been able to analyze, synthesize, and organize ideas in the form of tables, diagrams, graphs, and so on. It is recommended to make a plan from a logical starting point and consider the source, intent, and purpose of the decision.

D. Carrying out the plan

The strategy which has been developed to solve the problem at the time of planning can be implemented at this stage. When carrying out the plan, each stage of the plan is observed and checked again.

E. Evaluate the results

In this evaluation phase, a solution analysis is done to the real problem. Then the relationship between the results and the problem will be seen, whether the result of the problem has been resolved or there is a change.

Students must understand the problem and have a desire to find a solution in solving the problem. Therefore, the problem should be chosen which is not too easy, not too difficult and interesting. If students can understand the problem, students can prepare the problem solving plan. Solving problems according to the problem solving plan requires knowledge, concentration on goals, and success. Examination of the steps and results is obtained by checking the truth of each statement used. If students work according to the plan, have written the solution of the problem, and check every step of the settlement, they will have enough reasons to convince that the solution is appropriate.

The purpose of this research was to describe the phase of students' moral development of SMPN 6 Banjarmasin towards environmental issue in the riverbanks through valid and reliable problem solving.

II. Method

The research was descriptive research with qualitative approach. The subjects consisted of two different classes who did Defining Issue Test (DIT) based on the theory by Lawrence Kohlberg. DIT consist of six stories of dilemma in biology-moral issue. The result of the test was expected to show a phase of moral development although it was not conducted through the stages of problem solving using written assignments.

Students who were selected to be the subjects of research were given a written assignment to carry out problem solving on the discourse of moral dilemmas by researchers for two rounds of appropriate material that has been studied by the subjects. Furthermore, analysis of the answer was held to get the data of moral development stage and the characteristic of students' moral development.

Interview was conducted to guarantee the data validity. The result of the interview was transcribed and combined with the written test of the subjects. If the obtained data were invalid, time triangulation was held by providing similar problem solving task and interview once again.

III. Result and Discussion

Moral development is often aligned with a person's cognitive development. Therefore, to dig the stage of moral development of students, problem solving is needed. The problems that have been selected are the environmental issues on riverbanks. Subjects of this research with the results are as follows.

TABLE I. RESULT STAGE OF STUDENTS' MORAL DEVELOPMENT

No	Subjects	Stage of Moral Development
1.	Subject 1 (MF)	Stage2
2.	Subject 2 (MA)	Stage5

A. Subject 1 (MF)

In the test of moral development (DIT), MF was at the stage 2 of moral development. To verify the results, a written assignment 1 was given with the result of the MF at the stage 2 of moral development according to Kohlberg because he can understand the problem with the orientation of the desire to be recognized as a good person, can think of possible solutions, can make plan but cannot implement the plans, and cannot evaluate the results. To reinforce the result, further assignment of written assignment 2 was given with the result of the MF at at the stage of moral development 2.

Characteristics of MF's moral development stage as the male subject was at the stage 2 of moral development. The data were obtained from the results of interviews based on written assignments 1 and 2 on MF.

Based on the result of written assignment interview 1, it can be said that MF can position himself with both roles that exist in written task discourse. It was seen when the researcher asked his opinion about the two figures in the written task.

M.F: *In a written assignment 1, people are facing the problem of house evictions while the government insists that evictions remain in place. While on the written assignment 2, the problems faced by a man who fish with traditional fishing rods with small results, while his friends switch to use the stun device to get a lot of fish.*

When understanding the problem, MF showed his orientation view toward others. When planning for problem solving, MF showed a view that is concerned with the needs of others. This was seen when he was asked if he was in a different position, according to the character in the written task.

R : *If you are in between two positions,* the people who *have lived there for decades and the government who will displace the area to normalize the river function, which one will you choose? And why?*

M.F : *I choose to support the government because they want to restore the true function of the river and do a reforestation*

R : *Then on a written assignment 2, there was a man who stays at his stand by fishing using traditional tools and there are friends who turned to use practical methods of fishing using stun tools, which one do you choose? And why?*

M.F: *I agree with the actions of the man because it can keep the river ecosystem better. His friends should not force the man to come with them and never use the stun tool because it may damage to the ecosystem.*

Based on the interview results of both written tasks, it can be said that MF can position himself with both roles that exist in the discourse. Based on the description of the characteristics of MF in understanding the problem, it can be concluded that MF understands the problem based on the views and principles of action and the action is judged good if it is without imposing the will and mutual respect among others.

B. Subject 2 (MA)

In the tests of moral development (DIT), MA was in stage 5 of moral development. In order to verify the results, a written assignment was given. Based on the results of the written assignment 1, MA was at stage 5 of moral development because she can understand the problem with the orientation of the desire to be recognized as a good person, be able to think of possible solutions, can plan, can implement the plan, and can evaluate the results. To reinforce the above findings, a written assignment 2 was given with the following results. Based on the results of written assignments 2 that have been done, MA was confirmed at the stage 5 of moral development.

Characteristics of MA's stage of moral development were obtained from the results of written based interviews tasks 1 and 2 on MA. Based on the results of the written assignment interview 1, it can be said that MA can position herself with both roles in the written task discourse. It was seen when the researcher asked her opinion about the two figures in the written task.

M.A : *On the written task 1, the problem faced is the existence of evictions on the riverbanks by the city government of Banjarmasin. People who have been living in that area have objections and propose negotiations, but the government insisted on displacing the region. While on the written task 2, the problem faced is the confusion of a man who wants to maintain the river ecosystem by fishing using traditional fishing pole, but on the other hand many fishermen use stun tools to facilitate them to catch fish easier.*

When understanding the problem, MA showed her orientation towards a personal opinion based on rights of social agreement. This was seen when she was asked if she was in a different position, according to the character in the written task.

P : *If you are in between two positions, the people who have lived there for decades and the government who will displace the area to normalize the river function, which one would you choose? and why?*

M.A : *I still choose to support the government, because many of the settlements in the riverbank area make the nature functions of the river changed. If the river function has changed, then the river ecosystem will be damaged. Make the rules so that no residents occupy the area, and maintain the cleanliness of the riverbanks. Although people should be forcibly evicted, it is the best option to make the river function normally again.*

P : *Then on a written assignment 2, there was a man who stay at his stand by fishing using traditional tools and there are friends who turned to use practical methods of fishing using stun tools, which one do you choose? And why?*

M.A : *I also support the decision of the man. He is more concerned with the ecosystem and the people than himself. Although the income is small but still maintain the river ecosystem. Even he ignored his friend's invitation and still fishing with traditional fishing pole just to keep the ecosystem. Perhaps by making a pond to get lots of fish will to find another source to add his income.*

Based on the results of the interview, it can be said that MA can position herself with both roles that exist in the written task discourse and can understand the problem to develop a plan with a personal opinion oriented based on rights of social agreement. Based on the description of the characteristics of MA in understanding the problem up to evaluating the results, it can be concluded that MA can conclude the solution to the real problem, check the outcome whether it has overcome the problem or has brought the change with a personal rights orientation in accordance with the social agreement.

Through written assignments and interviews, it can be seen that the stage of moral development of students based on problem solving was at the stage of moral development 2 and 5 according to Kohlberg. Table II shows the findings that refer to indicators of moral development [2].

TABLE II. INDICATORS OF JUNIOR HIGH SCHOOL STUDENTS' MORAL DEVELOPMENT BASED ON PROBLEM SOLVING

Moral Development Stage	Indicator	Description
Stage 2	Understand the problem Think of possible solutions	Students are able to understand the problem with the profit-oriented gain, can think of possible solutions, cannot plan, cannot implement the plan,and cannot evaluate the result.
Stage 5	Understand the problem Think of possible solutions Devising a plan Carry out the plan Evaluate the results	Students are able to understand a problem with social agreement-oriented, can think of possible solutions, can plan, can implement the plan, can evaluate the result.

The stage 2 of moral development can be synchronized with Piaget's level of moral development in which rules and laws are made by human and when judging an act they consider its value and consequences. From Kohlberg's statement, at this stage the subject thinks if it is good to others then others will also be good, and the subject develops greater sensitivity to social conditions.

The stage 5 of moral development can be synchronized with Piaget's level of moral development that punishment is seen as an automatic consequence of offense. From Kohlberg's statement, at this stage the subject is aware of individual differences and opinions. Therefore, this stage is considered the stage that allows the achievement of consensus deliberation. This stage enables a person to see right and wrong as a matter of one's own values and opinions. At this stage, laws or rules can also be changed if it is better for the people.

Based on the data description by comparing the results of observation, written assignments, and interviews, these seven students were in the stages of moral development of 2and 5 namely at the pre-conventional and conventional. This is in accordance with the opinion which states that the pre-conventional level is the level of most children under the age of 10 years [2]. The conventional level is the level of most teenagers and adults. While the post-conventional level is the level achieved by a sizable minority of adults. Stage 6 is included in the conventional post stage that is rarely achieved.

Moral dilemma requires careful consideration of the various problems of amoral dimension, and solved problems will exercise creativity in finding potential moral solution [8]. Similarly, the process of development of moral reasoning is a process over the role, which is a process of development towards a more comprehensive structure, more differentiated and more balanced than the previous structure [2] .

However, the researchers in field found that the assessment of problem solving ability of two different individuals does not merely refer to the individual at the same stage of moral development, or otherwise. Through moral dilemmas problem solving of environmental issues on the riverbanks which conducted by the students, it was found the orientation stage of moral development is at the stage of 2 and 5. Students in making morally oriented decision have advantageous terms and the desire to meet the environmental expectations. There are differences in the character of problem solving from each of the students and the differences characterize these findings.

Based on the results of the study, each stage of moral development produces different level of ability characteristics, where the higher stages of moral development, the more complex the characteristics obtained [9]. Subjects who are at stage 2 of development tend to be altruistic on real benefit of people, but also respect the others. The subjects who are at stage 5 of moral development relatively uphold the rule in the interests for all.

The formation process of moral behavior involves four key stages: (1) to interpret the situation in order to understand and discover what action that has to be done and how it affects the overall existing problems, (2) to describe what needs be done by applying a moral value in certain situations with the aim to establish a moral behavior, (3) to choose among moral values to decide what is going to do in actual ways, (4) to act according to moral values [10].

In terms of the ability to solve problems on discourse of moral dilemmas, the subjects at all stages of moral development have demonstrated the ability to understand the problem and think about possible solutions. Some of the subjects demonstrated an ability to plan, implement plans, and evaluate results. This shows that the problem solving is one of the most important ability and needs to be developed in the Biology teaching in junior high school. Problem solving is the process of applying the previous obtained knowledge into new situations that have not been known [11].

IV. Conclusions

Stage of the moral development of junior high school students toward environmental issues on riverbanks through the problem solving was at the stage 2 (orientation relativist-instrumental), and stage 5 (the orientation of social agreement) which were valid and reliable.

Each stage of the moral development in this study was obtained to produce the characteristics of moral development stages of junior high school students toward environmental issues on river banks through problem solving with different results.

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Electrochemical Methods for Manufacturing Silver Nanoparticles

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***Abstract*— In this study the manufacture of silver nanoparticles has been carried out using an electrochemical method. An electrochemical method by electrolysis is one of the alternatives of making silver nanoparticles. It is easy, simple and does not require a long time. Silver nanoparticle characterization using Ultraviolet Visible (UV-Vis) and X-ray Diffraction (XRD). The test results showed that the concentrations of 0.2 M sodium citrate have a wavelength of 416-418nm and the absorbance of 0.825. XRD tests showed the peaks characteristic in 2Θ of 38.06^0, 44.14^0, 64.47^0, and 77.40^0.**

Keywords—Electrochemical, Silver Nanoparticle, Ultraviolet-Visible; x-ray diffraction

I. INTRODUCTION

Nanoparticles are clusters of atoms in the size range of 1–100 nm. “Nano” is a Greek word synonymous to dwarf meaning extremely small. Nanoparticles are widely used in the present century as they have the defined chemical, optical and mechanical properties [1].

Synthesis of silver nanoparticles can be done by several methods such as electrochemical methods [2] photochemistry [3], laser ablation [4], thermal decomposition [5]. Factors that affect the synthesis of silver nanoparticles are solution temperature, concentration of precursors, reducing agents and reaction time [6].

Preparation of the highlights of colloidal silver nanoparticles is by use of a reducing agent. There are a wide variety of reducing agents that can be used, one of which, is sodium citrate. Sodium citrate excellence in the synthesis of silver nanoparticles is that it can be functioned as reducing, stabilizing and complexing agents [7]. Besides it is relatively cheap.

An electrochemical method by electrolysis is one of the alternatives in the manufacturing of silver nanoparticles because of the lower processing temperatures, the simple equipment used, and the controllable products and the short time needed. Electrochemical methods have previously used a metal silver to produce silver nanoparticles by using a reducing agent Polyvinylpyrrolidone (PVP) [8] .

The main advantage of an electrochemical method lies on the high purity and particle size of the nanoparticles that can be controlled by adjusting the current density without being supported by the expensive equipment or vacuum. Key to the success of an electrochemical method is in the right choices of chemical substances and of processing conditions [9].

In this study, the synthesis of silver nanoparticles is conducted through an electrochemical method by the electrolysis to take advantage of sodium citrate as the reducing agents to produce silver nanoparticles. This needs a relatively affordable cost. The resulted silver nanoparticles are then expected to be applicable in the various fields such as cosmetics [10], the catalyst [11], and glucose sensor [12].

II. METHOD

Equipments needed are power supply, multimeter, cable, alligator clamps, heater, magnetic stirrer, hot cables of 1 mm, Silicon Carbide Sandpaper, slass, pipette volume, drop pipette, Volumetric flask, spatula of metal silver material, sodium citrate, distilled water. Instruments are the Ultraviolet Visible (UV-Vis) and X-ray Diffraction (XRD).

In preparation, Silver Nanoparticles Silver nanoparticles are synthesized using an electrolysis cell with a set of silver electrodes as the anode and cathode. The electrolyte material used is water while the reducing agent used is 0.2 M sodium citrate. The potential value used is 10 volts and a synthesis time is 30 minutes. The electrolysis device of the first step is set and the power supply is turned on. Furthermore, 400 ml of distilled water is boiled and maintained at a temperature of 60 ° C. Then, 10 mL of 0.2 M sodium citrate is added to the distilled water and stirred using a magnetic stirrer.

The observed color changes from colorless to yellow. The yellow color shows silver nanoparticles have been formed. The uptake of silver nanoparticles can be determined through characterizing it using ultraviolet rays. The uptake of silver colored nanoparticle is about 400-500nm [6] [13].

III. RESULTS AND DISCUSSION

Spectrophotometer ultraviolet visible (UV-VIS) absorption has been proved to be quite sensitive to the formation of silver colloids because silver nanoparticles exhibit an intense absorption peak due to the surface Plasmon (it describes the collective excitation of conduction electrons in a metal) excitation [14]. UV-visible spectroscopy is one of the most widely used techniques for structural characterization of silver nanoparticles. Spectra UV Vis can be seen in figure 1.

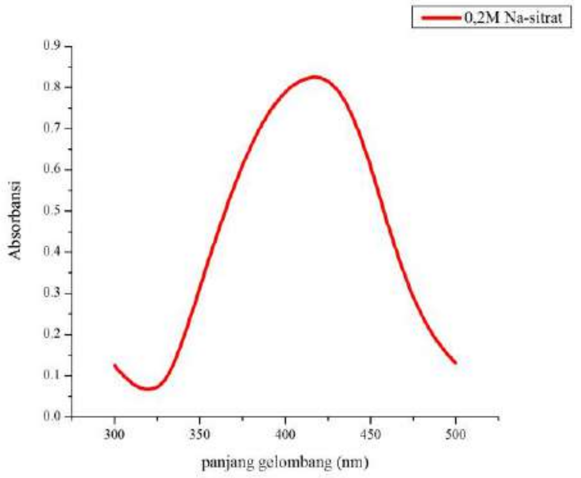

Fig. 1 Ultraviolet visible spectra

Fig.1 shows the UV-VIS spectra of the silver colloid in the range of 300 nm – 500 nm. Plasmon peak at 445 nm) is typical for silver nanoparticles. Absorbance value provide information on the number of particles while the wavelength provides information size particle [6].

The higher the absorbance value assumes the more nanoparticles formed. Stability of colloid of silver nanoparticles can be seen from the changes in the peak absorbance. Stability of colloidal solution of silver nanoparticles can be seen from the changes in the peak absorption. If a shift to the peak absorption is higher, this indicates that the silver nanoparticle colloidal solution is less stable due to occurrence of agglomeration. In the case of agglomeration, the color of the solution changed and wavelength of absorption will shift [6].

Silver nanoparticle formation was observed in 5 days. Color formed is yellow. Yellow is the color characteristics of the silver nanoparticles [15] [13] [2].

X-ray diffraction in this study is only used to identify the crystal phase. XRD analysis of test results can be seen in Fig.2.

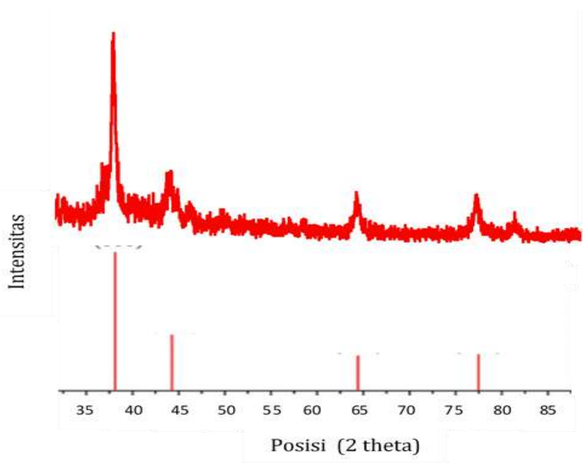

Fig. 2 X-ray diffraction spectra

Fig.2 shows the XRD spectra. XRD Spectra determines a product phase. Part (a) shows the standard of XRD Ag (JCPDS no. 04-0783). While the image of silver nanoparticles b test results. Diffraction peaks at position 2 ϴ of 38.060, 44.140, 64.470, and 77.400. Diffraction of peak product is not much different from the standard diffraction and that of the previous studies [2] [16]. So it can be confirmed that the product is Ag. The XRD pattern also shows that the product has good crystallinity and high purity.

IV. CONCLUSION

Based on this research, it can be concluded that the electrochemical method can be used for manufacturing silver nanoparticles. Excellent electrochemical electrolysis method that is easy, simple and does not require a long time.

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5th South East Asia Development Research (SEA-DR) International Conference

Potential Wetland Screening in Barito Kuala and Banjarmasin as Source of Science Learning

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***Abstract*—Learning science utilizes potential diversity of wetlands in South Kalimantan as students learning source.It will be an intermediary for students to learn about themselves and the contextual nature or closely related to everyday life. Decentralization of education brought the Indonesian education toward the development according to the potential of each area, so it needs an effort of educators to explore the diversity of wetlands to be integrated in the process of learning science as a learning source. This is a qualitative research,and the data collection wasconducted through observation and literaturereview. This research was conducted in several areas of Barito Kuala and Banjarmasin in South Kalimantan province. This study covered the area of the river, swamp forests, agricultural land, flora and fauna. The observed variables comprised the characteristics, benefits and categorizing objects including river wetlands, farmland and swamp forests, as well as the diversity of flora and fauna. The data were analyzed by describing, outlining and categorizing the diversity of wetlands that can be considered and integrated in the learning process as learning source.**

Keywords—Learning source, Learning Science, Wetlands

I. INTRODUCTION

Indonesia has a wide diversity of wetlands such as marine, coastal, brackish, rivers, swamps, natural or artificial ponds, and peatlands. The diversity of these wetlands need a "manager" or a candidate manager who is skilled and enthusiastic "preservation" so that it is not only able to be utilized, but also is reliable in environmental conservation in the future. Such managers can be prepared through education. Education is not only preparing students to be able to compete in life, but also able to manage the environment that became the place to live. Therefore, there is an awareness needs by students to respond to the environmental issues.

South Kalimantan has a very diverse and abundant wetland environment. Not only the coast, and sea, South Kalimantan also has peatlands, agricultural lands, swamp forests and streams. According to the data, there are about 400 more rivers located or passing the capital city of Banjarmasin [1]. The diversity of wetlands as well as flora and fauna in South Kalimantan should be immediately noticed by teachers. Therefore, teachers should be able to empower the potential of biological diversity into a learning source in the learning process. Making a wetland potential becomes interrelated in the learning process, it can also be inserted with the character education. It is the character of care and "conservation" on the soul of students and it is necessary to "investigate" that must be done to know what wetland potential learning source to be developed into a part of learning.

II. METHOD

This study used mix-method approach. The data collection techniques used direct observation techniques accompanied by literature study. Direct observations were conducted in Barito Kuala and Banjarmasin in South Kalimantan province, covering river areas, swamp forests, agricultural lands, flora and fauna. Data analysis was by describing and categorizing the diversity of wetlands that can be categorized and integrated in the learning process as a source of learning.

III. RESULT AND DISCUSSION

The potential learning source in wetlands is summarized and can be seen in Table I. It shows some of the research results for the 7thgrade junior high school.

TABLE I. THE SHARING OF LEARNING SOURCES WITH BASIC COMPETENCIES IN SCIENCE LESSONS ON THE 7TH GRADE JUNIOR HIGH SCHOOL

Basic Competencies	Subject Matter	Learning Sources
Understand the concept of measurement of the various magnitudes that exist in the self, living things, and surrounding physical environment, as part of the observation, as well as the importance of standardized (standard) standard formulation in measurement.	Science and Observation Objects	Wood Processing along the Barito river, in the Alalak area.
Separate mixtures based on physical and chemical properties	Substance Characteristics	Farmers in Barito Kuala practice separation of rice pulp with rice grains containing rice using a tool called "Gumbaan".

Basic Competencies	Subject Matter	Learning Sources
Know the concept of energy, various energy sources, energy from food, energy transformation, respiration, food digestion system, and photosynthesis	Energy in the Life System	Introducing biomass energy from peat soil, briquettes from the bark that are found in Barito Kuala can be practicum.
Describe the interaction between living things and their environment. Present observation results to the interaction of living things with the surrounding environment	Interaction of Living Beings and the Environment	The rivers and swamps of Barito Kuala and Banjarmasin can be a source of learning about the interaction of living beings and the environment.
Describe the pollution and its impact on living things	The Impact of Pollution on Life	Observing pollution of Barito river and rivers in Banjarmasin contaminated by wood waste, water hyacinth (organic) and plastic waste (inorganic)
Describe the causes of global warming and its impact on ecosystems	Global Warming and Ecosystems	The peat swamp fires that occur in Kalimantan, especially in South Kalimantan in the Barito Kuala area at the end of 2015 can be part of science learning and become a source of learning.

The results of the screening are partially described in Table I. These results can be developed into a module in the science lesson. The module can make students to learn independently. With the development of locally based local advantage modules, it will be able to improve students learning outcomes and provide mastery of the lesson [2][3].

The development of teaching materials and learning tools have been largely done by previous researchers although they are only limited to the feasibility test, and legibility alone, as has been done by [1] who reviewed the study of legibility in the development of ecological materials in wetland areas. The development process in this study produces good teaching materials and can be applied to secondary schools in Kalimantan areas that have wetlands.

This development makes students aware of the wetland environment. Students will also be "knowledgeable" or literate with science because the learning involves local excellence such as wetlands as a source of learning. This is able to make students literate with science which has been undertaken by [4]. He has already undertaken the development of learning tools based on the local excellence of Kalimantan's peatlands. This research produces tools that can give influence to the students of SMP/MTs on the attitude of concern to environment and make students to be more literate to science.

The abovementioneds research has resulted in the importance of local excellence as well as the wetlands in South Kalimantan as part of potential learning source integrated into learning. However, based on the studies that have been done, it cannot be categorized as the suitability of "potential" with the material contained in the school in terms of competence. So, it is necessary to investigate any wetlands potential that can be related to the competence of science subject.

These two new studies are based on some previous research such as research on the development of Subject Specific Pedagogy (SSP) based on local wisdom. It can improve the character (learning motivation and positive attitude) of the science of the 7th grade high junior students in Batam, Kepulauan Riau [5]. Then, another research resulted that there are significant differences between learning using conventional device compared to SSP result of development which was designed based on the implemented learning cycle [6]. This research was about the influence of development of SSP to planting characters of responsibility and creative. Meanwhile, the SSP was developed based on cognitive domains to instill the characters performed [7]. It is also able to improve learning outcomes in the cognitive domain of junior high school students.

Ref. [8] concluded that the a series of the most effective step in identifying the development of learning tools of science is by conducting literature studies, planning, device designing, product designing, validating, limited testing, evaluation and improvement, operational trials, and the last device enhancement. The attainment of the skills-based science learning tools is good, thus providing a significant influence between process skills, scientific attitudes and experimental classroom learning outcomes and controls.

The potential of wetlands in South Kalimantan is the object of learning source including rivers, agricultural lands and swamp forests, flora and fauna. The potential of this wetlands is studied and observed includes the presence of the ecosystem in general, physical properties, chemical properties, benefits, characteristics, diversity of flora and fauna that occupy it, and then linked and grouped according to the subject matter of science.

IV. Conclusion

Screening of wetland potentials in the two districts in the province of South Kalimantan raises the understanding that there are many wetland potentials can be raised as learning source for science learning. The role of a science teacher in learning becomes very important to develop a learning science that brings the wetlands as a source of learning. Some of the potential wetland screening that can be developed as part of learning are such as teaching materials, books or modules. The module can make students learn independently to be used in learning at school or at home independently.

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5th South East Asia Development Research (SEA-DR) International Conference

The Analysis of Science Process Skills on Natural Science Questions at Elementary Schools in Tarakan

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***Abstract*—Education quality control, essentially, is a control to the human resources quality. This control effectiveness level should require information on students' conditions whether the change is available or not, the teachers work well or not, and the school supports the implementation of educational programs to achieve an optimal result or not. The assessment on learning is frequently overlooked, especially where the learning assessment is rather only performed to the results/scores than to the process skills in doing it; whereas, the formulation, implementation and evaluation should be done in balance and simultaneous. This study aimed to identify the fifth grade students' science process skills on natural science questions at elementary school in Tarakan city. This study deployed qualitative descriptive method. Purposive sampling was used as technique sampling in this study. Descriptive statistics with percentage technique was used as data analysis technique. From this study we concluded that in questions of the fifth grade elementary school students' natural science midterm exam questions, there are several aspects of natural science process skills, i.e. observing, classifying, inferring, predicting, and designing experiments. However, the most dominant of natural science process skills aspect that contained in the questions is observation aspect.**

Keywords—Science for Elementary School, Science Process Skill, Question

I. INTRODUCTION

Education in Elementary Schools is the students' foundation to instill the basic knowledge that is developed. One of them is through teaching the Natural Science (IPA). The necessity to master the natural science teaching in accordance with the intellectual development level of students should be done early; especially, in order to absorb the development of knowledge and technology as well as how to think logically. The natural science itself that is frequently referred to the term of natural science education is a compulsory subject in elementary school. The nature of natural science is a science to study the symptoms through a series of processes known to the scientific process. This process is built on the scientific attitude and the results are manifested as a scientific product composed in three most important components, namely: concepts, principles and theories that should be applied universally. [1] argued that the learning of natural science in elementary school has some purposes as follows: (1) to gain the faith to the greatness of the Almighty God by the presence, beauty and order of His creation; (2) to develop knowledge and concepts of natural science understanding that are useful and can be applied in daily life; (3) to develop curiosity, positive attitudes and awareness of interplay relationship between science, environment, technology, and society; (4) to develop process skills to investigate the nature of surroundings, to solve the problems, and to make decisions; (5) to raise awareness to participate in preserving, maintaining, and conserving the natural environment; (6) to increase the awareness to appreciate the nature and its regularity as one of God's creation, and (7) to acquire knowledge, concepts, and skills of natural science as a basis to continue their education to junior high school.

Based on the goals of learning science in elementary school, which are to develop the process skills to investigate the surroundings nature, to solve the problems, and to make decisions, then, the school has a necessity to develop an assessment based on process skill. Process skills make the students to feel the nature of science and allow the students to do 'sciences'. Science process skills are overall scientific skills that focuse on both cognitive and psychomotor. They are used to find concepts or principles or theories in order to develop concepts that have existed before or to perform a denial to an invention or classification Indrawati in [2]. In other words, these skills can be used as a tool to discover and develop concepts, principles or theories.

Assessment using natural science process skills has already been developed, one of which is [3], entitled: "Pengembangan tes Keterampilan proses sains dasar SD/MI" (Development of basic natural science process skills test on Elementary School/Islamic Elementary School). The same research has also been done by [4] entitled: "pengembangan tes pengukur keterampilan proses sains pola divergen mata pelajaran biologi SMA" (Test Development of natural science process skills gauges with divergent pattern to senior high school biology subjects). Based on an interview with one of the teachers in Tarakan Timur, he stated that teachers had very little information about the natural science process skills; in learning and scriptwriting the questions and they tend to use the lecture method and used questions that only refers to indicators leading to a few of skills of science process only.

Based on this background, we concluded that analysis on the natural science process skills of Natural Science questions on the fifth grade of Elementary School in Tarakan Timur is necessary to be studied. Given this research, teachers could have feedback on how should natural science process skills be applied in writing an evaluation tool.

II. Methods

A. Research Design

Qualitative descriptive study method was used in this study. Qualitative study is the collection, analysis, and interpretation of comprehensive narrative and visual data to obtain views on particular phenomena for the purpose of a deep understanding of environmental phenomena, processes, and trust.

B. Time and place of study

The study was conducted at elementary schools in Tarakan Timur in 2017.

C. Population and sample

The population of this study was the fifth grade elementary school teachers in Tarakan Timur district. The sample of this study was teachers at SDN 047, SDN 007, SDN 031, SDN 016 and SDN 027 Tarakan. The sampling technique was done in purposive sampling with consideration that these four schools are able to represent the elementary schools in Tarakan Timur.

D. Reserach Instrument

The instruments used in this study were a checklist sheet of natural science process skills, teachers' interview on learning evaluation tools.

E. Data Collection Technique

Data collection techniques in this study were the use of students' midterm exams (UTS) of the fifth grade natural science subjects at schools selected as sample only and interviews with the teachers at the schools.

F. Data Analysis Techniques

Further analysis was done to the following obtained data:

- The data obtained from the natural science midterm exams of the fifth grade students are analyzed by examining the items whether they fulfill the aspect of natural science process skills or not, i.e. basic process skills (observing, comparing, classifying, communicating, modeling, data recording); intermediate process skills (inferring and predicting); and further process skills (making hypotheses, designing experiments, interpreting the data).
- The data obtained from interviews with teachers, i.e. the completeness of evaluation tools will be analyzed with descriptive qualitative method.

III. Results and Discussion

The midterm exam questions of the natural science subject in the fifth grade consisted of several parts. For midterm exam of Natural Science subject at SDN 016 Tarakan of the fifth grade consisted of 20 multiple choice questions, 10 short answer questions and 5 essay questions. The midterm exam of Natural Science subject at SDN 007 Tarakan consisted of 20 meatier and 5 essays. Then, the questions on SDN 027 Tarakan consisted of 10 short answer questions and 5 essay questions while the midterm exam of Natural Science subject at SDN 031 Tarakan consisted of 20 multiple choice questions and 5 short answer questions.

The Natural Science process skills analysis shows that not all aspects of natural science process skills were included in midterm exam questions; there were some aspects of Natural Science process skills that were not included in the questions.

The data of natural science process skills that are not included in fifth grade natural science process skills are as follows:

A. Basic Skills

1) Observing

The first aspect of natural science process skills was observing. The following is observation aspect data of natural science process skills at the midterm exam of natural science in class V SD that is presented in Table 1 below.

TABLE I. QUESTIONS ON OBSERVATION ASPECT

School	Number of Questions on Observation Aspect	Total Question	Percentage (%)
SDN 007 Tarakan	6	25	6
SDN 016 Tarakan	11	35	31.4
SDN 027 Tarakan	3	15	20
SDN 031 Tarakan	4	25	16

Based on these data, the midterm exam questions of SDN 016 Tarakan have the most dominant aspect of observation. Observation is an activity that involves the five senses. The following is one of the question examples from observation aspect:

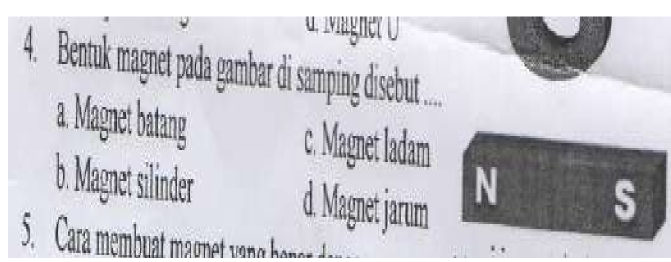
4. Bentuk magnet pada gambar di samping disebut ....
a. Magnet batang c. Magnet ladam
b. Magnet silinder d. Magnet jarum

Fig. 1. Question Examples from observation

2) *Classifying*

The second natural science process skills is classifying. The following is classification aspect data of natural science process skills at the midterm exam of natural science in class V SD. They are presented in Table 2 below.

TABLE II. QUESTIONS ON CLASSIFICATION ASPECT

School	Number of Questions on Classification Aspect	Total Question	Percentage (%)
SDN 007 Tarakan	-	25	0
SDN 016 Tarakan	2	35	5.7
SDN 027 Tarakan	1	15	6.7
SDN 031 Tarakan	-	25	0

Based on Table 2, the schools that included classification aspect questions are SDN 016 and 27 Tarakan. The following is one of the question examples from the classification:

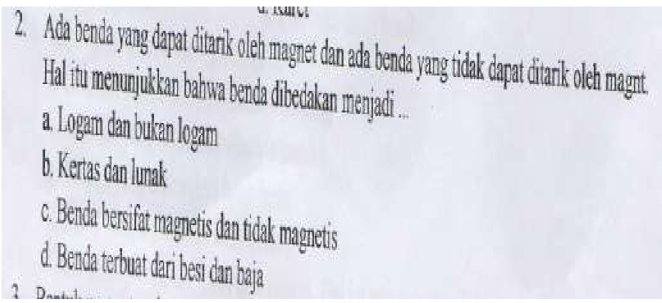
2. Ada benda yang dapat ditarik oleh magnet dan ada benda yang tidak dapat ditarik oleh magnt. Hal itu menunjukkan bahwa benda dibedakan menjadi ...
a. Logam dan bukan logam
b. Kertas dan lunak
c. Benda bersifat magnetis dan tidak magnetis
d. Benda terbuat dari besi dan baja

Fig. 2. Question examples from classification

3) *Inferring*

The next natural science process skill is to infere. The science process skill at inference aspect of the fifth grade's midterm exam questions are presented in Table 3 below.

TABLE III. Questions on Inference Aspect

School	Number Of Questions On Inference Aspect	Total Question	Percentage (%)
SDN 007 Tarakan	1	25	4
SDN 016 Tarakan	3	35	8.6
SDN 027 Tarakan	4	15	26.7
SDN 031 Tarakan	5	25	20

Based on these data, the midterm exam questions with most numerous aspect of inference is SDN 031 Tarakan. Inference is a skill to make tentative conclusions related to the hypothesis. The following is one of the question examples from inference aspect.


pada saat bola di lemparkan ke atas, bola akan kembali jatuh kebawah. Hal ini dipengaruh oleh...

Fig. 3. Questions on Inference Aspect

4) *Predicting*

The next natural science process skills is to predict. The science process skill at prediction aspect of fifth grade's midterm exam questions is presented in Table 4 below.

TABLE IV. QUESTIONS ON PREDICTION ASPECT

School	Number of Questions on Prediction Aspect	Total Question	Percentage (%)
SDN 007 Tarakan	1	25	4
SDN 016 Tarakan	-	35	0
SDN 027 Tarakan	-	15	0
SDN 031 Tarakan	-	25	0

Based on these data, the school that included the prediction aspect in its midterm exam questions is SDN 007 Tarakan. Prediction is an allegation to several instances of an event in the future that has been known. The following is one of the question examples from prediction aspect.

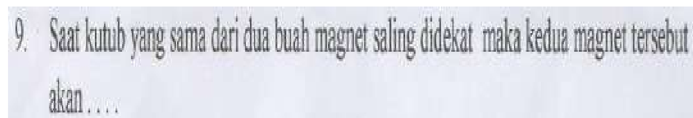
9. Saat kutub yang sama dari dua buah magnet saling didekat maka kedua magnet tersebut akan . . . .

Fig. 4. Questions on prediction aspect

5) *Designing the experiments*

The next natural science process skill is to design the experiments. The process skill in aspect of designing experiments in fifth grade's midterm exam questions on natural science is presented in Table 5 below.

TABLE V. Questions on Designing the Experiment Aspect

School	Number of Questions on Designing the Experiment Aspect	Total Question	Percentage (%)
SDN 007 Tarakan	1	25	4
SDN 016 Tarakan	-	35	0
SDN 027 Tarakan	-	15	0
SDN 031 Tarakan	1	25	4

Based on these data, the schools that included the aspect of designing experiment in their midterm exam questions are SDN 007 and SDN 031 Tarakan. The following is one of the question examples from aspect of designing the experiment.

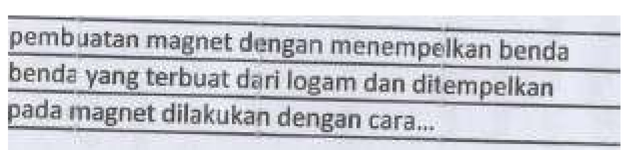
pembuatan magnet dengan menempelkan benda benda yang terbuat dari logam dan ditempelkan pada magnet dilakukan dengan cara...

Fig. 5. Questions on Designing the Experiment Aspect

At the fifth grade's midterm exam questions, the available aspect of process skills are aspects to observe, classify, infere, predict and design the experiments, in addition to the questions are categorized as memorization questions and recall as well as questions that are not categorized as natural science process skills.

Based on the interviews with the fifth grade science teachers, there was only one teacher who has ever heard the term of "natural science process skills', while the other teachers never heard the term. However, in learning process and in making question script writing, the teachers have implemented some aspects of the natural science process skills such as observing, classifying, and others. In practice, in writing the midterm examination questions in schools, the teachers have written the questions based on learning indicators, as well as based on the students' understanding level to the subjects that has been taught. It is proven from table of specification of questions that have been made by the teachers in writing midterm examination questions. Some question indicators use the verb containing operational aspects of the natural science process skills. Multiple choice questions, short answer questions or essay questions can be used to measure the process skills. This is in accordance with [5] who stated that multiple choice questions can be used to measure the ability to observe, to know the methods, to interpret, to assess the methods, to classify, to infer, to predict, and to design experiments. Therefore, the multiple choice questions have the potential to be developed as a measuring tool of process skill, namely by generating aspects of natural science process skills in the question item.

Natural science learning should use natural science process skills. This is in accordance with one of the goals of natural science education and curriculum requirements. The Educational Objectives are as expressed by [6] that the curriculum in elementary and secondary schools emphasize the use of natural science process skills approach in teaching the natural science. In addition to the implementation of learning, a teacher must also evaluate/assess at every teaching and learning activity. The assessment of natural science process skills can not be separated in learning process of natural science, it is supported by Trihastuti in [7] that the assessment on process skills should always be done to develop students' skills.

In writing the midterm examination questions, the questions made by the teachers are formed in institution known as school affiliation/school group. One group consists of several schools. The constraint that hinders the teachers in making the questions is the lack of reference that can be used in writing the questions both in textbooks and in the knowledge-based to write questions on Natural Science Process Skills [8]. There are three aspects that must be prepared by the teachers to write questions with Natural science process skills, namely: they should have the skills or master the natural science process skills, students need to be guided and given the opportunity to practice the natural science process skills, and the students' progress in implementing the natural science process skills should be assessed by their teacher.

IV. Conclusion and Suggestion

A. Conclusion

Generally, the midterm exam questions of the fifth grade on natural science subject already contain some aspects of the natural science process skills namely observing, classifying, inferring, predicting and designing the experiments.

B. Suggestion

Further study on the development of test/question-based natural science process skills and learning with the use of natural science process skills approach should be done.

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Analysis of Students' Critical and Creative Thinking Style and Cognitive Ability on Chemistry

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***Abstract*— This study aimed to determine chemistry education students' style of critical and creative thinking as well as cognitive abilities related to acid-base materials. The research method applied in this study was survey to identify the students' style of critical and creative thinking as well as cognitive abilities. Instructional process was conducted by using *Student Center Learning (SCL)*. The sample consisted of 30 students (24 females and 6 males). The data were collected by using open-ended questions related to critical and creative thinking and *Yanpiaw-critical Creative Styles* (YCCS) test. The research showed that no student had superior creative thinking style category (0%), 20% of the students were categorized having creative thinking style (medium category), 46.66% had critical thinking, and 33.34% had superior critical thinking. Students' academic achievement showed that only 26.66% of the students have the interpretation critical thinking category, analysis critical thinking category (20%) and no student has the originality of creative thinking category. Based on data analysis, it can be concluded that the students' critical and creative thinking styles have the relationship with cognitive ability.**

Keywords —critical thinking; creativity; cognitive abilities; acids and bases

I. INTRODUCTION

Humans are always challenged to be tough and resilient in facing rapidly changing situation. Toughness and tenacity are not enough if the ability to solve problems does not exist. Capability requires ability to think critically and creatively. According to [1], the success of the individual's life is largely determined by its ability to critically and creatively solve problems. Critical thinking can cover the concept of decision-making, strategic planning, scientific process, and critical problem solving. Thinking implies a decision-making process that is full of judgment and conducted independently. Critical thinking skill is an essential ability that to life and work, and it functions effectively in all other aspects of life [2]. Critical thinking is an important process, focused, and obviously used in mental activities such as solving problems, making decisions, analyzing assumptions, and conducting scientific research. Reference [3] stated that core critical thinking is a detailed description of a number of characteristics that include analysis, inference, explanation, evaluation, self-regulation, and interpretation. In addition to critical thinking to cope with life in the 21st century, creative thinking is also required. Creative thinking is an ability to create something new with specificity. According to [4], creative potential can be accessed in four components, namely (1) fluency, which is the ability to generate a number of ideas (2) originality, which is the ability to generate unique ideas out of the ordinary, (3) flexibility, which is the ability to generate various ideas, and (4) elaboration, which is the ability to develop an idea or issue. Creative people can look at a problem from different perspectives. Perspective thus allows individuals to obtain various alternative solutions appropriate to complete problems. Problems will be solved easily if students used to be trained to think critically and creatively in learning through problem solving. Critical and creative thinking can be trained in schools through the learning process. This process can be implemented with *Student Center Learning* (SCL).

II. METHOD

Method used in this research was survey method to determine students' style of critical thinking and creative chemistry as well as the cognitive abilities during the implementation of Student Center Leaning (SCL). SCL is a learning strategy that puts students as active and independent learners (subjects) with a psychological condition as adult learners. Project-based learning was given to 30 students (24 females and 6 males) at the end of the learning session on the evaluation for both critical and creative thinking. The data were collected using *Yanpiaw-critical Creative Styles* (YCCS) test. This instrument can find a person's style of critical thinking and creative person. Knowing thinking style will assist in identifying the strengths and weaknesses of thought [5]. These instruments have been standardized by the instruments of critical thinking and creative thinking such as Watson-Glaser Critical Thinking and the Torrance Tests of Creative Thinking (TTCT). Scoring of *Yanpiaw-critical Creative Styles* (YCCS) test was based on the total points of a circle divided by the number of circles (no matter the number of items).

III. RESULTS AND DISCUSSION

The data from the survey using *Yanpiaw-critical Creative Styles* (YCCS) test were collected and calculated to determine the students' scores. The socres were subsequently analyzed and presented in Table I. Based on Table I, the result of 0% for superior creative thinking indicates that the chemical education students have not been able to learn quickly and effectively through a critical and creative approach. Their general style of creative and critical thinking was medium with the percentage of 46.66%. Furthermore 20% of students think creatively and 33.34% of students think critically. Students with superior critical and creative thinking are hardly found (0%). This condition is very rare as has been done in previous studies by researchers at senior high school. Thus, it can be assumed that the chemical education students will have difficulty in solving problems related to the higher-level thinking such as critical and creative thinking because according to [6] a person's thinking style can predict thinking skills such as critical thinking skill.

TABLE I. DATA OF CHEMICAL EDUCATION STUDENTS' STYLE OF CRITICAL THINKING AND CREATIVE THINKING IN BANJARMASIN

Criteria	Qualifications thinking style	Score range	Percentage
A	Superior creative thinking	1.00 2:00	0%
B	Creative thinking	2, 0 4.51	20.00%
C	Medium thinking	4.52 -5.51	46.66%
D	Critical thinking	5.52-8.00	33.34%
E	Superior critical thinking	8.01 to 9.00	0%

To see more about the link between thinking styles and cognitive ability, the collected data shown in Table II can be observed. Based on the analysis of the students' answers, 26.66% of students (8 students) showed critical thinking indicator of interpretation.

TABLE II. COGNITIVE ABILITY OF STUDENTS IN ANSWERING QUESTIONS CRITICALLY AND CREATIVELY

No	qualifications matter	Number students answered correctly	of persentase who
1	Critical thinking(Interpretation)	8	26.66%
2	Critical thinking (Analysis)	6	20.00%
3	Creative thinking (Originality)	0	0%

The example of students' answer to interpret and portray problem-solving abilities can be seen from Fig. 1. Based on Fig. 1, 26.66% of the students are able to think critically in interpreting and describing the problem solving through chemical reactions. Moreover, the ability of students for analysis indicator shows about 20%. Therefore, the percentage of students who have critical thinking was 46.66% (14 students). If related to the thinking styles of students, there are 6 students who have critical thinking, 2 students have creative thinking and 3 students have medium level of thinking.

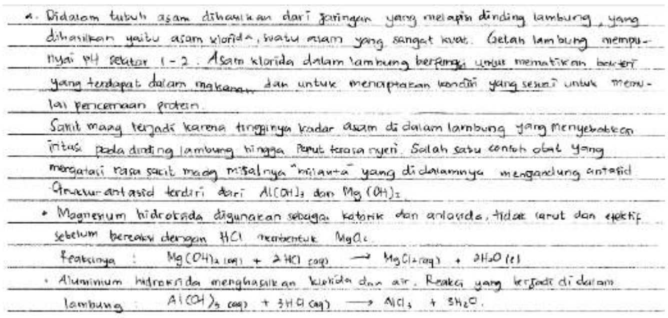


Fig. 1. Students' correct answer on the interpretation indicator of critical thinking

It is hardly to find students who possess cognitive abilities in critical thinking have the style of critical thinking. This is according to what is disclosed by [7] between critical thinking ability of the agricultural university students and their academic achievement in Missouri. Moreover, from the collected data, the students who are not able to answer questions related to the higher-level thinking or critical and creative thinking were 53.34%. The students' weakness is that they do not have a deep understanding of acid-base reactions although they have studied the material since high school. They are only used to memorize formulas without comprehending the material deeply. The example of incorrect answers is shown in Fig. 2.

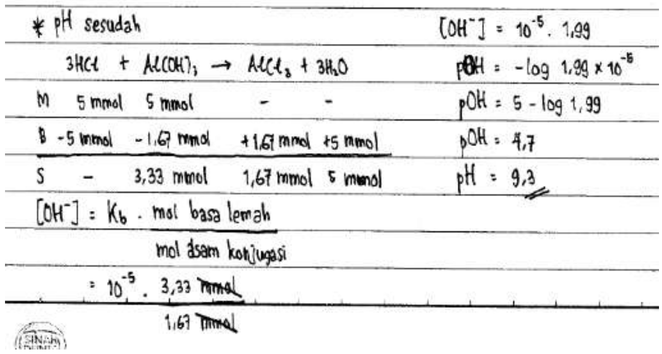
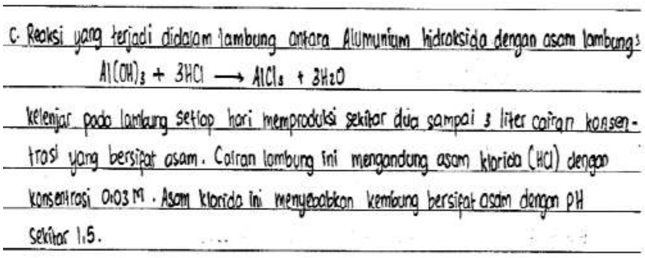


Fig. 2. Students' incorrect answer on analysis indicator of critical thinking

Based on Fig. 2, the students do not understand very well about acids and bases. Their analysis is still weak because they are not able to distinguish between the buffer and hydrolysis so that the pH calculation becomes wrong. This circumstance is in line with the result of interviews and questionnaires which show that almost all of the students stated that this happened because the given problems are very different from the given example even though in principle the problems are the same. This also indcates that the students are not familiar to perform complex cognitive. If they can only do the test questions which are similar to the example, it shows that students are less creative. Furthermore, no students are able to think creatively by showing originality (novelty). It might be because the ability of students who have a style of creative thinking to answer creatively is still low as fluency and clarity indicators are similar to question no 1 and 2. Ability to think creatively with originality indicator is quite difficult for students. It can be seen from the example of students' answer in Fig. 3.


c. Reaksi yang terjadi didalam lambung antara Alumunium hidroksida dengan asam lambung:

$Al(OH)_3 + 3HCl \longrightarrow AlCl_3 + 3H_2O$

kelenjar pada lambung setiap hari memproduksi sekitar dua sampai 3 liter cairan konsentrasi yang bersifat asam. Cairan lambung ini mengandung asam klorida (HCl) dengan konsentrasi 0,03 M. Asam klorida ini menyebabkan lambung bersifat asam dengan pH sekitar 1,5.

Fig. 3. Students' answer on originality indicator of creative thinking

According to Fig. 3, it can be seen that the students have not been able to think out of the usual way because they focus on the existing examples in the previous questions, while the question actually requires a different answer from the previous question. This shows lack of the students' creative thinking which needs to be developed. The analysis of the data in this research demonstrated that the ability of students to answer with critical thinking was only 46.66% and the remaining 53.34% was not able to answer with the high-level thinking skills. Accordingly, it is necessary to find a learning model which can train critical and creative thinking to improve higher-level thinking in order to face current 21st century. This process will be improved more effectively if there is the role of the community, teachers, and parents [8]. Furthermore, the weakness of this research is that it did not involve matters relating to indicators of *fluency* and *clarity* for creative thinking to see the cognitive abilities of students, so these indicators need to be studied further in advanced research.

IV. CONCLUSION

Based on the research results and discussion, it could be concluded that chemical education students do not have the category of superior creative thinking style (0%). There are 20% of the students who have creative thinking styles, 46.66% having medium thinking style and 33.34% having critical thinking. No student has superior critical thinking. Cognitive outcomes showed that only 26.66% of the students have interpretation category of critical thinking, 20% have analysis category of critical thinking and no student has the originality category of creative thinking. Students' critical and creative thinking styles link to cognitive ability to think critically and creatively.

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Internalization of Values in Learning of Zakat by Using the Concept of Percentage

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***Abstract*— Islam is perfect in managing relationships with fellow beings. The example is in managing the charity of the treasure. Treasure is not only private property but some is also owned by others. Therefore, the property must have a social function and ruhiyah. Property must be used and functioned optimally through various economic activities, including the fulfillment of charity, infaq, and charity, as well as a variety of other charities that aim to purify and promote development and achieve the pleasure of Allah SWT. Zakat can be regarded as a special worship in Islam. Privileges of Zakat, among others, lies in their multiple aspects of a human being in the running Worship of Zakat. Those are the bodily, Ruhaniyah, emotional, and spiritual aspects. Viewed from the educational domain, Zakat has some values, namely in the forms of spiritual, physical, and social education. It can be seen from the rules in implementing Worship of Zakat related to the concept of learning mathematics, namely: percentage. Thus, zakat can be used as the material on thematic learning in primary schools.**

Keywords— percentage, religious values, zakat

I. Introduction

A. Zakat

In the Qur'an there are many orders regarding charity. These ones become the background of why Muslims are required to present a charity. Some of the orders are the verses 37-40 of Surat Ar-Rum:

Do they not see that Allah extends provision for whom He wills and restricts [it]? Indeed, in that are signs for a people who believe (37). So give the relative his right, as well as the needy and the traveler. That is best for those who desire the countenance of Allah, and it is they who will be the successful (38). And whatever you give for interest to increase within the wealth of people will not increase with Allah. But what you give in zakat, desiring the countenance of Allah - those are the multipliers (39). Allah is the one who created you, then provided for you, then will cause you to die, and then will give you life. Are there any of your "partners" who does anything of that? Exalted is He and high above what they associate with Him.

Linguistically, zakat means development and purification. Treasure evolves through zakat without being noticed. Zakat can clean the perpetrators of sins and show the truth of faith. A Muslim owning sufficient property is obligated to pay the zakat to the people who deserve it either through the committee and distribute it directly by himself. Zakat is mandatory for a Muslim whose property has reached the minimum payment calculation of zakat called nisab. Zakat is the third pillar of execution of Islamic rules. Ibnu 'Arabi said: Zakat is defined as the obligatory alms and Sunnah charity.

B. Zakat Command

A good Muslim is not allowed to use the property owned having reached a certain amount and then he is obliged to spend a charity. The aim is to help people who can not afford. Zakat is a religious obligation. In the Al-Quran surah Al-Baqarah verse 43 Allah says: "And establish prayer and give zakat and bow with those who bow [in worship and obedience]" (43).

Terms of a person issuing zakat is intelligent, adult and independent. Within the provisions of law, zakat is a definite practice, where it does not require arguments again. Differences of opinion occur only in some furu only. While the rule is clear and basically people who deny it are called infidels [1].

From the standpoint of faith, a charity is the hallmark of faith of someone who is grateful for the blessings of God given to him.This charity has a social value becoming a bridge between the rich and the poor. In the Qur'an Allah also provides a threat to those who only collect the treasures without spending zakat, as stated is in Surah At-Tauba verse 34-35. Its meaning: O you who have believed, indeed many of the scholars and the monks devour the wealth of people unjustly and avert [them] from the way of Allah . And those who hoard gold and silver and spend it not in the way of Allah - give them tidings of a painful punishment (34). The Day when it will be heated in the fire of Hell and seared therewith will be their foreheads, their flanks, and their backs, [it will be said], "This is what you hoarded for yourselves, so taste what you used to hoard." (35)

Based on the paragraph above, it can be concluded that the rights contained in other people's charity. We are required to tithe for charity as a bridge between the rich and the poor.

Thus, the benefits gained when issuing zakat is the formation of social values in them. Social value is what we should develop in everyday life both in the family, school, and community.

C. Distribution of Zakat

The command to spend this charity has existed in the time of the prophet Abraham. Allah has commanded people to pay zakat. There are two kinds of zakat, namely: zakat mal/property and tithes. Zakat is a religious duty imposed on someone to remove most of the wealth with the terms and certain ways, namely: reaching its nisab and haul. What is meant by nisab is the minimum amount that must be issued its zakat of treasure, a time period to spend zakat according to its nisab is one year. If those conditions are met, then the zakat spent meet the levels. What is meant by levels of zakat is the amount of zakat that should be excluded.

Obligation of Zakat on treasure has been prescribed in the Qur'an and the book of hadith, specified and developed by Ithe Islamic jurists through ijtihad. The treasures on which Zakat must be payed are gold, silver, deposits, crops, livestock, merchandise, results of business entities, services (honorarium), antiquities found (rikaz), minerals (makdin), marine products, and all the objects having have economic values.

Based on the above list of treasurer, as presented in Table 1, muzakki can calculate their own zakat and assess his wealth in rupiah unit according to the prevailing market at the time and spend it according to applicable regulations. Zakat collected are usually distributed into eight groups (asnaf) called as mustahik the persons entitled to receive zakat. They are predetermined to receive zakat in accordance with Allah's determination in Surah At-Tawbah, ayat 60: (1) indigent; (2) poor; (3) amyl; (4) converts; (5) riqab; (6) gharim; (7) the way of Allah; and (8) Ibnu sabil [2].

TABLE I. NISAB, HAUL, AND LEVELS ZAKAT

No	Type of Treasure	Nisab	Haul	Level
1	Livestock animals	40 goats	Once a year	2.5 percent
2	Plants having economical values	750 Kilograms of rice	Every harvest	5 percent
3	Gold and silver	96 grams of pure gold	Once a year	2.5 percent
4	Business entity	96 grams of pure gold	Once a year	2.5 percent
5	Salary, Honorarium and Incidental Income	96 grams of pure gold	Each time we get it	2.5 percent

Source: Ali (2015)

The second type is zakat fitrah. This zakat is required already to be paid before Ramadan ends or at the latest before Eid Al-Fitr begins. Zakat fitrah which is paid after Id prayers, is denatured into a regular alms. Tithes is required for every Muslim to remove it at a predetermined time. Zakat is not only mandatory for those who pay but also for those who are under their responsibilities as wife, children and household assistants.

D. Benefits of Zakat

Q.S At-Tawbah verse 103 reads:

Meaning. Take alms of their wealth, the charity that you cleanse and purify them and pray for them. Indeed prayer that you be peace for their souls. And Allah is heard again Knowledgeable (Q.S At-Tawbah verse 103).

Zakat means holy, clean, evolve, and grow, therefore it is essential for human life as an individual and social. The essences are as follows:

1) Cleaning Treasure

One of the benefits of zakat is to clean the property from greed and love of the world but its status of haram is not clear. Zahat is meant to purify treasure.

2) Taking care of the Poor

Zakat is bridging between the rich and the poor by feeding the poor, so that they also feel the excitement in the feast day as perceived by those who are the haves.

3) Giving Longevity

Zakat Fitrah is a self charity, through which God gives him a long life so that he may survive by His Favor

4) Cultivating Noble Character

Generosity is one of the attributes of Allah. So by giving away possessions, we learn to share the blessings that He has given. Other benefits of tithes as well as the embodiment of faith in Allah are cultivating noble characters.

5) Providing Tranquility and Peace

After serving tithes, each of us will feel calmerand peace; there is no burden on the property that have not been clean.

6) Eliminating The Ugly Nature

With tithe, humans will be clean of any dirt, especially from miserly nature. This is important, because basically miser is a common human nature. As stated in the Qur'an sura Al-Ma'arij verses 19-21

Meaning: Indeed, man was created to be complaining. When he was in distress he lamented. and if it gets good (property) he was so miserly.

2) Having a Social Value

When the rich give donation to the such poor people who need, it would become a pillar of charity together between the rich and the mujahideen who used to strive in the Way of Allah.

3) As a Form of Social Guarantee

Beside being a pillar of joint charity, zakat is also one of the concrete forms of social guarantee as prescribed by the Islamic teaching, the Shari'a. Through charity, the lives of poor people and the other suffering people will be well guaranteed.

4) Manifestations of Gratitude for The Favors of Allah

Zakat is proof that we are grateful to the grace of Allah SWT

5) Familiariza Discipline

Additionally, there is no a time limit to pay tithes. This is meant to train ourselves to be more disciplined.

6) Cultivating an Attitude of Mutual Help

Zakat can make the rich closer to the poor. Zakat can be a spiritual bridge that connects between the two so that the sense of mutual help will occur.

7) Perfection of a Muslim

From the standpoint of faith, charity is a sign of the perfection of a Muslim's faith because zakat is one the pillars of Islam.

8) Avoiding Catastrophe

Hadith of Rasulullah Shallallahu 'alaihi wa sallam says: "It is a person reluctant to give alms of his wealth, he will be prevented from getting rain from the sky. Were it not for cattle, it would not be raining. " (HR. Ibnu Majah).

9) Guaranteeing to Go to Heaven

Many verses of the Qur'an were ordered mengelurkan zakat of wealth given by God Almighty are as follows: Surat Al-Baqarah Ayat 3, 43, 83, 110, 177, 277, Surat A-Nisa Ayat 77 & 162, Surat Al-Maidah Ayat 55, Surat At-Taubah Ayat 5, 11, 18, Surat Al-Hajj Ayat 35, 41, 78, Surat Al-Mukminun Ayat 2-4, Surat An-Nur Ayat 37, 56, Surat An-Naml Ayat 3, Surat Luqman Ayat 4, Surat Al-Mujadalah Ayat 13 and Surat Al-Muzammil Ayat 20 as well known from the Hadith Rasulullah SAW, which means: "Verily in Paradise there are rooms whose outside can be seen from the inside and it can be seen from the outside." Then there was a Bedouin stood up and then asked, "To whom (chambers) Rasullullah?" He said, "For people who say well, feeding (including through zakat, pen), diligent fasting and pray for God at night in when people were asleep" (HR. Tirmidzi). So it is appropriate that people spend zakat get to heaven because obedience to the commands of Allah and the Prophet Muhammad.

Thus, the many benefits of paying zakat as described above. There is no doubt for Muslims to carry out the pillar of life in this world and in the hereafter.

E. Zakat from Various Viewpoints

1) Social

In view of the social sciences, there is a social education that includes about how to interact socially with good, civilized, balanced and behaved wisely. When Muslims pay zakat and donation then these activities is tantamount to build bonds of brotherhood with the people who are outside of their social environment, growing comfort in the life of society, and foster a feeling of gratitude for being able to live in a better condition than others [3]

2) Economy

Meanwhile, when viewed from an economic perspective there is an interaction term (muamalah) [4]. Zakat Fund is a capital available in developing the economy of the poor communities. Zakat fund is developed not only to meet the needs of poor people's consumption, but it also functions for empowering the poor Muslim community to be more independent in meeting their economic needs in the future time.

3) Development

Indonesia, as the country with the largest Muslim population in the world, it should consider the potential of zakat as one of the major capital of development. Social and economic dimensions managed by religious charities board is the right combination for the development of the Indonesian people physically and mentally. From here we are increasingly aware that Islam brings mercy to all the worlds.

Based on the description above it can be seen that the zakat can be used as teaching material in schools. This study will look at the internalization of religious values in the learning of mathematics in elementary school.

II. RESEARCH METHODS

The data were analyzed qualitatively. This study aims to describe and analyze the internalization of religious values in the learning of mathematics in primary schools and the achievement of the internalization of religious values in the learning. This study includes a qualitative research, the design of which may be improved at any time depending on the circumstances in the field. Qualitative Method is a research procedure that produces descriptive data in the form of speech or writing and the observable behavior of the subject itself. The research result is transferable which then emphasizes the significance compared to generalization so that the results can be applied to the same social situation. The study is conducted in grade 5 on which the percentage is taught using the concept of charity. This research is qualitative with the elementary school background. The data are collected through observation, interviews, documentation, and literature. The data are analyzed qualitatively.

Internalization of religious values in the learning of mathematics begins with the constructing of learning modules combined with a material percentage of zakat. Tthe module contains the verses of Qur'an and Hadith as sources of learning charity and percentages. Based on the verses and the hadith, it is obtained various religious values of the results of the interpretation. From the religious values, it is obtained religious indicators of students' competence achievement, so that the learning will be successful when it meets these indicators.

III. RESULT AND DISCUSSION

Research findings are about the primary issue on Internalization of religious values through mathematics learning. What are approach used and the achievement of the Internalization? Internalization of religious values through Learning mathematics can be done using value analysis approach. Value analysis approach places emphasis on the development of students' ability to think logically, with analysis of the problems associated with social values. When compared with the approach of cognitive development, one important difference between the two that the value analysis approach given an emphasis on the discussion of the problems including the social values. The cognitive development approach emphasizes individually on the moral dilemma. There are two main goals of moral education according to this approach. First, it helps the students to use logical thinking skills and scientific discoveries in analyzing social issues, which relate to certain moral values. Second, it helps the students to use rational and analytical thinking process, in attributing and formulating the concept of their values. Furthermore, method of teaching frequently used is the individual or group learning about the social problems including moral values, literature investigation, field investigations, and class discussions based on the rational thought.

Religious values found in the field, one of which is a social matter. It is the fact that we are not alone; we must have positive thinking that must be developed in everyday life. That is not a mystery that human beings cannot live without the transcendent, others, and ourselves. The transcendent here means something that is greater than human beings, which is beyond human [5]. It is clear that the man in his life should interact with each other. In other words, when someone has developed a social care attitude, then he has experienced a positive life. In the class 5, it has been found that there are some students who listen carefully to zakat material being taught. Also, it has been found that some students who are busy with their activities outside school hours. Learning begins with apperception from teachers regarding the material on percentage to be taught. Teacher shows some examples in everyday life such as "wadai lempeng" that has been cut into sections so that one section is part of the whole “wadai lempeng”. In other words, this refers to the concept of fractions and percentages. Then the teacher deepens further insight regarding the concept of percentage for the students with other examples. Then the teacher begins to write on the whiteboard about concept of matter, accompanied by illustrations in the concept of charity. After that the teacher also writes the verses in the Qur'an and Hadith showing tithe obligation for humans along with its distribution. This is the concept of percentages

It is expected that when students have received zakat material, they are able to practice charity in everyday life; they have the attitudes of empathy, and generosity; and the most important thing that they have social and environment care. These are all included in 18 national characters derived from Pancasila.

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Diversity of Shrimps at Asam-Asam River in Tanah Laut as A Teaching Material:

Preliminary Study of Teaching Material Development On Environmental Toxicology Subject

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***Abstract*— Shrimps play several important roles as resource of animal protein and a part of an ecosystem balance. However, diversity of shrimps depends highly on the condition of their habitats. The aim of this research was to analyze the diversity of shrimps which lives in Asam-Asam River as a teaching material in the form of *a leaflet*. The method of this research was the descriptive method. This research used three stations of observation. The first station was situated at Asam-Asam River near the natural vegetation. The second station was situated at Asam-Asam River near the outlet of Coal-fired Power Plant (hence PLTU as Indonesian acronym), and the third station was situated at Asam-Asam River near the settlement of residents. Each station was divided into two zones that were the left and the right sides of the river. Shrimps found were identified by using the shrimp-identification books and then were analyzed by using formula. The results of this research showed that there were four species of the shrimps which were found in all stations, namely : *Palaemon concinnus*, *Metapenaeus monoceros*, *Macrobrachium rosenbergi,* and *Macrobranchium acanthurus*. The value of diversity indexes of Station I, II, and III respectively were 0,271, 0,693, and 0,271 or diversity indexes of the shrimps were low** (H' = <1). The results of this research will be developed become teaching material in form of a *leaflet* which were valid and reliable according to the validators.
Keywords— diversity; shrimp; Asam-Asam River

I. Introduction

Diversity of shrimps is part of river diversity of freshwater ecosystems. Shrimps are found at freshwater ecosystems which have an important role in keeping the balance of ecosystems because of its role as one of the food chains. Freshwater shrimps often are found in Asam-Asam River.

Asam-Asam River have several functions. Beside its function as the facility for water transportation for society, Asam-Asam River is a livelihood of the society. In addition, Asam-Asam River has a function of the resource of drinking water, especially several decades ago [1]. People who live around Asam-Asam River often catch shrimps and fish in the river. Shrimps can be the resource of prominent food which contains high protein. According to early survey from researcher, the shrimp-population tends to decrease. This was estimated to be caused by several activities which have been operated in the area. One of these activities is the Coal-fired Power Plant (PLTU) which products liquid waste. Row material of the Coal-fired Power Plant is coals. The liquid-waste of the PLTU contains several heavy metals which are harmful if they enter the river. The other activity is throwing the waste into the river by the resident. Those activities can disturb the balance of the river ecosystem. When the river ecosystem is disturbed, habitats of the shrimps could be disturbed, too. As the results, the diversity of the shrimps could decrease.

The condition of Asam-Asam River had been polluted chemically because the parameter contains Zink (Zn), hydrogen of sulfide (H_2S), and iron (Fe) were above the threshold of quality standards based on the regulation of the Governor of South Kalimantan Number 05 of 2007 [2]. The values of each parameter were Zn = 0,087 mg/l, H_2S = 0,003 mg/l and Fe = 1,66 mg/l. Whereas the value of standards respectively were Zn = 0,05 mg/l, H_2S = 0,002 mg/l, and Fe = (-) or very small.

II. Method

The tools which were used to take the shrimp samples were a dragnet (*lunta* in Banjarese language) and several tools which were used to take the water samples were bottles of samples. The method used this research was descriptive method. The data were collected directly by doing observation to the field. This research was located at Asam-Asam River in Tanah Laut Regency. The procedures of this research were to observe the location of research, and then prepare the tools and materials. The next steps were to determine the area of the sampling points. The sampling points consisted of three stations. The first station was situated at Asam-Asam River near natural vegetation. The second station was situated Asam-Asam River near the Coal-fired Power Plant (PLTU) and the third station was situated at Asam-Asam River near settlement of resident. Each station was divided into two zones that were the left and the right sides of the river. Each the side consisted of the ten sampling points. The dragnet (*lunta*) was used to catch shrimps and then the shrimps were put into plastic samples and were given a label of each zone as well as recorded. The shrimps which found in the field were collected for counting the shrimps. Some of the environmental parameters were measured and the shrimps were identified by using the shrimp-identification books. Then, they were analyzed by using the following formula:

$$H' = -\sum_{i=1}^{s}(pi \ln pi). \quad (1)$$

III. RESULTS

A. Diversity of the Shrimps

According to the results of the research which was done at Asam-Asam River of Tanah Laut, there were two families of shrimps (Palaemonidae and Peneaidae) which consisted of four spesies, that were Palaemon concinnus, Metapenaeus monoceros, Macrobrachium rosenbergii, dan Macrobrachium acanthurus.

TABLE I LIST OF THE AMOUNT (NP) OF THE SHRIMPS AT THE RESEARCH AREA

Species' name	Station I Amount (NP)	Station II Amount (NP)	Station III Amount (NP)
Palaemon concinnus	170	116.667	-
Metapenaeus monoceros	30	-	-
Macrobrachium rosenbergii	-	83.333	167.307
Macrobranchium acanthurus	-	-	32.692
Total	200	200	200

Notation :

Station I : Area of the Asam-Asam River near the natural vegetation

Station II : Area of the Asm-asam River near Electr Generator of Stem Power (PL

Station III : Area of the Asam-Asam River near the settlement of Residents

TABLE II LISTS OF THE DIVERSITY INDEKS OF THE SHRIMPS AT THE RESEARCH AREA

Species' name	Station I Diversity Index (H')	Station II Diversity Index (H')	Station III Diversity Index (H')
Palaemon concinnus	0.178	0.346	-
Metapenaeus monoceros	0.321	-	-
Macrobrachium rosenbergii	-	0.346	0.073
Macrobranchium acanthurus	-	-	0.197
Total	0.500	0.693	0.271

Notation :

Station I : Area of the Asam-Asam River near the natural vegetation

Station II : Area of the Asm-asam River near the outlet of Electric Generator of Stem Power (PLTU)

Station III : Area of the Asam-Asam River near the Settlement of Residents

TABLE III. THE VALUE OF THE ENVIRONMENTAL PARAMETERS AT ASAM-ASAM RIVER IN TANAH LAUT

Environmental, physical and chemical Factors	Station I	Station II	Station III
Temperature	29-30^{0}C	26-27^{0}C	26-27^{0}C
Acidity of degrees	7.5 – 8.0	6.6 – 6.9	7.2 – 7.4
Current speed	0.0313-0.0323 m/s	0.04 – 0.0476 m/s	0.0455-0.0556 m/s
Brightness	48 – 50 cm	28 – 30 cm	19 – 23 cm
Suspended solids	0.2186 mg/l	0.2959 mg/l	0.3092 mg/l
Water Depth	124-168 cm	78—105 cm	106-121 cm
Basic Subtract	Sandy mud	Pebble mud	Clay mud
Sulfide	0.041 mg/l	0.118 mg/l	0.108 mg/l
Phosphate	0.069 mg/l	0.006 mg/l	0.006 mg/l

B. Teaching Material Development

The result of the research about the diversity of the shrimps at the Asam-Asam River in Tanah Laut were poured out into a teaching material in form of a *leaflet*. The species which were found in this study area were only four species, that were:

Palaemon concinnus

Metapenaeus monoceros

Macrobrachium rosenbergii

Macrobrachium acanthurus

IV. DISCUSSION

A. The shrimps found at Asam-Asam River in Tanah Laut

According to description of the shrimps at Asam-Asam River in Tanah Laut, there were four species of the shrimps that consisted of the two families, namely Palaemonidae and Penaidae. According to Table I, at the station I (near natural vegetation) and II (near the outlet of the PLTU) there were only Palaemon concinnus species was found. This was because there were many water plants as the shrimps' food in station I. This was supported by [3] statement that the species of the Palaemon concinnus could be reproductive well since its habitats were planted by water plants. Besides, the water of the river in the station I still contains brackish water and this statement is in line with the statement of [4] that habitats which are liked by Palaemon concinnus is estuary which includes brackish water.Ref [5] said that in general, coastal area and sea have more stable pH and there were range of limited value, namely 7,6 – 8,3 of pH. This is an alkalinity.

No species of shrimp was not found at the station III. This was estimated that Palaemon concinnus could not adapted by the habitat condition in the station III where the condition in station III was very far from the estuary area. The salinity of the station III was estimated low. The other reasons were that the water plants as a shrimp's food in the station III were few in number and the brightness of station III was low, namely only 19 to 23 cm. Then, the basic subtract of station III was the mud clay.

Metapenaeus monoceros was only found at the station I (near natural vegetation area), whereas it was not found at the station II (near the outlet of PLTU area) and station III (near the of the settlement-residents). This was estimated that station I had the habitats which contain the sandy mud. Ref [6] said that Metapenaeus monoceros like sediment area which contain a mud sandy as its habitat better than the other habitats.

Macrobrachium rosenbergii was found at the station II (area near the PLTU) and station III (area of the residents' settlement) although it was not found at the station I (near the natural vegetation area). This was caused by the characteristic of Macrobrachium rosenbergii which was not active during the day. This was supported by [7] that Macrobrachium rosenbergii was one of a nocturnal shrimps. It was the animal which is active in the night. During the daylight, it is more likely to hide under the plants, rocks, or other things in the water because Macrobrachium rosenbergii does not like the sunlight [8]. Ref [9], the members of Macrobrachium were shrimps which prefer freshwater, such as river, pond, and lake as their habitats.

Macrobrachium acanthurus was only found at the station III (area of the settlement-residents). This was due to many detritus estimated at the station III detritus as a source of main food for Macrobrachium acanthurus. This detritus comes from disposal of organic wastes from settlement of residents. Some of the disposal of organic wastes were food- residue and feces thrown to the river.

The suspended solids which were at the station III was higher (SS= 0,309 mg/L) than the station I and station II. This suspended solids could trigger other microorganism to survive in this area. Ref [10] said that Macrobrachium acanthurus shows the characteristic of omnivore, and their main food is detritus, while the others were oogonium, macroalgae, and a part of benthos.

B. The amount and the Diversity of Shrimps at Asam-asam River in Tanah Laut

According to the results of this research, the shrimp with the most important value and the highest amount was Palaemon concinnus species compared to the other species. This was estimated since the food which was needed from this shrimp was enough because of many plants in this area. Ref [11] state that plants are the main food of shrimps, whereas mollusca and insect are the supplement food. This was supported by [3] that the Palaemon concinnus could be reproductive well because its habitats have many plants as the source of food. Metapenaeus monoceros had the lowest amount. It was considered that Metapenaeus monoceros could not adapt at the area of natural vegetation.

According to the results of this research (Table I), the diversity index of the all stations were low (H'<1). The low-diversity indexes were caused by pollution of sulfide which disturbed the survival of shrimps. The results of measurement showed the water quality at Asam-Asam River in this research area had the concentrations of the sulfides of 0,04 mg/l to 1,118 mg/l, whereas the threshold of quality standard of sulfide was 0,002 mg/l. The sulfides were estimated to come from disposal waste of cola-fired power plant (PLTU) and disposal waste of residents' settlement. Ref [12] said that this molecule could be from the organic material which appeaed during the rain, from industrial waste, domestic waste, and agriculture waste. Sulfides were toxic for water biota, including shrimps, although their concentrations were 0,1 mg/l [13]. This was supported by the condition of hydrogen sulfide which tends to become a problem in the society who is near certain industry. Hydrogen sulfide was found at the deposit of coal and oil which were mobilized by people [14]. Ref [15] said that shrimps can lose of balance at the concentration of sulfide of 0,1 to 0,2 ppm and they cannot survive at the concentration of sulfide of 1 ppm.

In addition, the low diversity index is might be caused by the concentrations of suspended solids in this location of the research (Table III) which were high above 20 mg/l. This statement was supported by [16] that suspended solids in the streams could reduce the number of species in the ecosystem.

The other possibility of the low-diversity index of the shrimps in this location of the research area was that the shrimps are usually caught by the communities around the river for self-consumption and trade to the other communities. According to the community near the river, the shrimps are caught by the community almost every week by fishing or using dragnet.

C. Teaching material according to results of the research

The results of this research were very important to become the teaching material in Biology especially in Environment Toxicology subject because the results explain about the livings diversity. The livings diversities are in the curriculum of the Senior High Schools or in the Universities. We can explain one of the living diversities with the results of this research, that were the diversity of the shrimps which be lives in the river. We can mention of the shrimps which were be lives at the Asam-Asam River. Also, we can explain why the diversity of the shrimps were low in the area of study.

In addition, students can describe the shrimps and show the picture of the shrimp species which was life at the Asam-Asam River. Then, students can finally more understand about the living diversities in the rivers, especially in the Asam-Asam River around the PLTU.

V. CONCLUSION

Based on results and data analysis which had been done at the Asam-Asam River in Tanah Laut, we were found that :

1. There were four species of shrimps which consisted of three species from the Palaemonidae families and one species from the Panaeidae family. The species of the Palaemonidae were *Palaemon concinnus, Macrobrachium rosenbergii* and the species of the Panaeidae was *Metapenaeus monoceros.*
2. The count results of the diversity index according to Shanon-Winner {H' = - $\sum_{i=1}^{s}(pi \ln pi)$} at the all of the stations of observation, we were found that the diversity index were low (H' <1.)
3. The results of the research in form of the *leaflet* was very useful and can be used for teaching material.

VI. SUGGESTION

We need further research at other different-characteristic-habitats about the kind of shrimps with using an different apparatus on

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Principal's Leadership in Education Innovation
(Case study at MTsN Model Amuntai)

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Abstract—**This study was aimed at understanding and describing the leadership of Madrasah principal in carrying out the education innovation. This study focused on activities of the principal of Madrasah Model Amuntai in the education innovation. This study was qualitative in nature, using case study design. Data were collected using three techniques: observation, interview, and documentary. The data were interpreted using phenomenological perspective. Validity of the data was attained through depth of observation, traingulation, and *debriefing*. The results of this study showed that the principal of Madarasah Model Amuntai has innovated the following educational activities: (1) implementing *integrated learning*, improving learning strategies, and being more selective in the new student enrollment. There was less or no innovation in financial management, facilities and infrastructure, and public relation, (2) There was less innovation in human resources and evaluation, (3) the nature of the behavior of the principal is *task oriented behavior*, and occasionally *relation oriented behavior* in instructive, consultative, partisipative and delegative styles, (4) the implementation of education innovation is driven by strong ideology of the spirit of perseverance (*ruhul jihad)*.**

Keywords—Leadership; Islamic School Principal; Education Innovation

I. Introduction

Societies of the world have been changing. The changes are due to the dynamics of global information era. Rural societies are no exception to these changes. They tend to shift to more materialistic and capitalistic way of life. Madrasahs, which are built by-and-for-community education institutions, are now viewed by the society as unprofessional lack of quality in terms of managerial practices.

Reference [5] lists the following weak spots of Madrasahs; (1) emphasizing matters over methodology, (2) preference to rote memorization over analysis and dialogue, (3) putting more importance to vertical over lateral way of thinking, (4) inclining the left brain over the right brain (5) teaching religious subjects atraditionally rather than rationally, and (6) overemphasizing on knowledge as final product rather than on its methodological process.

The abovementioned phenomena are common in most madrasahs in Indonesia, especially in South Kalimantan. The phenomena seem worse in private Islamic education subsector. To name some factors that cause these phenomena would include weak leadership, i.e. the one which is unable to encourage, motivate, influence, drive, and develop human resources to its best potentials.

Based on the above problems of Madrasahs, in the periode of 1997 to 2002 Asian Development Bank (ADB) and Minsitry of Religious Affairs (Mora) launched a project to upgrade and improve quality of both public and private Madrasahs. The first two years of the project was for civil works while the rest is for trainings. Such trainings were intended to improve human resources of Madrasahs. These trainings included In-service Trainings which cover Kelompok Kepala Madrasah (KKM) for principals, Kelompok Kerja Guru (KKG) for Islamic elementary school teachers, Musyawarah Guru Mata Pelajaran (MGMP) for subject matter teachers of junior high level, librarianship training, financial management training, supervision training, and BP3 (parent-teacher association) training. The projects were implemented in six provinces, of which South Kalimantan was one of them.

Basic framework of the In-service Trainings was that upon participating in the training activities, all parties (stake holders) of Madrasahs; principals, teachers, treasurers, librarians, and parent-teachers association members would actively involve in the process innovation for the betterment of madrasah quality. Reference [1] suggests that successful schools are those that are able to make innovations. Innovations are more of leadership matter. This means that in order for a madrasah to develop, it needs to have a visionary principal, the one who keeps making innovation to cope with new development.

The most strategic innovations of education include strategy, design, awareness, vision, mission, scheduling, job distribution, making use of infrastructure, good supervision and guidance, and control in both educational and administrative processes. Considering the huge amount of tasks to undertake, the efforts should be carried out step by step yet continuously.

This study is a report of research on one of the six target madrasah receiving benefits of ADB-Mora Basic Education Project. This study was carried out in Madrasah Tsanawiyah Negeri (MTsN) Model Amuntai, Hulu Sungai Utara Regency, South Kalimantan. Preliminary observation and interview with the principal and vice principal for curriculum of MTsN Model Amuntai as well as Head of MTs sub-section of Mora office of Hulu Sungai Utara Regency revealed that some innovations have been implemented to some degree, including teaching-learning strategy, breakthrough of cooperation with stakeholders, utilization of available learning sources, incorporation of local content in the curriculum, teachers and personnel coaching. As for some activities that have not been optimally implemented including insufficient and inappropriate supervision to teaching and learning process, ineffective and inefficient processes of new students intake, students' discipline supervision, and underused or ineffective use infrastructures.

This study is about Leadership of Madrasah Principals in Education Innovation (Case study in MTsN Model Amuntai). Question to be answered in this study being how is the leadership of MTsN Model Amuntai in impelementing education innovation. This question is elaborated in four more detailed foci: the background of the implementation of education innovation, the implementation process, efforts made by the principal of MTsN Model Amuntai in such process, and behaviors of the principal in the process of education innovation.

II. METHOD

This study is qualitative in nature and designed as a case study. Techniques of data collecting used were interviews, observation, and documentary. Checks of data validity include: (1) *triangulation*, for both sources and instruments of data collecting; (2) *member check*; and (3) Peer discussion.

III. RESULTS AND DISCUSSION

This study revealed that the main reason of the principal and school personnel in implementing education innovation is to make MTsN Model Amuntai as a modern and effective madrasah. The aspects of education innovation which have been implemented are curriculum, infrastructures, finance, teaching and learning strategies, new students' enrollment, and supervision of teacher personnel. Efforts and behaviors of the principal include adapting to immediate situation and available condition and act accordingly, and in the processs of the implementation the principal used participative, instructive, delegative, and consultative approaches.

A. *Backround of the Implementation of Education Innovation in MTsN Amuntai*

People act accordingly to their environment. They learn and analyze their physical and non-physical surrounding and react to them in accordance with their needs for development. Due to differences in physical and non-physical world, people have different motivation in their actions and reaction to their respective immediate situation and condition. The difference of responses by people may also be due to difference of personnel and social background.

The principal of MTsN Amuntai has envisioned his school to become an ideal and effective school with positive ethos and supportive climate. This vision was motivated by the school's previous stigma as less wanted, underachieved, less prestigious, and unqualified. In the efforts of actualizing the vision, the principal has done some innovations in the management of curriculum, infrastructure, finance, teaching learning strategy, teacher personnel, and public relation. The importance of setting a goal to achieve in education institution is to have clear and achievable vision and mission.

During the last three years, MTsN Model Amuntai has enjoyed significant development. There have been more public awareness and interest in enrolling their children in MTsN Model Amuntai.

Attitude and perspective of a principal as a leader plays an important role in the innovation of Madrasah. Leadership paradigm of the principal of MTsN Amuntai include (1) striving to create conducive atmosphere for learning, (2) motivating and encouraging teachers to get involved and committed to the improvement, development, and progress of the school, and to have high morale and ethos, and (3) making efforts to gain public trust and support, and this could only be achieved through inclusive approach, open financial management, effective and direct communication, and good service to the community.

B. *Physical and Non-physical Innovation*

Education innovation means new changes taking place qualitatively differentiated from previous condition, and purposely carried out to increase ability in achieving specified goals. Education innovation refers to new ideas, things, methods perceived and observed by an individual or society in the forms of invention or discovery used to achieve educational goals or to solve education questions. Yet, innovation may be perceived differently by different people or institution. For one it is an innovation, while others that is not the case.

Education innovation in MTsN Model Amuntai new ideas, things, and methods taking place in MTsN Model Amuntai observable as new by school personnel were used to solve problems and to achieve goals set by MTsN Model Amuntai in its vision and mission.

Such innovations are indicated by 1) the improved infrastructure, 2) the improved or higher quality of students achievement, 3) the qualified output, (more students accepted in better accredited high schools, 4) higher enrollment of students (from 340 to 678 more than 90% increasing).

The followings are aspects of innovation taking place Madrasah Tsanawiyah Model Amuntai in the last 3 years:

1) *Curriculum*

Curriculum innovation implemented by principal of MTsN Model Amuntai included modifying the curriculum, i.e. three more hours into the schedule (from 45 hours per week to 48 hours per week). The increase is added to equalize with SMP (general school) academic curriculum, while maintaining the religious subjects. This is in line with what Soedijarto argues that curriculum is the strategic framework of materials of education in order to achieve educational goals which are relevant to current changes in society. Therefore, curriculum innovation is necessary. Reference [4] stated that curriculum innovation may be in changes of its contents and organization, or objectives. Innovation takes place in three steps: (1) needs assessment of development, (2) planning of development, (3) implementation of planning of development.

This study reveals that the principal of MTsN Model Amuntai has implemented innovation in the form of *integrated learning*; that is integrating contents of academic subjects into religious subjects. Teachers are required to incorporate the teaching of sciences in Al-Qur'an and Hadits or vise versa.

2) Finance

Funding or finance is a very significant source in teaching and learning process. If it is managed professionally, other sections of the school activities will also run effectively. Financial management in MTsN Model Amuntai has adopted the School Based Management since 2001. The principal of MTsN Model Amuntai adopted open management for financial innovation. The management of financial sources comes in two steps; one-man receipt, one-man disbursement and control, and process of buying or using of fund delegated to the teachers and personnel. This practice is in line with the concept of *self-managing school* as the actualization of School-Based Management [3], that is involving subordinates or personnel to manage fund in such an effective and efficient way.

3) Teachers Personnel Management

Teachers and personnel management is key success for an education institution. Motivating and encouraging teachers and personnel in order to develop the teachers to the best of their potentials are efforts that have been made by the principal of MTsN Model. However, these efforts have not yet been done maximally. Therefore, we can say because what have been done by the principal are not different from what other principals usually do in their respective madrasah, the principal has not done any innovation in this aspect.

4) Public Relation

Public or society is partners, as well as users or beneficiaries of education institution. Vision and mission of an education institution should reflect the public needs. The higher the level of society living standard, the higher their needs for quality education that provides products of society members (students) who can adapt and adopt the new higher standard of living. The principal of MTsN Model Amuntai has done some innovations in this aspect. Through School-Based management society, parents are involved in formulating and decision making. He has begun the reach-out program with all stakeholders.

C. Efforts Made by the Principal for Education Innovation

1) Striving for Excellent School Goal

Besides presenting himself personally as role model by being humble, open, objective, rational, and consultative, the principal has also taken other professional measures, one of which is very selective enrollment of students. One of the key factors for successful school is the quality of input. In addition to that, he also provides good quality education infrastructures.

2) Human Resource Development and Empowerment

Three aspects of education innovation are necessary cover of the teaching and learning process, school internal and external factors, and suprastructure or regulation. The other factors may include human resource development and pattern of interaction of the leader and the group he or she leads. Principal shall distribute jobs professionally and proportionally. Teachers and personnel in MTsN Model Amuntai are so varied in terms of their educational, socio-economic standing, and other personal and social differences of background. With his skill and Islamic religious knowledge and belief, the principal has been able to manage to motivate and encourage each individual in the school to carry out and finish each of their main jobs. He based his view on the teaching of the Holy Quran that every believer is brother and sister, so be kind to each other.

This explains that the principal of MTsN Model Amuntai has so far been setting the un-actuated ideals of innovation, there has been no real action. Human resources have been developed through mainstream methods; in-service trainings, seminars, and workshops which are usually top-down instruction from the regional office of Mora.

3) Evaluation of Innovation Implementation

Evaluation is carried out by principal of MTsN Model Amuntai based needs, situational and step by step. When problems arise especially in teaching and learning process, evaluation is made, decision making is achieved through consensus of individuals involved in the process under the coordination of vice principal for curriculum. When the innovation is deemed incompatible with students needs, coordinator and the team will ponder or speculate new alternative breakthrough. While step by step evaluation is for students' grade reports cards for each semester, and for every year end. This will show or prove the degree of success and failure.

4) Institutionalization of Innovation

In general, the implementation of education in MTsN Model Amuntai has been in process. The ideas and ideals of development of MTsN Model Amuntai so far has been from the principal, and in the process still depends very much on the elaboration from the principal to the school personnel, teacher and staffs alike. Therefore, in view of management principles, success or even failure of MTsN Model Amuntai principal in his role in organizing, mobilizing, and trusting to his subordinates are very much in process, we cannot declare its success in a tested point.

D. Behaviors and Attitudes of the Principal

The management implemented by the principal of MTsN Model Amuntai is adopted and adapted from Western theories which are simplified or actualized in accordance with real condition. Innovation is planned in Snow ball model, a continuous staging.

In terms of organization, what has been done in the last three years by the principal MTsN Model Amuntai can be said as considerably good, especially in mobilizing, influencing, and empowering as well as coaching-guiding school personnel.

In fact, the principal of MTsN Model Amuntai has always got all school personnel especially teachers involved in materializing his ideas of making the school as the ideal school. In its operation, the leadership performed by the principal is task-oriented behavior. Effectiveness of a principal leadership according to [2] is that of ”high-high leader”, that is based on high task and high relationship. However, what has been displayed by the principal MTsN Amuntai is high task oriented, while maintaining low relationship. But, it is worth noting that the principal has been able to assess the actual and real condition surrounding his school, both physically and non-physically.

Reference [6] states that there are three aspects of behaviors of personnel in accepting ideas of innovation and tasks from their leader, commitment, compliance, and avoidance. Most school personnel are committed to what has been set by the principal along with steps decided in consensus to be carried together. This is due to the principal’s openness to minor change of decision in relation with the actual situation and condition. In addition, he has always got all personnel involved in all processes.

In doing so, the principal has kept telling the school personnel that what they have been doing is not a matter of worldly or profane activities, there will be spiritual rewards based on Islamic religious belief.

Model of leadership implemented by the principal of MTsN Model Amuntai is situational leadership. The situational model of his leadership may be instructive, consultative, participative, and delegative.

Instructive leadership is applied especially for new personnel and/or low performance personnel. Consultative leadership is for personnel with capability yet lower motivation. In the process principal gives a wider freedom to the personnel in conveying their opinions, and keeps appreciating them. Participative model is for personnel with lower ability, but higher willingness. In his view, this kind of personnel is participants and partners. Delegative model is for personnel with high ability and high willingness. It is then conclusive that the leadership model applied by the principal is situational model.

This study confirms that in light of management and leadership agents of change (innovation) in MTsN Model Amuntai has been from **internal and externa**l. This differs from Baffadal’s study [2] which stated that agents of innovation in schools are of school supervisors from the government office. Therefore, instead of deconfirming previous studies, this study adds more insight to theory of agents of innovation in MTsN Model Amuntai consist of the principal as internal agent and government supervision officials as external agent.

IV. Conclusions

In general, the leadership of MTsN Model Amuntai principal in education innovation has been visible in teaching and learning strategies, new students enrollment, and curriculum. Managements of infrastructure, finance, personnel, and public relation have been neglected. If there were innovations, there have been very conceptual, not yet implemented.

However, MTsN Model Amuntai has the potential to develop due to its location.

- The reason behind the implementation of education innovation is to make MTsN Model Amuntai as ideal, modern, and effective school.
- Education innovations implemented including: (1) Curriculum- the incorporation and integration of academic knowledge or sciences into religious subject matters or vise versa. (2) Infrastructure – there has been less innovation. MTsN Model Amuntai has been playing the role of initiative giver to the government and project funder (ADB). (3) Finance - *open management* concept from School-Based Management principles has been implemented. (4) Teaching learning strategies – there have been team teaching and rotation class, and active learning approach implemented at this school. (5) New students enrollment – more selective students enrollment process is implemented. To guarantee smooth process of learning in this Islamic school, MTsN Model Amuntai accepts only prospective students with Arabic letters literacy (can read and memorize some verses of the Holy Quran). (6) Public relation – the school has extended its reach for wider community involvement and cooperation.
- There has been less concrete effort by the principal due to unavailability of the master plan.
- The leadership approaches adopted by the principal of MTsN Model Amuntai in education innovation were participative, instructive, delegative, and consultative.

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Increasing Students Learning Process and Outcomes through Matrix Strategy in Biodiversity Concept

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***Abstract*—The concept of biodiversity is taught in the second semester in the tenth grade of senior high schools. Based on the interview results to a Biology teacher in SMA Muhammadiyah 2 Banjarmasin, the concept of biodiversity has not reached the individual KKM which is ≥ 70. In addition, complete lesson plans are not in accordance with the curriculum; therefore, some indicators of the curriculum have not been included into the lesson plans. This study aimed to improve the process and outcomes of students learning as well as to evaluate the responses of students and teachers. It was an action research conducted in two cycles. The subjects were students of class X A SMA Muhammadiyah 2 Banjarmasin in a number of 27 students. The performance during the process of the learning process increased in general from cycle I to cycle II. The performance assessment process supported by students activity gained excellent category, the performance assessment of students learning process gained categories, with the category of very good psychomotor, behavioral assessment by the category of very good character, social skills of students during learning with both category management and activities of the teacher during learning was on the very good category. The results of students learning during the learning process increased from cycle I to cycle II with completeness percentage of 94.84%. The results during the learning process based on the value of LKS gained either category. At last, students and teacher responses showed a positive response.**

Keywords*—*Biodiversity Concept, Matrix, Process and Learning Outcomes

I. Introduction

The biodiversity concept was carried out on the previous year by observation, assignment and discussion. However, there are still students who are passive so that the discussion is not effective as the material being discussed is not in accordance with the curriculum. Therefore, the curriculum discussion is recommended with the addition of recording and classifying the material into a table. Individual study results do not meet the specified individual school KKM that is ≥ 70. Meanwhile, the RPP is incomplete because there are several indicators on the curriculum that have not been entered.

This study aims to improve students learning process and outcomes as well as evaluate the responses of students and teachers on the concept of biodiversity.

II. METHOD

This type of research is the Classroom Action Research (CAR) with 2 cycles based on [9]. The subjects of this study were the tenth grade students at SMA Muhammadiyah 2 Banjarmasin. This school is located at Jalan Mangga III RT. 22 No. 47 East Banjarmasin, South Kalimantan.

The qualitative data were obtained from the students' learning process and the responses of students and teachers through questionnaires as well as the data of students learning in the form of worksheets. Meanwhile, the quantitative data were obtained from the study in the form of pre-test and post test.

The survey analysis data were classified as qualitative data conducted in a descriptive way. Quantitative data analysis was carried out on a percentage basis. And the data analysis about students and teacher responses results was shown descriptively. Qualitative indicators are students learning in the form of assessment of students activity, performance assessment process of student learning, psychomotor assessment, behavioral assessment character, social skills assessment, and teacher assessment of activity of the first cycle to the second cycle of excellent category [5]. Quantitative indicators are students learning outcomes in the form of pre-test and post-test from the first cycle to the second cycle on complete category. Students achieve mastery set by the individual school. And the results during the learning process, namely from LKS results from cycle I to cycle II is on excellent category [5]. Then, students and teachers show positive response [1].

III. RESULTS AND DISCUSSION

A. *Improved Students Learning Process Results from Cycle I to Cycle II*

The Improved students learning process results from cycle I to cycle II in general was increased. It can be seen on Fig. 1-6.

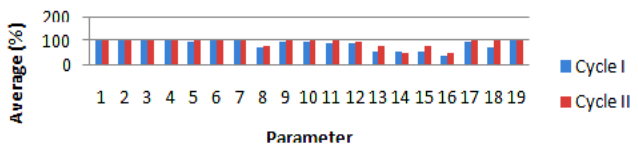

Fig. 1. The Average Results of Students Learning Process in Cycle I and Cycle II

The parameter information:

- Students listen and answer teacher's greeting.
- Students raise their hands when they are called.
- Students prepare to learn.
- Students pay attention to the teacher in apperception and respond to teacher's questions.
- Students work on the problems from the pre-test.
- Students receive information on the subject matter topic and their learning goals.
- Students pay attention to the delivery of information in general about the learning material.
- Students answer questions posed by the teacher.
- Students form study groups and joined the group members.
- Students help the teacher to distribute teaching materials and worksheets.
- Students pay attention to the explanation given by the teacher in the example and populate the matrix.
- Students discuss with members of the group in completing the worksheets.
- Students take turns to present the results in discussions.
- Students receive the teacher's award given for the best group.
- Students ask the teacher about the material that is not understood.
- Students make conclusions to learning materials on the day.
- Students work on the problems in the post-test.
- Students receive information about the subject at the next meeting.
- Students pay attention to the teacher closes the lessons and respond the greetings.

B. *Performance Results of Students Learning Process in Cycle I and Cycle II*

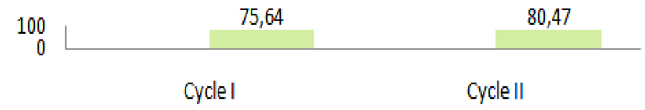

Fig. 2. The Average Performance Results of Students' Learning Process in Cycle I and Cycle II

C. *Psychomotor Results in Cycle I and Cycle II*

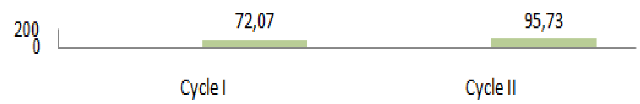

Fig. 3. The Average Psychomotor Results in Cycle I and Cycle II

D. *Character Behavior Observation Results in Cycle I and Cycle II*

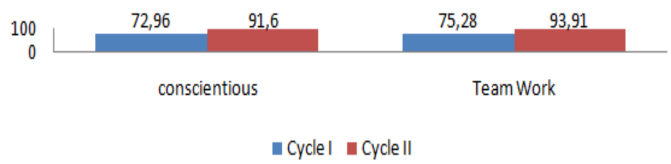

Fig. 4. The Average Behavior Character in Cycle I and Cycle II

E. *Social Skills Observation in Cycle I and Cycle II*

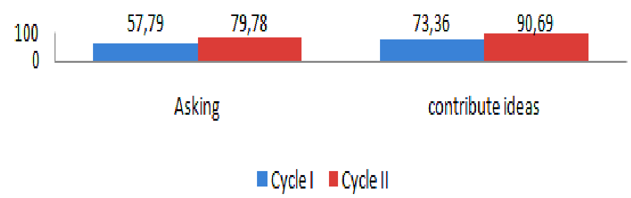

Fig. 5. The Social Skill Average Rating in Cycle I and Cycle II

F. *Results of Activities Master in Cycle 1 and Cycle II*

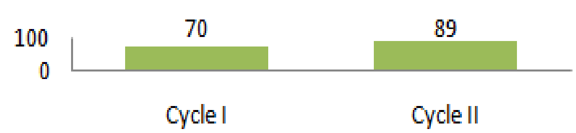

Fig. 6. Teacher Activity Average Score in Cycle I and Cycle II

The Increased students learning from cycle I to cycle 2 is affected by such things as follows:

1) The Activities of Students in Learning in Cycle I to Cycle II

Students activities increased from Cycle I (86.05%) to Cycle II (91.63%), showing that the teacher's dominance is reduced. It is in line with [3] that the matrix strategy can devote attention to the lesson thinking, and critical thinking;

improve the ability to organize, identify, and classify the material and activeness of students in learning.

2) Student Learning Process Performance in Cycle I to Cycle II

Students learning process performance increased from Cycle I (75.64%) to Cycle II (80.47%), showing a good implementation of the information provided by the teacher, then the information is managed by the students to fill out the matrix. It aims to increase the ability of students' understanding of information. This finding is consistent to an opinion by [11] that the matrix strategy enhances the ability to identify and classify the material. It makes it easy to understand the lesson and influence the outcome of the learning process.

3) Psychomotor in Cycle I to Cycle II

Psychomotor result increased from Cycle I (72.07%) to Cycle II (95.73%), showing the students' attention already led to a discussion of material so that students are actively following the discussion, give and respond to the opinions and appreciate suggestions. These results are consistent with [4] that increased students curiosity and answered the increasing cover topics.

4) Character Behavior in Cycle I to Cycle II

There was an increased character behavior in terms of meticulous Cycle I (72.96%) and (91.60%) Cycle II and co-operation (75.28%) first cycle and (93.91%) Cycle II. This finding is consistent with the opinion of Smith in [2] that the cooperative learning through small groups of students working together with friends maximizes the learning process so as to make them learn together well and carefully in the troubleshooting process.

5) Social Skills in Cycle I to Cycle II

Increased social skills, in terms of asking Cycle I (57.79%) and Cycle II (79.89%) and contribute ideas/opinions (73.36%) in Cycle I and (90.69%) Cycle II. These results are consistent with [6] that it is done by asking to encourage the process and learning outcomes, gather information, check the student's understanding and evoked response. According to [8] by contributing students ideas/opinions Students work in learning.

6) The Activities of Teacher in Management Education in Cycle I to Cycle II

Teacher's activities increased from Cycle I (71.05%) to Cycle II (89.47%), showing that teacher optimizes the learning process. This is in accordance with the opinion of Uzer Usman [6] that a classroom management skill of teachers is to create and maintain an optimal learning condition.

G. Improved Students learning outcomes on Biological Diversity concept with strategy matrix

The improved students learning outcomes from the first cycle to the second cycle in general has also been completed. It can be seen in Fig. 7-8.

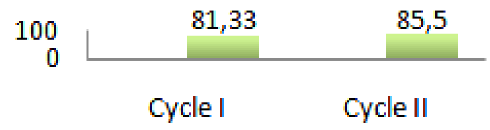

Fig. 7. The Average students worksheet results in cycle I and II

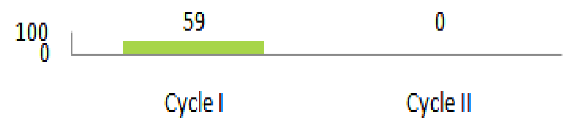

Fig. 8. The Average Test Results of the Pre and Post Test in cycle I and II

Students learning outcomes improvement from cycle 1 to cycle 2 is influenced by factors such as:

1) Students worksheets in Cycle I to Cycle II

Students worksheets increased from Cycle I (81.30%) and Cycle II (85.49%), due to complete the task. The students worked together and helped each other in understanding the material. The matrix strategy is able to manage information through organizing concepts into a matrix.

2) Post Test in Cycle I to Cycle II

The rated post test in cycle I was 45.57% and cycle II was 88.79%, the classical completeness of cycle I to cycle II was 94.84%. The growing willingness of a person is associated with maturity, since maturity means readiness to implement prowess. Readiness to consider in the process of learning is also taken into account because students learn that there is readiness, then good study results are achieved [7].

H. Responses of the Tenth Grade Students at SMA Muhammadiyah 2 Banjarmasin on Biological Diversity Concept with Matrix Strategy

Learning through matrix strategy on Biological Diversity concept has received positive responses from students of class X A SMA Muhammadiyah 2 Banjarmasin, this can be seen in Fig. 9.

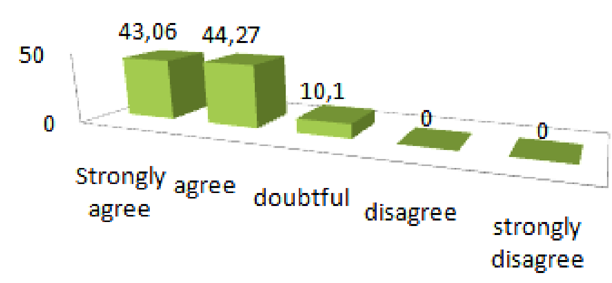

Fig. 9. Response Against Student Learning

Students questionnaire responses provide students answers which show agree inasmuch 87.33%. Learning through matrix strategy received a positive response from the students of class X A SMA Muhammadiyah 2 Banjarmasin.

I. *Teacher's responses during the Learning Activities on Biodiversity Concept through Matrix Strategy*

Learning through matrix strategy on biological diversity concept has received positive responses from the tenth grade biology teacher at SMA Muhammadiyah 2 Banjarmasin, this can be seen in Fig. 10.

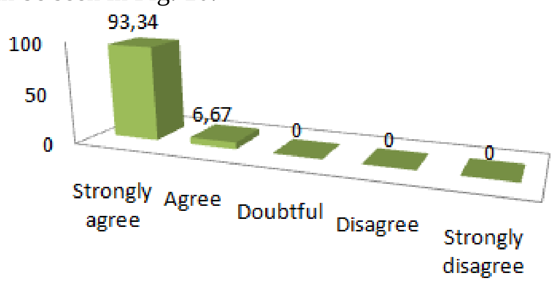

Fig. 10. Teacher's Response to Learning

Among 15 statements, 14 numbers obtained strongly agree answer and got the percentage inasmuch 93.34% and one answer was agree to the percentage of 6.67%. Learning to use this matrix strategy received a positive response from the tenth grade biology teacher at SMA Muhammadiyah 2 Banjarmasin.

IV. Conclusion

The increased learning process of students are because of: 1. Activities of students on Cycle I (86.05%) to Cycle II (91.63%); 2. The performance of the students' learning process in cycle 1 (75.64%) to Cycle II (80.47%); 3. Psychomotor from Cycle I (72.07%) to Cycle II (95.73%); 4. Behavior character: meticulous Cycle I (72.96%) and (91.60%) Cycle II and co-operation (75.28%) on Cycle I and (93.91%) Cycle II; 5. Social skills: ask Cycle I (57.79%) and Cycle II (79.89%) and contribute ideas/opinions (73.36%) on Cycle I (90.69%) on Cycle II and 6. Teacher's activities from Cycle I (71.05%) to Cycle II (89.47%).

Then, the increased of students learning outcomes are due to 1. Students worksheets results from Cycle I (81.30%) and Cycle II (85.49%) and 2. Post-test rated on Cycle 1 (45.57%) and Cycle II (88.79%), increase in completeness classical in Cycle I to Cycle II was (94.84%).

Matrix strategy on biological diversity concept received a positive response from students and teacher of biology at the tenth grade of SMA Muhammadiyah 2 Banjarmasin.

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The Relationship between Principal's Leadership and Teachers' Professional Ethics to Teachers' Performance of Public Elementary School

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***Abstract*—The purpose of this study is to determine the relationship between principal's leadership and teachers' professional ethics to teachers' performance of public Elementary School in East Banjarmasin District. The employed method was descriptive-quantitative approach. The researcher used validity test and reliability test for the instrument and normality test, linearity test and homogeneity test for analysis requirements. The researcher used Pearson Product Moment correlation and double correlation. These two correlations were operated by using SPSS 18.0 program with the 0.05 level of significance for knowing the relationship of each variable. The results showed that (1) there is a positive and significant correlation between school leadership and teachers performance, (2) there is a positive and significant correlation between teachers' professional ethics and teachers performance, (3) there is positive and significant relationship between variables simultaneously.**

***Keywords*—Principals' Leadership; Professional Ethics; Teachers' Performance**

I. Introduction

Education according to the Law No. 20 of 2003 is essentially a conscious and deliberate effort to create an atmosphere of learning and the learning process so that students are actively developing the potential for them to have the spiritual power of religion, self-control, personality, intelligence, noble character, and skills needed, society, nation and state (Education Law Decree No. 20 of 2003 on National Education System).

The quality of education in Indonesia must be improved as the effort to prepare qualified human resources. Improving the quality of education must also be supported by an increase in the educational quality. The educational staff is an important component in the provision of education because they are in charge of organizing activities of teaching, training, conducting research, developing, managing and providing technical services in the field of education [7].

Teacher is a figure who occupies the position and plays an important role in education. Teachers are educators whose main role is to educate, teach, train, and guide students. Educational success is determined by the readiness of teachers in preparing their students through teaching and learning. Therefore, teachers are required to master the basic skills needed as educators, counselors and teachers so that the necessary ability to form a set of knowledge and teaching skills.

The role of teachers in an effort to neutralize the existing demands is inseparable from teachers' performance. Teachers' 'performance reflects their ability as seen from the appearance of the work of teachers in performing their duties. Murphy stated that the performance is the quality of task-oriented behavior or work [16]. This is because the performance of teachers largely determines the success of education in the learning process effective and efficient so that educational goals can be achieved and realized. Reference [17] states that the development of teachers performance is closely related to the efforts of the leadership in order to increase loyalty, responsibility, obedience, cooperation and initiative. The success of school education is determined by the success principals in managing the academic staff at school. The school principal is one component that affects education [13] in improving teacher performance. The school principal is responsible for the implementation of educational activities, school administration, coaching other education personnel, and efficient utilization as well as maintenance of facilities and infrastructure.

Reference [6] describes the performance of the individual performances theoretical model that consists of a variable capacity and skills, personal backgrounds and demographics. According to [6], variable capacity and skills are factors that influence the behavior and performance of individual work directly. Meanwhile, the demographic variables have an indirect influence. Groups of variables in the psychological aspect consist of variable perceptions, attitudes, personality, learning and motivation. It is heavily influenced by family, social, work experience and demographic variables. Therefore, there is one aspect that is influenced by the environment.

The school principal as a leader in the school is responsible for the attainment of the objectives of the school. Leadership by Terry R. Georger [10] is the activity of influencing others to achieve group goals. Furthermore, the principal is required to have the elements of leadership, namely: (1) have a strong personality, (2) understand the conditions of teachers, staff and students, (3) have the vision and understand the mission of the school, (4) have the ability to take decisions and (5) have the ability to communicate. It is supported by Path-goal theory proposed [9] that emphasized the effort of determining the relationship between the behavior of the leader with the performance of subordinates and work activities. The basis of this theory is that the leader's job is to assist his/her members in achieving their goals and giving direction, supporting or both are needed to ensure their goal which according to the organization's overall objectives.

Thus, the required behavior of a positive school leadership can encourage, guide, and motivate the whole school community to work together to realize the vision, mission and objectives of the school. Principals should be able to work scientifically and lead a professional, attentive, and democratic with the emphasis on improvement of the teaching and learning, for it was necessary to devote creativity in educational improvements.

The school principal should be able to practice management functions such as planning, organizing, actuating and controlling, because it will contribute to the improvement of teachers performance. These management functions will work synergistically with the principal's role as educator, manager, administrator, supervisor, leader, innovator and motivator. Thus, it takes commitment, capability and flexibility in performing their duties.

The school principal is also expected to manage and empower teachers to continue improving their work through capacity-building program of educational personnel. With the increased ability for all its potential, certainly teachers who also work as partners with school principals in various fields of educational activities may be trying to show a positive attitude towards work and improve its performance. This was disclosed by Greenfield and Manasse that, "Effective principals reviews their activities focus on instruction and the classroom performance of teachers" [19].

Asmara [2] explained that the action against the school leadership and teachers work maturity and teacher job satisfaction are positively correlated, meaning that the maturity of high employment tends to be followed by high job satisfaction. Based on these opinions, it can be concluded that the principal's leadership in teacher performance is strongly influenced by the leadership that can increase the activity of teachers' work. Therefore, the role of the school principal positioned the leader to communicate, socialize, and at the same time work with people to build, maintain, and develop a an espoused vision. The quality of school leadership determines the success of the school to achieve the goal by empowering teachers. This can be done by providing instructions and conducting surveillance so that motivation can lead to satisfaction for teachers.

Teacher is a component that contributes to the escalation of schooling. Thus, the ethics of the teaching profession is also necessary to support the teachers performance in the education process. Reference [1] argues that teacher is a determining factor for success in school, because teachers are the central as well as a source of teaching and learning. Teachers in practice hold that double duty as a teacher and educator. As a teacher is in charge in pouring a number of lessons into the students while the duty as a teacher educator guides students to be proficient human decency, active, creative and independent. Reference [5] argues that both teaching and educating is the duty and responsibility of the teachers.

The ethics of the teaching profession is supported by the theory of Alderfer which suggests that there are three needs that underlie in human behavior, namely: (1) Existence, a fundamental requirement of human survival, (2) Relatedness, the need for interaction with others, (3) Growth, a requirement for channeling the creativity and being productive. One of these theories suggests the need for interaction with others that human behavior can be encouraged to do a good job according to the professional ethics [8].

Ethics of the teaching profession is a profession teacher attitude in tasks that affects the learning process. Meanwhile, the Master Code that regulates the norms must be run by a teacher who aims to guide the attitudes and behavior of actors in implementing the teaching profession and perform various tasks as an educator, society member, and citizen. Article 28 of Law No. 8 of 1974 on the main points of personnel explained that the civil servants have a code of ethics to guide attitudes, behaviors and actions inside and outside the office. While the Code of Ethics of Indonesian Teachers Congress XIII enhanced PGRI XXI Congress in 2013 stated that there are two basic elements, namely: (1) a moral basis, (2) a behavior guide. Teacher Indonesian Code serves as a moral foundation and guidelines for each teacher behavior in the discharge of duties of citizens PGRI service as a teacher, both inside and outside the school as well as in everyday social life in the community. Thus, the Code Guru Indonesia is an indispensable tool for the establishment of professional attitude of the members of the teaching profession [18].

However, the application field still looks poor performance of teachers, it is suspected because it is less well functioning school leadership. As noted [20] factors that affect the performance of the teacher is the knowledge, skills, attitudes, work style, interests, fundamental value, trust and leadership.

Based on the field observation seen from some problems that identify the problem of teacher performance, it is evident from some of the phenomena that (1) there are still many teachers use the lecture method, and less creative in the implementation of teaching and learning, (2) there are teachers who do the teaching and learning activities without referring to the RPP have been made, and even less likely to conform the sequence in the learning process, (3) there are difficulties on teachers to solve the problem of learners. In addition, the professional visible attitudes of teachers are (1) lack of contribution of teachers in professional organizations, (2) tendency to carry out tasks with sober profession, (3) rarely provide feedback to the leader.

Meanwhile, the school leadership that still become visible phenomena, namely: (1) the principal role is still less in guiding teachers who have difficulty in completing its tasks, such as in the preparation of lesson plans, (2) the principal s still less in paying tribute to teachers in an effort to carry out their duties, (3) there is still the principal who pays less attention if any opinion, advice or criticism with the teacher, and (4) the principal fails to give information relating to the duties of teachers.

The phenomena shown above can be in general summarized as (1) the performance of teachers in elementary schools in East Banjarmasin district area is still less than the optimum performance, (2) the leadership of principals in leading and managing teachers will affect the performance of teachers, (3) teachers in implementing the tasks can be influenced by the leadership of the principal and teacher's professional ethics attached to the teacher. Based on the setting in which the above description, this study intends to reveal the relationship between principal's leadership and teachers' professional ethics to teachers' performance of public elementary schools in East Banjarmasin district area.

II. Method

Based on the purpose of this research, it employed a descriptive quantitative approach because it emphasized the analysis on numeric data. This kind of useful correlational studies determine whether there are contributions between two or more variables. The subjects in this study were certified teachers in UPT East Banjarmasin district area. The instruments in this study was a questionnaire. To measure each item of this instrument in this research, it was used to rate the scale (graduated scale) is a Likert scale having a gradation from very positive to very negative. Likert scale in this study using five scales in the form of positive statements used to measure positive interest.

The data collection technique in this study is as follow. Before the questionnaire was distributed, the questionnaire was tested first using validity and reliability. Validity and reliability of the measured instruments intended to be representative of the data obtained in the study. Meanwhile, the data processing of test validity and reliability in this study used the SPSS program.

Test prerequisites of normality, linearity test, homogeneity test and hypothesis testing were performed with SPSS version 18.0 program.

III. Results and Discussion

To reveal the results of a variable in this study, it was done by using the attitude scale. This study provides a number of statements. The respondents were asked to choose one of the five alternative options available namely Always (S), Frequently (Sr), Sometimes (KK), Rarely (J), and Never (TP). For a positive statement of the range of values obtained from 4-1, and vice versa for negative statements the values obtained with the range 1-4.

If it is found that the value of the results of the instrument, it is then performed by the statistical disclosure properly using SPSS version 18 program in the form of a mean value, median, standard deviation, variance, range, as well as minimum and maximum values. Then, it is proceeded to explain the distribution of these scores into the chart.

As for knowing how much the relationship between variables, the data can be made by using a statistical description by calculating the average base price (Mi), and standard deviation (Sbi) in order to obtain high yield/good, moderate/sufficient or low/less. Additionally, descriptive analysis was used to obtain an overview of data dissemination of research results of each of these categorial variables.

For the testing requirements analysis, the normality test and homogeneity tests were conducted using computer facilities SPSS version 18 to determine whether or not there is a relationship between variables. The normality test used One-Sample Kolmogorov-Smirnov Test. If the p value shows Sig> 0.05 (level of significance), the data are normally distributed.

For the linearity test, it was performed by using ANOVA analysis with regard to the value linearity in the relationship between the dependent and independent variables. When SPSS output on the test results obtained linearity significant value of each relationship between Principal Leadership factor (X1), Professional Ethics of Teachers (X2), the Teacher Performance (Y) is lower than the significance level of 0.05, it is declared that it has linear relationship of the independent variables.

Homogeneity test using SPSS 18.0 program and Levene formula if the value of the output at Levene statistics show significant value over the value of the significance level (Sig = 0.000> 0.05). Ho is accepted or the data are homogeneous. This can be interpreted that the data have the same characteristics or variants.

After all tested were conducted, analysis on the data was performed in order to determine whether there is a relationship between leadership principals with the performance of teachers, teacher professional ethics in the performance of teachers and school leadership to teacher performance to test the hypothesis used SPSS version 18.0 and analysis using Pearson correlation.

The results of the analysis of the correlation between school leadership and teachers performance known with the value of r = 0.729 or 72.9% correlation coefficient. Meanwhile, categories/intervals are on high coefficient because it is in the interval coefficient from 0.600 to 0.799. In this connection known Sig = 0.000 <0.05 then Ho is rejected and Ha accepted. This means that the hypothesis "There is a positive and significant relationship between school leadership with teacher performance Elementary School in District East Banjarmasin" is accepted. Thus, there is a positive and significant relationship between school leadership and the performance of teachers in the district of East Banjarmasin.

This suggests that the success of an organization or educational institution is highly dependent on the ability of the principal in the lead. Reference [17] states that the development of teachers performance is closely related to the efforts of the leadership in order to increase loyalty, responsibility, obedience, cooperation and initiative. If the leadership exercised by the principal right then it will increasingly support the improved performance of teachers is high. Subsequently, if the leadership conducted by the principal is not right then there is a tendency of low teachers performance.

Therefore, the principal as leader is a subject that must transform leadership through the provision of guidance or advice to the school he/she lead for the achieved purpose. Reference [14] states that failure or success of an organization is determined by the leaders. Leaders are the ones who control and determine the direction to be taken by the organization towards the objectives to be achieved. Leaders or in this case principals should be able to manage all the available resources effectively and efficiently to achieve the goals of education in school. New educational paradigm shift needs a professional school leadership.

The elements of leadership that should be possessed by the principal are namely: (1) having a strong personality, (2) understanding the conditions of teachers, staff and students, (3) having the vision and understand the mission of the school, (4) having the ability to make decisions and (5) having the ability to communicate. It is supported by Path-goal theory proposed [9] that emphasized the effort of determining the relationship between the behavior of the leader with the performance of subordinates and work activities. The basis of this theory is that the leader's job is to assist his/her members in achieving their goals and giving direction, supporting or both are needed to ensure their goal which according to the organization's overall objectives.

This is in line with what was described by the Ministry of Education and Culture in the management of elementary school [3] that educational leadership is the ability of the principal to provide the effects that can cause teachers motivated to carry out the duties and activities together to achieve goals education efficiently and effectively. In this case a teacher performance.

Teacher performance as the ability and effort of teachers to carry out teaching duties in the planning of teaching programs, learning and evaluation of the implementation of learning outcomes. Reference [12] explains that it is said to be high if a targeted work can be completed in a timely manner or do not exceed the allotted time. In contrast, the performance becomes low if finalized exceeded the allotted time or not at all resolved. Mahmudi also stated that there are several factors that affect the work, namely: (a) personal/individual, covering the knowledge, skills (skills), ability, confidence, motivation, and commitment of every individual factor, (b) leadership factors, including quality in providing impetus, encouragement, guidance and support given by the manager and the team leader, (c) team factor including the quality of support and encouragement given by a colleague in a team, confidence in his fellow team members, unity and cohesion of the team, (d) system factors, including: the working system, working facilities or infrastructure provided by colleagues as a team, confidence in his fellow team members, compactness and the closeness of the team members, and (e) contextual (situational) factor including pressure and change external and internal environment. Leadership factor is one of the key factors in performance.

In other words, the ability of the principal in leading an important factor to influence or encourage the implementation of teachers performance by providing instructions and conducting surveillance makes motivation leads to satisfaction for teachers.

Meanwhile, the results of correlation analysis between the professional ethics of teachers and teacher performance known value of r = 0.718 or 71.8%. The correlation coefficient of categories/intervals is on high coefficient because it is in the interval coefficient of 0.600 to 0.799. In this connection known Sig = 0.000 <0.05 then Ho is rejected and Ha accepted. Means that the hypothesis "There is a positive and significant relationship between professional ethics of teachers with teacher performance Elementary School in District East Banjarmasin" received. Thus, it can be said there is a positive and significant relationship between teachers' professional attitude and performance of teachers in the district of East Banjarmasin

This shows that the professional ethics of teachers affect the performance of teachers. This is because of the work achieved by practicing a teacher with expertise in education and their education level will affect the implementation of the work according to a certain standard value or the size of the organization in which the individual works. Reference [15] mentions a teacher is a professional who can make students able to plan, analyze and conclude the problems encountered. Therefore, a teacher must uphold the code of conduct of teachers. The code of ethics is a moral foundation and guidelines for behavior in carrying out professional work. Thus, it can be understood as an attitude of professional ethics devotes himself/herself to work with the standards of moral values and norms. This is confirmed by the opinion of professional ethics Keizer in defining the attitude of life in the form of justice to provide professional services to the community with a full order and expertise as a service in order to carry out the task in the form of obligation to the community.

Meanwhile, according to [11], teacher's performance is a picture of a teacher's work related to the task at hand and based on the responsibility of the teacher profession possessed. Thus, teachers have high performance may desire and strive to improve their competence, both in relation to the planning, implementation, and assessment in order to obtain optimal results [13]. Teacher performance can be seen and measured in accordance with specifications or criteria of competence which should be owned by every teacher. In connection with the performance of teachers, a form of behavior in question is the activities of teachers in the learning process is learning how a master plan, implement learning activities, and assess learning outcomes.

Thus, the teacher's performance is influenced by the professional ethics of teachers in the implementation of its obligations as a teacher at the school. The ethics of the teaching profession is supported by the theory of Alderfer which suggests that there are three needs that underlie in human behavior, namely: (1) Existence, a fundamental requirement of human survival, (2) Relatedness, the need for interaction with others, (3) Growth, a requirement for channeling the creativity and being productive. One of these theories suggests the need for interaction with others that human behavior can be encouraged to do a good job according to the professional ethics [8].

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It shows that the leadership of the principal and teachers professional ethics affects the performance of teachers. Reference [13] states that a teacher who has a high performance to be passionate and strive to improve their competence, both in relation to the planning, implementation, and assessment in order to obtain optimal results. Meanwhile, the professional attitude of the teacher is as a component that contributes to the escalation of schooling. Thus, there is the necessary of professional attitude of teachers to support the performance of teachers in the education process.

Leadership is as one of the variables in this study. Reference [10] states that leadership is a relationship problem and influence between the leader and what he/she led. The leadership is emerged and developed as a result of the interaction automatically between leaders and individuals. Leadership is able to function on the basis of power of leaders to persuade, influence and mobilize others to do something for the achievement of a goal

Hughes added in the implementation of leadership effectiveness are three factors that will influence this interaction. First, it is leader behavior (behavior of leaders) that is leadership effectiveness is strongly influenced style of the lead person. Second, subordinate (subordinate), namely, leadership effectiveness is influenced by the level of acceptance and support of subordinates. Subordinates will support a leader as long as they see the actions are considered leaders can benefit and increase their satisfaction. Third, it is the situation. A situation in which leadership style: leader of the relationship, the level of the task structure and position power leaders who can through formal authority. Thus, the ability of the principal's leadership in relation to the implementation of teacher performance is the determining factor of empowerment and improvement of teacher performance.

IV. Conclusion

Based on the analysis and discussion of the research results, it can be concluded that: (1) there is a positive and significant relationship of school leadership on teachers performance of Elementary Schools in East Banjarmasin district area. This may imply better if the school leadership teacher performance increases, (2) there is a positive and significant relationship of professional ethics of teachers on teacher performance Elementary School in East Banjarmasin district area. This can be interpreted if the better the attitude of the teacher professional teacher performance increase, (3) there is a positive and significant relationship of school leadership and professional ethics of teachers on teacher performance Elementary School in East Banjarmasin district area. It can be interpreted that the better the leadership of the principal, the better the teacher professional ethics in performing their duties so that the teachers' performance increased.

Based on the research results, the following things are suggested, namely: (1) in particular, the Department of Education in East Banjarmasin district area is expected to continue to improve educational services and contributions in the form of attention and support both morally and materially in order to create high-quality graduates, educators professional, and leadership that support the implementation of education, (2) the supervisors are expected to be a material consideration in coaching and mentoring to school principals and teachers to continue to enhance the role of leadership, and ethics of the teaching profession in order to have an impact on improving teacher performance continuously in all the Elementary School in East Banjarmasin district area, (3) the principals are expected to be used as input for the management and coaching of teachers to improve professional ethics of teachers and teacher performance state elementary school in East Banjarmasin to do the coaching, (4) the teacher is expected to concern in an effort to improve the quality as educators who have good professional ethics in order to continue to make efforts that support the creation of a good teacher performance and professional well with training and support things, (5) parents, community leaders, and all parties are expected to concern to the problem of education that can be a reference material in school improvement efforts, (6) further research in this area are advised to conduct similar research yet on different objects with other variables that can affect the performance of teachers. In addition it is advisable to conduct further research with a qualitative approach or by using another theoretical study.

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The Effectiveness of Empty Seats Technique in Resolving Verbal Communication Difficulties

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Abstract—**In school environment, verbal communication is a main support in learning activity. However, it often happens that students tend to have difficulties in verbal communication such as miscommunication that leads to a failure in making a relation, conflict, also may disturb thinking process. These happened because of disruption in communicating such as articulating, voice, accuracy and fluency problem and verbal language problem. Therefore, it is needed to develop a technique to overcome those problems. One of many ways is to an individual counseling service using empty seats technique approach branch from Gestalt theory. The aim of this research was to find the effectiveness of this counseling technique to resolve verbal communication difficulties from students of VII grade. It was a quantitative research with experimental research. The research was conducted at SMPN 31 Banjarmasin. The population was VII grade students with total 120 students while the sample was acquired through inclusion criteria with purposive sampling technique, with a number of eight students. The instrument of the research and data collection was in form of measurement scale of verbal communication difficulties. The data were analyzed using t-test formula. Based on the data obtained from the testing of obtained t > t table 0.95% (5.60> 3.182), then H_0 was rejected, which means there were different levels of verbal communication difficulty percentage of students before being given a counseling by using empty seats technique and after given a counseling. Based on the results, it can be concluded that the individual counseling with an empty seats technique was effective in overcoming the difficulties of verbal communication. Therefore, the counselors were suggested to apply the empty seats technique in overcoming difficulties in verbal communication of the students.**

Keywords—Empty Seats Technique, Verbal Communication Difficulties

I. INTRODUCTION

As social human beings, people cannot avoid interaction between one another. There is a different needs and a specific objective to be achieved, even to speak and treat other human beings in a civilized way. It takes an interaction with a way of communicating. In order to communicate in good ways, students need to have a verbal and non-verbal skills. Communication of the subject of this case is Included as verbal communication. Verbal communication itself is a sending and receiving of meaning either in oral or written communication.

However, various problems were often found in the verbal communication. The problem is for instance the emergence of a miscommunication that makes a failure in relationships, makes a conflict and may impede the process of thinking. It is caused by an interruption in communication such as articulation disorders, disorders of the voice, fluency and fluency disorders, as well as language disorders.

In school environment students ages are ranged from 12 to 20 years old. On these ranges, they are in teenager phase (12-15 years old) and late adolescent phase (16-20 years old). Related to the task fulfilling, these students are acussed to be more active in various things. Many demands push them to be able to communicate well. Unfortunately, it often happens that students tend to have difficulties in verbal communication. The verbal communication difficulties that happen to students cannot be seperated with their learning and social problems. Therefore, it is necessary to develop a technique that can be used by school counselor to overcome this verbal communication problem.

One counseling service that can help students in coping with the verbal communication problem is empty seats technique. Empty seats technique is a role play that is executed by an individual (a client) using a dialogue in describing dream. The role which is being played is done by turning the students one by one on the provided seats. In the implementation of the empty seats technique, verbal communication in students need to be raised and moved. In order to do so, the therapy counselors need to know students' needs in fulfilling the issues so that they pay attention and get their interest to achieve meaningful goals [2].

As a result, the main purposes of this study are to find (1) how the description of verbal communication difficulties on the students of SMPN VII Banjarmasin before given an empty seats technique is; (2) how the description of verbal communication difficulties on the students of SMPN VII Banjarmasin after given the empty seats techniques is; and (3) whether the empty seats technique is effective in overcoming verbal communication of SMPN VII students Banjarmasin.

II. Review of Literature

A. *Verbal Communication*

Language according to Larry L. Barker in [3] has three functions namely naming or labeling, interacting and transmission. Verbal communication is a process of transferring and accepting symbols that have meaning, whether in the form of information, thought, or opinion. Meanwhile, according to [4] in verbal communication activity speaking is the meaning of verbal communication itself. In fact, there is no rule mentioning that the meaning transferred through oral and written could also be defined as speaking.

From some definitions above, it can be concluded that verbal communication is a process of transfering and accepting meaning or message that has similarity in meaning between one person and another through words or sentences whether it is oral or written.

Verbal communication can be influenced by some factors namely [3]:

1) Self and Other Imagery

When someone communicates to other people, he/she may have a self imagery. So, other people imagery to communicate influences the way and ability of a person in communicating. Basically, people learn to create their own imagery through connection with others, especially other human being whom he/she considered as important for himself, like father-mother, teacher and etc.

2) Psychological Atmosphere

Psychological atmosphere is recognized to influence communication because it is hard to communicate when someone is sad, confused, angry, dissappoint, envy, etc due to the psychological atmosphere. In short, someone's feeling is hard to be controlled by other people.

3) Physical Environment

In regard to physical environment, communication can take place anywhere and anytime with different style and way. Communication that takes place in the family and society is different from the communication in school. The atmosphere at home is informal while the atmosphere at school and community is formal; therefore, the communication that takes place must obey the norm.

a) *Language*

Verbal communication is often the language used which was unable to represent an object in question precisely. Someone assortment interpretation of the language used is due to the use of language (in a cultural context).

b) *Age Difference*

The age difference makes people talking by previously considering whom the people they talk to. Everyone has each word that must be understood according to their life span.

The Following is verbal communication disorders in the academic field: (1) Reading disorder, according to [1] people whose grammar is bad, in form of speaking or listening, cannot understand any meaning from what has been uttered as well as cannot understand the messege of the written form. (2) Dyslexia, it is a developmental disorder including difficulty in language acquisition in both reading and writing. (3) Writing disorder, it is divided into two, namely expressive writing and dysgraphia. Difficulty in expressive writing is marked by an inability to express thoughts or feelings into writing. The main symptom is an error in the spelling of words, grammar, punctuation, paragraphs and very bad handwriting. People who have this disorder also experience the lack of themes in their writing [5]. Meanwhile, according to [1] speech and language disorders including problems in speech such as articulation disorder, voice disorder, and speech fluency disorder, and language problem such as difficulty receiving information and expressing language. (4) Articulation disorder, it is a problem in the pronunciation sounds correctly. Articulation problems generally can be fixed with talking therapy although it would take many months or years (Spiel et al 2001 in [1]. (5) Voice disorders, it appears in the unclear speech, hard, too fast, too high, or too low. Voice of children who harelipped are usually difficult to understand. (6) Accuracy or fluency disorder, it is usually called "stuttering". This condition occurs when a child's speech stammering, long pauses, or repetitive. The anxiety that was felt by children for stuttering usually makes their condition worse. (7) Language disorder is divided into (1) Receptive language disorder is the acceptance and understanding of the language. As a result, someone may find it hard and difficult to process received information effectively. (2) Expressive language disorder is related to the ability to use language in expressing ideas and communicating with others. The problem in this discussion is the common language disorder. There are several characteristics of individuals suffering from oral expressive language disorder (Boyles & Contadino, 1997) in [1] namely feeling shy and withdrawn, as well as having problems in social interaction; postponing in giving answers; finding proper words hard; having scrambled and disorganized thought that makes listeners face some problems; eliminating an integral part of the sentence or the information needed for comprehension; having serious learning problems.

B. *Empty Seats Technique*

Empty seats technique is a way to encourage counselees to internalize introjections. Basically, the empty seats technique is a technique of playing the roles by the counselees themselves. Often, counselors do not need any process to play the role as he/she approaches the two seats although it will still be beneficial for a variety of emotional feelings verbally and nonverbally [6].

Empty seats technique is the technique of playing the role performed by one individual (the client) to use dialogue to describe dreams. Then, the role that he/she plays performed in turn by the other individual on the provided seats alternately.

1) Role and Function of Counselor in Empty Seats Technique

Most counselees will initially be reluctant to talk to an empty chair. To assist and encourage counselees in this process, the counselor can stay beside them and model the appropriate behavior to make a statement on behalf of a role in the empty seats. In this process, the role of the counselor is to direct the course of the game's role by giving instructions to the counselees when to move from one chair to another [6]. To create an atmosphere that increases exploration, the counselor should be deeply involved and honest with clients. Polster and Polster (1973) emphasize that counselors should be fun, energetic, and humane.

2) Implementation procedures of Empty Seats Technique in Counseling

a) *First Meeting:*

(1) FIRST STAGE

The first session is an early stage of the introductory session between the counselor and counselee, held within more or less 5 minutes.

(1) The counselor explains individual counseling services as well as the counselor and counselee roles respectively.
(2) The counselor informs the principles and codes of conduct that are held by counselee or the counselor in the counseling process.
(3) At this stage the counselor try to establish a good relationship to the counselee in order to help foster a sense of trust towards the counselor.
(4) Counselor and counselee make a time agreement during the counseling process. Meetings are held twice a week, and the counseling process is implemented for ± 45 minutes.

(2) MIDDLE STAGE

The middle stage was done for ± 13 minutes to which the counselor identifies problems of verbal communication difficulties experienced by the counselee.

(1) First Step
Before counselor identifies the problems faced by the counselee, the counselee is given relaxation in advance so that the counselee feels comfort and calm while revealing the problem to the counselor.
(2) Second Step
Furthermore, the counselor identifies problems of the counselee by digging counselee’s problems experienced when communicating through asking a few questions, such as: What are your problems in verbal communication? Why do you think these problems appeared? How is the communication pattern you have done previously? What changing attitude that you want so that it could help you in overcoming the verbal communication difficulties that you are dealing with now?
(3) Third Step
After counselor identifies problems and explore the background in the counselee, the counselor then offers alternative solutions to problems in communicating verbal difficulties faced by counselee using the technique of empty seats, the process is carried out for ± 10 minutes. Counselors at this stage explains the technique of empty seats to which as follows: (a) Informs the definition of the empty seats technique and its role in overcoming the difficulties of verbal communication. (b) Introduce and demonstrate the technical implementation of empty seats technique in overcoming difficulties and verbal communication. (c) Explain the advantages and positive impact of the use of techniques of empty seats in overcoming difficulties and verbal communication.
(4) Fourth step
At the first step, counselor helps the counselees to recognize their problem and find the behaviours that indicate the verbal communication difficulties on the counselee. At the second step after counselee realized his/her problem and the source of the problem, the counselee has to decide the development that he/she wants. In the third step, the counselor explains the implementation strategy of empty chair tehnique to the counselee, such as the counselor provides two face to face empty chairs, and the counselee is asked to sit down on one of the chairs and the counselor asks them to imagine that there is someone in front of him/her and is now talking to the him/her; On the first meeting, the counselor is allowed to sit in front of the counselee and acts as an interlocutor, the purpose is to encourge the convesation to serious conversation between the counselee and the interlocutor.After that, the counselor leaves the chair slowly so the counselee acts responsively on both chairs to relate the communication. The counselor asks counselee to repeat and note the result of the technique used in 3 days countinuosly and on the fourth day the counselor observes the counselee technique implementation.
(5) Fifth Step
Based on the stage that counselor conducted, the counselor asks the counselee to make a final conclusion from the meetings and collaborate to discuss the advantage and the challenge of the activity so that the problem can be anticipated on the next meeting. (*The counseling process is conducted during ± 15 minutes).*

(3) CLOSING STAGE

The counselor concludes the activity conducted and make an appointment for the next meeting, the counselee has to bring activity on the implementation on the empty chair technique and the their development during the use of the technique.

b) *Meeting II*

(I) BEGINNING STAGE

On the second meeting, on the beginning stage the counselor does a rapport again. This process is conducted for 10 minutes.

(2) MID STAGE

The conselor reminds the problem and agreement that have been made on the previous meeting, (1) The conselor asks the note of the empy chair implementation result from the counselee so the counser is able to review the counselee development. (2) The conselor helps the counselee to conduct self evaluation by making a repeated note during the technique implementation of the empty chair technique. Then, the counselee makes a conclusion by himself/herself. (3) If the data collected by the counselee show a succefull development on the final stage, the counselor is able to evaluate the counselee that becomes a reward for them. (4) However, if the data collected still show deficiency on the target behaviour, the counselor and counselee have to revise the strategy on the lack of the implementation. *(The counseling process is conducted for ± 30 minutes).*

(3) FINAL STAGE

After the second stage done, the counselor on the final stage asks the counselee to conclude few things on the counseling. Then, between the counselor and counselee, an appointment for the next meeting is arranged.

c) *Meeting III*

(1) BEGINNING STAGE

On the third meeting, on the beginning stage, the counselor asks the counselee to relax, so the counselee feel more prepare and open to tell their self development. *(The counseling is conducted for ± 10 minutes).*

(2) MID STAGE

On this stage the counselor conducts some activities such as: (1) repeating on the previous couseling result. (2) reviewing the data result note that were collected by the counselee about target behaviour, which is the result of revision or improvement on the empty seats technique, (3) asking the counselee to make a target behaviour improvement chart from the implementaion of counseling technique. (4) giving reward to the counselee in the form of motivation so that the counselee has more confident and is able to solve his/her problem. *(The counseling process is conducted for ± 25 minutes.)*

(3) CLOSING STAGE

The final stage on the third meeting is the last stage of the individual counseling between the counselor and counselee. The counseling ends by getting a counselee data that show the success changing of behavior and the development on verbal communication aspect. The counselor can ask some questions such as: How is your feeling after you implement the empty seats technique on solving your verbal communication problem? Do you realize the specific problem of verbal communication on yourself? Does your problem of verbal communcation decrease?

Then, on the last stage the counselee is asked to see the extend of their development compare to the first meeting.

III. METHOD

This study employed quantitative research with experimental research design. It used the pre-experimental design in the form of intact-group comparison design in which there is one group used for research, but it is divided into two. Half of the group was the experimental (with treatment) and the other half was the control group (without treatment).

The research setting of this study was at SMPN 31 Banjarmasin. The subjects were the VII grade students and the object of the research was the difficulty of verbal communication on student of the VII grade students at SMPN 31 Banjarmasin. The researcher consideration to choose the VII grade because new students just entered the school and still on the process of adaptation with school society. On the other hand, they are also on the stage of development and growing, so there are physical and psychological change that often cause some problems at new school.

The population of the research was 120 students of the VII grade at SMPN 31 Banjarmasin. The following considerations and steps were used to determine the sample:

1) Interviewing the counselor of SMP Negeri 31 Banjarmasin. Based on interviews result concluded that the seventh grade students had a tendency to experience difficulties in verbal communication.

2) The interview result was also supported by the field observations on the problem of verbal communication difficulties experienced by students.

3) The subjects were given questionnaires on verbal communication difficulties to determine the level of difficulty they experienced.

After conducted sample filtering base on above points, the researchers divided verbal communication measurement scale to the population for further sample filtering. So, from the given questionnaire, eight students were taken as the research samples.

Data collection technique in this study was questionnaire in the measurement scale using likert scale. The questionnaire was used to test validity and reliability. The result of $r_{measure}$ bigger than r_{table} (taken from product moment table score with total N = 40 by trust standart 95%). The reliability has already tested with 0.904 *Alpha Cronbach* score, it was bigger than r_{table} 0.381 on the level of significance 95%.

The data obtained were then analyzed by using T-test to find the effectiveness of the empty chair implementation on solving students verbal communication problem. Then, the researchers analyzed the results of the pre-test, middle test, and post-test that can be seen in following section.

IV. RESULT

Based on Table 1, it can been seen that there was a different average score between before and after counseling with empty chair technique in the experimental group. The previous average score was 64.30% and after conducting the empty chair counseling on the second meeting percentage decreased to 77.63%. On the last meeting the decreasing was 82.36%.

TABLE I. PRE-TEST, MIDDLE-TES, AND POST-TEST RESULT OF VERBAL COMMUNICATION PROBLEM IN THE EXPERIMENTAL GROUP BEFORE COUNSELING

Code	Before counseling		Category
	Score	*%*	
Kl. 1	117	65 %	S
Kl. 2	128	71 %	T
Kl. 3	109	61 %	S
Kl. 4	109	61 %	S
average	115.75	64.30	

TABLE II. PRE-TEST, MIDDLE-TES, AND POST-TEST RESULT OF VERBAL COMMUNICATION PROBLEM IN THE EXPERIMENTAL GROUP MIDDLE COUNSELING

Code	Middle counseling		Category
	Score	*%*	
Kl. 1	128	71 %	T
Kl. 2	137	76 %	T
Kl. 3	146	81 %	T
Kl. 4	148	82 %	T
average	139.75	77.63	

TABLE III. PRE-TEST, MIDDLE-TES, AND POST-TEST RESULT OF VERBAL COMMUNICATION PROBLEM IN THE EXPERIMENTAL GROUP AFTER COUNSELING

Code	After counseling		Category
	Score	*%*	
Kl. 1	140	78 %	T
Kl. 2	154	86 %	T
Kl. 3	149	83 %	T
Kl. 4	150	83 %	T
average	148.25	82.36	

TABLE IV. DIFFRENCES OF (PRE-TEST AND MIDDLE TEST) AND (MIDDLE TEST AND POST TEST) BEFORE, MIDDLE AND AFTER COUNSELING

Code	Pre-Test & Middle Test differences	Middle Test & Post-Test differences
Kl. 1	5 %	7 %
Kl. 2	5 %	10 %
Kl. 3	20 %	2 %
Kl. 4	21 %	1 %
average	12.75%	5%

Table 5 shows that there was a different average score and percentage before and after counseling in the control group. The percentage before counseling was 66.25% and on the post-test result decreasing to 62.08. The percentage of verbal communication problem on control group did not change, but the percentage of verbal communication problem on counselee changed into -4.25%. Therefore, the verbal communication problem in the control group has got an improvement compared to the pre test.

TABLE V. PRE-TEST, MIDDLE-TEST AND POST-TEST RESULT OF VERBAL COMMUNICATION PROBLEM IN THE CONTROL GROUP BEFORE COUNSELING

Code	Before counseling		Category
	Score	*%*	
Counselee 1	117	65 %	S
Counselee 2	128	71 %	S
Counselee 3	112	62 %	S
Counselee 4	120	67 %	S
Average	119.25	66.25%	

TABLE VI. PRE-TEST, MIDDLE-TEST AND POST-TEST RESULT OF VERBAL COMMUNICATION PROBLEM IN THE CONTROL GROUP AFTER COUNSELING

Code	After counseling		Category
	Score	*%*	
Counselee 1	107	59 %	S
Counselee 2	122	68 %	S
Counselee 3	112	62 %	S
Counselee 4	106	59 %	S
Average	111.75	62.08%	

TABLE VII. DIFFRENCES OF (PRE-TEST AND MIDDLE TEST) AND (MIDDLE TEST AND POST TEST) BEFORE AND AFTER COUNSELING

Code	Pre-Test & Middle Test differences
Counselee 1	-6 %
Counselee 2	-3 %
Counselee 3	0 %
Counselee 4	-8 %
Average	-4.25%

The research findings of this study showed empty seats technique effectiveness on communication problem of the seventh grade students. It shows decreasing score on test result. Based on the individual counseling, the empty seats technique implementation based on total percentage collected from the experimental group was 82.36% and control group was 62.08%. Overall, the treatment influenced can be formulated as:

Treatment influenced $= O_1 - O_2 \Rightarrow$ 82.36% - 62.08% = 20.28%

O_1= Experimental group O_2= Control group

From the reduction of the post-test results in the experimental group and the control group in the results obtained 20.28%. Thus, it can be concluded that the individual counseling with an empty seats technique is effective in overcoming the students difficulties on verbal communication, which is characterized by the score decreasing after the verbal communication difficulties were given individual counseling.

V. DISCUSSION

The research findings show that the implementation of individual counseling with empty seats technique is effective in overcoming students verbal communication problem. One of the counselees got the optimal result in counseling process. He is the one who was very enthusiastic towards the counseling techniques conducted. This counselee also has a high motivation in overcoming his difficulties in communication.

This result is due to the influence of internal and external factors. In internal factors, in addition to the requirement of a strong commitment, understanding and knowing yourself are very important. Students are expected to recognize the things that are associated with symptoms that cause difficulty in communicating. So, the stage to recognize and understand themselves is an early stage in overcoming obstacles and demands of life that makes students to be always ready in facing all kinds of conditions they will encounter.

On the other hand, environment also influence students in making positive change on themselves through support, attention, and acceptance from outside. These will strengthen students commitment to make improvement on themselves related to daily life communication. Effective communication proccess between parents and children also help children to understand themselves, their feeling, their thought, their opinion and their ambition. Negative communication (verbal abuse) influences children brain development. Children who are always in underpressure situation will find themselves hard to think.

For the control group, (K1.1) had a problem with the voice. When the counselee spoke their voice was hoarsely so that the spoken word was not clear. This is because the counselee is male. The voice change was normal on teenager phase. However, the counselee felt distracted by the change because it was not familiar. Because of that, along with the counselor guidance, the counselee decided to train themselves talking with gentle voice. However, on the last meeting when giving the post test, the counselee did not show expected change.

Counselee (K1. 2) had difficulties in understanding the reading material. This counselee has a dyslexia. Hoensby (1984:9) in [5i], defined dyslexia not only making difficulties in reading but also in writing. For beginning training, the counselee decided to read more books to train her understanding. However, this counselee had an obstacle because she did not have much free time. As a result, on the posttest, she did not decrease the level of verbal communication problem.

Counselee (K13) had difficulties in finding vocabulary when making a story in Bahasa Indonesia lesson. This counselee was categorized as a student who has difficulties on expressive writing marked by the inability of express their thought or feeling in form of writing so it is hard for other people to understand. The main indication is the mistakes in spelling, grammar, punctuation, paragraph and bad hand writing [5]. However, from the counselee post-test result, he did not experience a change the level of verbal communication problem.

Counselee (K1.4) had difficulties in arranging word and he delayed on giving answer. This obstacle causes his shyness to talk in front of the classroom. This counselee trains himself to talk in front of the class, but he did not have enough confident with what he wanted to say. Therefore, on the third meeting, after gotten the post test result, this counselee still has difficulties in verbal communication.

VI. CONCLUSIONS

From the result it can be concluded that description of difficulties in verbal communication on students is in the middle level before given the empty seats technique. Description of difficulties in verbal communication on on students is in the low level after given the empty seats technique. Empty seats technique is effective in overcoming students verbal communication difficulties.

VII. SUGGESTIONS

The principal is suggested to better provide facilities to support individual counseling service. The teachers and counselor can increase their cooperation to help students improve their potency optimally, especially on the ability of effective verbal communication. The counselor can create a counseling guidance and service based on students need, especially on verbal communication improvement.

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Improving Students' Learning Outcomes by Implementing Simple E-Voting Application

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***Abstract*—From the observations in SDN Pelambuan 7 Banjarmasin, the learning outcome on local election learning material was still low. This is due to several factors, including the students' ability to make sense of the patterns and the use of less appropriate learning strategies so the learning does not run maximally and optimally. It is, therefore, important to be improve the learning outcome of the students through classroom action research (CAR) by implementing e-voting application in local election learning material to improve students' learning outcomes. This research was conducted in two cycles in which each cycle consisted of two meetings. The subjects were 29 students of class VI at SDN Pelambuan 7 Banjarmasin, consisting of 15 male and 14 female students. Sources of the data were obtained from the teachers and students in the form of quantitative and qualitative data. The data were obtained through observation which were recorded on a data sheet for observation and the students' learning outcomes were obtained through written tests including the evaluation of the students' work and the final evaluation and formative test. The results showed that the activities of teachers and students by using the simple e-voting application on local election learning material increased students' learning outcomes. In conclusion, it is recommended for teachers to apply a simple e-voting application in order to gradually and continuously assess patterns and appropriate learning strategies to improve the process and outcomes of learning.**

Keywords—Learning Outcomes, Local Election Learning, E-Voting Application

I. INTRODUCTION

A. Background of the research

The Preamble of the Constitution of the Republic of Indonesia Year 1945 has given a mandate to us that the national goal is to protect the entire Indonesian nation and the entire homeland of Indonesia and to promote the general welfare, educate the nation and participate in implementing world order based on freedom, lasting peace and social justice. To achieve the national goals, education is a contributing factor and decisive in the process of goal realization.

Developing or underdeveloped countries are five years behind in terms of development and pure science research as a key in the delivery of high-level technology [1]. The development of science in the developing or underdeveloped countries is more directed to pragmatic sciences useful for society in the short and medium term. "The West" has invested a very large budget to conduct in-depth research on the pure sciences because that is where the innovation by innovation in the field of education and technology occurs dynamically in creative and accelerated manner.

This opaque reality is experienced by the world of education in this country which always adopts the western discourse. The question is 'when is this nation able to become a manufacturer of world-class education that can be taken into account by other countries? This is the question we must think of together to improve the quality of education in this country.

Good quality education will lead a nation toward a revival [2]. Indonesian children are only able to control 30% of the reading material and it is difficult for them to answer the questions in the form descriptions that require reasoning. Perhaps it is because the reading material is often memorized (not experienced) as the results of multiple choice questions that are very commonly used in Indonesia.

Curriculum Education Unit has a goal set out in the all subjects, one of which is Civic Education. The aim of this subject is to enable learners have the ability to: (1) know the concepts related to people's lives and the environment (2) have the basic ability to think logically and critically and have the curiosity, the inquiry, problem solving and skills in the life of citizenship, (3) to have the commitment and awareness of the values of citizenship and humanity, (4) the ability to communicate, collaborate and compete in a pluralistic society, locally, nationally and globally [2].

To learn the concepts contained in Civic Education, critical thinking and rightful reasoning is necessary. Inside the concepts, Civic Education is learning concepts that seem simple but sometimes make students become confused. So that learners' achievements in Civic Education do not correspond to the learning objectives to be achieved. Which is the achievement of students who exceed the score of the minimum completeness criteria in SDN Pelambuan 7 Banjarmasin.

Improving the quality of learning will require refinement of learning in accordance with the purpose and nature of Civic Education. Students should be encouraged to interact with their peers in education, and given the responsibility of finding and obtaining their own education, so that students feel a healthy competition and can increase the motivation in the learning process.

Many factors cause students' learning outcomes and learning achievement of Civic Education at SDN Pelambuan 7

Banjarmasin irrelevant with the expected goals. One of the factors is that learners do not have the ability to use reasoning in the patterns and behaviour as well as the ability to make generalizations, compile evidence or explain ideas and statements in Civic Education.

In addition, factors that greatly affect the difficulty in understanding the learning of Civic Education in SDN Pelambuan 7 Banjarmasin are the less precise methods and approaches used by the teacher in the learning process which make the students do not understand the material. Moreover, some of the weaknesses that occur in the process of learning, especially applied by teachers at SDN Pelambuan 7 Banjarmasin in subjects at the sixth grade Civic Education, are as follows. There is still a paradigm that education can be transferred to the students right away. Using such assumptions, teachers focus Civic Education on the effort of pouring education as much as possible to students. In general, teachers at SDN Pelambuan 7 Banjarmasin still are applying lectures, so students' skills in practicing the concepts they learn are very low. Thus, learning is perceived as unhelpful, uninteresting and boring.

Similarly happened in SDN Pelambuan 7 Banjarmasin, based on the researchers' observations, the students' learning outcomes of Civic Education were low. Based on the observation on October 10 2013, the results of learning achieved by sixth graders in Civic Education were 29 as the lowest score with a very low category and were 64 as the highest score with medium category. The average score was 51.80 and the students' learning outcomes of Civic Education were still low.

The learning outcomes of the students on Civic Education in SDN Pelambuan 7 Banjarmasin, especially in the sixth grade were considered as low based on the SKM (Minimum Passing Standard) at SDN Pelambuan 7 Banjarmasin specifying the SKM for Civic Education subject for sixth grade is 65. In fact, the students' learning outcomes on Civic Education were still far below the SKM. There are allegations that the poor performance of students is influenced by the approach and learning media used. Based on the aforementioned findings, one of the innovations that can be applied to deal with is the implementation of simple e-voting application. The learning medium is expected to increase the motivation of students due to the interaction among the students themselves both physically and psychologically. These interactions can occur among students which ultimately improve student learning outcomes.

Based on the aforementioned description of the problems, the researchers intended to give concrete alternative solution to overcome these problems. The alternative is implementing learning activity of this material using a simple instructional medium of e-voting applications. By using this application which was designed effectively, positive interactions can occur from any direction and it is based on PAIKEM, an Indonesian acronym (Active, Innovative, Creative, Effective and Fun).

Therefore, the researchers considered that it was necessary to do the study entitled "Implementing Simple E-Voting Application to Improve Students' Learning Outcomes".

B. Formulation of the Problem

Referring to the background, the researchers can draw formulation of the problem as follows:

1. How does the activity of Teacher in Implementing Simple E-Voting Application To Improve Students' Learning Outcomes At SDN Pelambuan 7 Banjarmasin?
2. How does the activity of students in Implementing Simple E-Voting Application To Improve Students' Learning Outcomes At SDN Pelambuan 7 Banjarmasin?
3. Does an increase happen in Implementing Simple E-Voting Application To Improve Students' Learning Outcomes At SDN Pelambuan 7 Banjarmasin?

C. Problem Solving Plans

Based on the description above, SDN Pelambuan 7 Banjarmasin confronted by the problems of learning is the use of conventional methods and models, less attractive learning and students tend to be passive so that the student learning outcomes is low. If the problem is allowed to continue and not repaired, the result of learning objectives and targets cannot be fully achieved, so that student achievement will also be decreased.

According to the researchers, the use of teaching models and the right teaching media is an alternative in an effort to foster a sense of fun for students to attend classes so that students can learn Civic Education integrated with a sense of fun so as to awaken the giant within (the brain) which still asleep to absorb the information given by teachers and learning environments. The teaching strategy using media, simple e-voting applications, were applied by teachers are not expected to take place more effectively and efficiently.

II. METHOD

A. Description of Research Setting

This Class Action Research was conducted at SDN Pelambuan 7 Banjarmasin, Jalan Bina Karya Simpang Jagung Rt. 61 No. 5 Kelurahan Pelambuan, West Banjarmasin District, Kota Banjarmasin. The research was conducted at the sixth grade with the number of 20 students, consisting of 10 male and 10 female. The classroom of VI grade at SDN Pelambuan 7 Banjarmasin has dimension of 7.5 m x 7.5 m with 20 students' desk.

The learning activities in the academic year 2014/2015 in the sixth grade 0f Elementary School Pelambuan 7 Banjarmasin still use KTSP, for the 2013 Curriculum has not been implemented in this school because the curriculum book has not been distributed to support teaching and learning. Similarly, standard and basic competencies are applied in accordance to KTSP with a number of lessons for the subjects of Civic Education Education of 2 lesson hours per week with an allocation of 2 x 35 minutes.

The researchers also conducted interviews with sixth grade teacher. The interviews were conducted with teachers to identify early problems in learning, discussing the difficulties of teachers in implementing the learning of Civic Education, Civic Education learning outcomes and the activities of the students in the learning process. The teacher stated the appropriate learning model is hard to apply if the learning materials are abundant while the time available that listed in the syllabus is very little. Therefore, teachers focus Civic Education on the effort of pouring as much knowledge as possible to students. In general, teachers at SDN Pelambuan 7 Banjarmasin still apply lecturing technique, so students' skills in practicing the concepts they learn are low, making the learning perceived as unhelpful, uninteresting and boring.

The joint research of Civic Education subject teachers of sixth grade formulated and used methods and models whose goal was the achievement of learning outcome and increase the activity of the students in the sixth grade on Civic Education subject. Based on the low score on students' learning outcomes of Civic Education in SDN Pelambuan 7 Banjarmasin, the researchers were interested in doing research using simple e-voting application.

B. *Research Preparation*

The observer in this study was a teacher at SDN Pelambuan 7 Banjarmasin, who served as Civic Education teacher of Class VI and has additional duties as Principal in SDN Pelambuan 7 Banjarmasin. The reason for choosing the teacher as the observer because she has had sufficient experience in conducting various studies with a fair and even very good mark.

C. *Class Action Implementation*

The steps of conducting the research were as follows:

1. Designing learning scenarios by using the approach of learning media to produce simple e-voting application
2. Preparing a means of learning and media that support learning which helps the implementation of the problem solving
3. Making the observation sheet to see how the learning conditions in the classroom is when the simple e-voting application is used and implemented
4. Making the observation sheet to see the activities of students and teachers when conducting activities and learning in the classroom
5. Designing an evaluation tool for Civic Education subject to see their learning ability and the results before and after use of simple e-voting application

III. RESULTS AND DISCUSSION

Based on observations and analysis of the data, an increase in activity and learning outcomes of Civic Education in the subject of election freedom in Indonesia was found. The increase was found on the activity of the teacher, student activity, learning outcomes and student mastery level.

1) *Teacher's Activities*

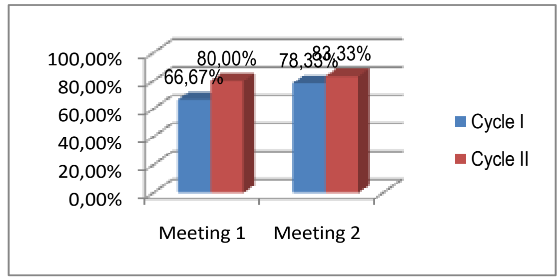

Fig. 1. Increase of Teacher's Activities

Based on the Fig. 1, it can be seen that the activities of teachers in the implementation of simple e-voting application were quite effective, but still not optimal. Seen in the first meeting, the activities of teacher obtained percentage value of 66.67% with a fairly good result. On the second meeting, teacher's activity increased earning 78.33% with a good level. All the planned activities were very well done. On the second cycle of learning activities, the activities of teacher were also stated quite effective and very optimum. Seen in the first meeting, activities for teacher obtained the average score of 80% with very good level. Furthermore, at the second meeting, teacher's activities increased and obtained the average score of 83.33% with a very good level. All the planned activities can be carried out well. This results show that there is an increase in the learning process by the teacher.

2) *Students' Activity*

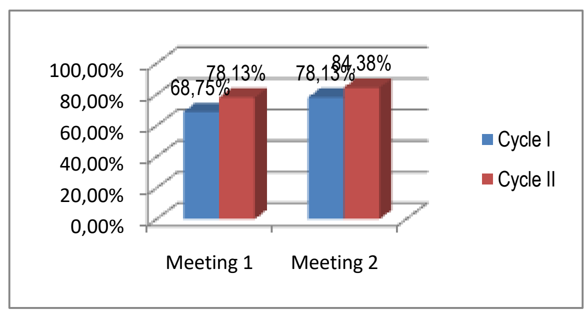

Fig. 2. Increase of Students' Activities

Based on the chart in Fig. 2, the activities of students in learning by using simple e-voting application in the first cycle increased. It can be seen in the observation sheet of students' activity on the first meeting which showed the score of 68.75% with a fairly good level. At the second meeting, students' activities increased to reach value of 78.13% with a good level. All activities planned were carried out well. Moreover, on the second cycle, students in learning activities using simple e-voting application showed an increase in their activities. It can be seen in the observation sheet of students' activities at the first meeting of the second cycle which showed the score of 78.13% with a good level. At the second meeting, students' activities also increased to the average score of 84.38% with a very well level. All the planned activities can be carried out well. This fact showed an increase in the learning process by students.

3) Students' Learning Outcomes

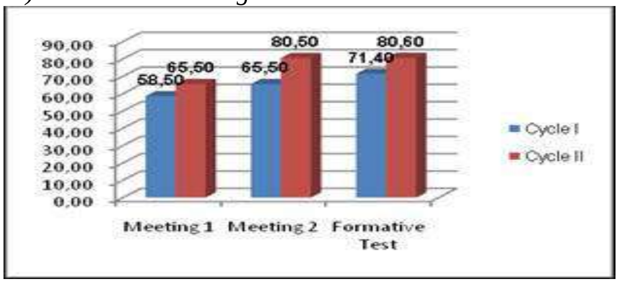

Fig. 3. Increase of Students' Learning Outcomes

Based on Fig. 3, the average value of students' learning outcomes at the first meeting of the first cycle was 58.50 with the percentage of 40% indicating students who passed the standard and 60% indicating students who did not pass. At the second meeting, the average value was 65.50 with the percentage of 55% indicating students who passed the standard and 45% indicating students who did not pass. Moreover, the results of formative test at the first cycle showed the average value of 71.40 with 65% of mastery level, and 35% of students did not pass the standard. Based on the average value of each meeting, there was an evident significant improvement, but not yet reached the level of completeness/standard in classical way as the percentage of completeness is still below the passing standard.

On the second cycle, students' learning outcomes at the first meeting obtained the average value of 65.50 with the percentage of passing standard achevement of 35%, and 65% of students did not pass. At the second meeting, the average value was 80.50 with 75% of mastery level, while 25% of students did not pass. The results of the formative test at the second cycle (formative II) revealed the average value is 80.60 with 95% mastery level of students who passed the standard, while only 5% of students did not pass. Judging from the average value of each meeting, there is a very significant increase and has reached a level of mastery in classical way as seen from the percentage of achievement compared to the minimum passing standard.

4) The Percentage of Students' Mastery Learning

Learning outcomes and students' learning mastery level still cannot reach the target and the minimum passing standard which has been established, so the implementation of the classroom action research continued to the second cycle. However, after considering the results of learning and mastery learning level of students in the second cycle, the minimum passing standard has been achieved by the students, so the implementation of the research was successful and has achieved the set targets. The detailed of students' mastery learning can be seen in Fig. 4.

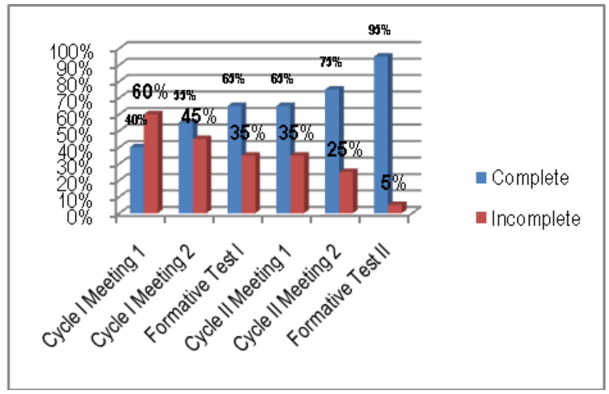

Fig. 4. Increase of The Percentage of Students' Mastery Learning

B. Discussion

Implementation of learning by teachers is constantly increasing. This is proven by the increase in the percentage of teacher' quality activities, namely 66.65% at the first meeting of the first cycle, 79.99% at the second meeting of the first cycle, 79.99% at the first meeting of the second cycle and 89.99% at the second meeting of the second cycle. In cooperative learning, teachers will tend to be successful if [3]:

a. the teacher stresses the importance of collective efforts in addition to individual efforts in learning;
b. the teacher requires all students (not only students who are smart) to obtain success in learning;
c. teachers want to instill, that students can learn from other friends and learn from the help of others;
d. the teacher wants to develop the communication skills of students as part of the curriculum;
e. the teacher wants the students to improve motivation and increase their level of participation;
f. the teacher requires the development of students' ability to solve problems and find different kinds of problem solving;

It is also in line with the opinion of [4] that cooperative learning can bring about the requirement for students to learn to think, solve problems, and integrate knowledge with skills. Cooperative learning is a form of learning that can improve the learning system that so far has lacked.

Activities of students in learning by using simple e-voting application are fairly supporting and active. This is seen on the observation sheet of students' activity which showed that all the planned activities can be carried out as well with the increasing percentage. Learning activities of students have also increased. This is evidenced by the percentage of completeness of students from the first cycle to the second. It is also proportional to the percentage of students' mastery learning.

Through cooperative learning, some perspectives, such as motivation, social perspective, the perspective of cognitive development and cognitive elaboration perspective can be explained. Motivation perspective means that the award given to the group allows each member of the group be willing to help each other. Thus, the success of every individual is essential for the group's success. This matter will encourage each member of the group to fight for the group's success.

This is according to the experts who stated that the role of teaching and learning activities both intrinsic and extrinsic motivation is needed. With the motivation, the students can develop activities and initiatives, direct and maintain diligence in learning activities [5].

The level of learning completeness at each meeting also increases in terms of learning outcomes. Based on the findings, the individual mastery of learning at the second cycle has increased compared to learning completeness individual at the first cycle. This increase is due to implementation of cooperative model strategies on the subjects of civic education in the sixth grade SDN Pelambuan 7 by using e-voting application. This is consistent with expert opinion that through cooperative learning strategies, learners are more accountable for learning, develop students' skills, improve learning outcomes and develop the ability to solve all the problems carefully and precisely. Accordingly, the simple e-voting application designed and used by the researchers is very relevant to learning process and learning results.

We need to realize that students are the main subjects in the knowledge discovery. They compile and build knowledge through a variety of experiences that allow the formation of knowledge. They have to undergo their own experiences, which in turn give the spark of thinking about specific knowledge. The most important thing in learning is that students need to master how to learn. Thus, they can become independent learners and find for themselves knowledge they need in life.

Cognitive structures are facts, concepts and generalizations that have been studied and remembered by the students. On the first level of learning, information can be communicated to students in the form of learning discovery that presents information in its final form, and the form of acceptance that learning requires students to find their own part or all of the material that will be taught. In the second level, students connect or associate the information into the knowledge they already owned, in this case meaningful learning happens. However, students can also just try to memorize new information, without connecting it to concepts that already exist in the cognitive structure; in this case, rote learning takes place.

IV. CONCLUSIONS

Based on the results of the classroom action research, it can be summarized and concluded as follows: (1) The application of the teaching media using simple e-voting can increase the activities and students' learning outcomes on Civic Education subject. At the end of the first cycle and the second cycle, the formative tests were given to assess the improvement of students' learning outcomes through the implementation of the teaching medium using simple e-voting application.

Subsequently, it can be concluded that the implementation of the teaching medium using simple e-voting application can improve learning outcomes and learning activities. The implementation of the teaching medium using the simple e-voting application can improve student learning outcomes through debriefing activities, discussions and group work.

In applying any teaching media, including the simple e-voting application, teachers must have the knowledge and ability to utilize the media, so any confusions during the application of the media does not occur. Moreover, learning activities are very important since the activities can create student involvement which isinstrumental in achieving the learning objectives and affect the learning outcomes as well. To avoid any other difficulties encountered in the implementation of any teaching media, making clear rules and providing more learning facilities are necessary to create meaningful and interesting learning experience.

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Students' Mathematical Thinking Ability in Solving Geometry Problems based on Cognitive Style

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***Abstract*—Students are expected to have higher order thinking skills, yet they were rarely given problems to practice those skills during the primary, junior high and senior high schools. In regard to solve the problems, everyone has different characteristics in compiling and processing information as well as experiences that they are owned, this is known as cognitive style. The purpose of this study was to determine students' mathematical thinking ability and the influence of cognitive style on mathematical thinking ability to solve geometry problems. This study employed descriptive method by involving 29 students who took geometry courses as the subjects. Mean score and linear regression analysis were used to analyze the research data. The results showed that students' mathematical thinking ability in solving geometry problems were in the qualification grade C^{+}and there was a significant influence of cognitive style on students' mathematical thinking ability.**

Keywords—Ccognitive style, Mathematical thinking

I. INTRODUCTION

Man is a creature of thought; therefore, there is not anyone who never experiences the stages of thinking. Thinking itself is processing information that has been received to respond or process something. In teaching and learning activities, students experience the process of thinking where the knowledge has been obtained will be more meaningful. Ibrahim and Nur [1] state that thinking is the ability to analyze, criticize, and reach conclusions based on inference or careful consideration. In addition, Marpaung [1] states that thinking is an activity that starts from finding information (from outside or student themselves), processing, storing and recalling information from students' memories. Based on some of these notions, thinking is a complex process in which the process begins with discovering, processing, and drawing conclusions.

The mathematics according to Johnson and Rising [2] is one of the subjects taught in formal education. Mathematics is taught gradually from concrete to abstract and continuously, so it needs special thinking skills termed mathematical thinking. Dewanto [3] states that the ability of high-level mathematical thinking is a capacity above the information provided. This ability is with a critical attitude to evaluate, has metacognitive awareness and has problem-solving skills. Stein and Lane [4] reveals that high-level mathematical thinking skills use complex, non-algorithmic thinking to solve an unpredictable problem and using different approaches to existing tasks or practice examples.

Based on some of the above statements, high-level mathematical thinking is one of the stages of thinking that cannot be separated from everyday life and each student is directed to have such a high-level thinking. As revealed by Dahlan [5], a high-level thinking example makes someone think critically when he/she gets data or information. This person will make the right and correct conclusions as well as see the contradiction, consistency or irregularities in the information.

In fact, practicing high-level mathematical thinking skills still becomes a problem. Students at the elementary, junior and senior high schools are rarely given the problems that train the high-level mathematical thinking skills. These students should have trained on the first semester for high-level mathematical thinking use.

Thompson [4] states that using Bloom's taxonomy is one of the alternatives used by lecturers to conduct an assessment of high-order thinking skills. Krathwohl [6] states that one of the indicators to measure the ability of high-level mathematical thinking includes the ability to analyze. Suherman and Kusumah [7] argue that analysis is an ability to break down or break a problem into smaller parts (components) and be able to understand the relationships between the parts.

With regard to solving problems, of course, each person has different characteristics, so have his/her own preferred way of composing what he sees, memorizes and thinks about. Thus, giving rise to ways of behaving, accepting, judging, thinking, and processing information from the problem becomes different too. Interpersonal differences in how to organize and process information and experiences are known as cognitive styles [8].

According to Slameto [8], cognitive style is an important variable that affects the choices of someone in the academic field, the continuation of academic development, how to learn and how to interact in the classroom. Its influence covers almost all human activities related to understanding, social functions and functions among people. One cognitive style that has been studied extensively is the so-called "Field independent" (FI) and "Field dependent" (FD). This cognitive style has been studied extensively. Desmita [9] states that the cognitive style of FD and FI is a type of cognitive style that reflects the way a person's analysis in interacting with his/her environment. Individuals with FD style tend to accept a pattern as a whole. They are difficult to focus on one aspect in one situation, or analyze patterns into different parts. In contrast, the individual with the FI style receives more separate parts of the overall pattern and analyzes the patterns into its components.

A student with FD cognitive style, finds difficulty in processing, but easily perceives when information is manipulated according to the context. He/she will be able to separate the stimuli in context, but his/her perceptions are weak when there is a change of context. Meanwhile, students with FI cognitive style tend to use internal factors as direction in processing information. They do the tasks in a row and feel efficient working on their own.

Slameto [8] also states that in certain subjects from various studies conducted showed that students with cognitive style FI prefer fields that require analytical skills such as mathematics, physics, biology, engineering and mechanical activities, while those who Cognitive-style FDs tend to choose areas that involve interpersonal relationships such as social sciences, persuasive activities, literature, and trade management.

As a result, the purpose of this research is to determine the students mathematical thinking ability in solving geometry problems based on cognitive style and to know the influence of cognitive style to students' mathematical thinking ability in solving geometry problems.

II. METHOD

The method used in this research was descriptive method. The subjects were the 1st semester students in Mathematics Education FKIP Universitas Lambung Mangkurat, 2016-2017 academic year in a number of 29 students. The data were collected through test. Data analysis technique for the test of the mathematical thinking ability and cognitive style in this study was descriptive statistic consisting of average, percentage and simple linear regression analysis.

III. RESULT AND DISCUSSION

The results of cognitive style test showed that there were 17 students or 58,62% in FD category and students who were on FI category were 12 students (41,38%). In the other words, more than 50% of the students of mathematics education program on geometry course had FD cognitive style. This is somewhat contrary to the opinion of (2010) that FI cognitive person prefers fields that require analytical skills such as mathematics, physics, biology, engineering and mechanical activities, whereas cognitive FD tend to choose areas that involve Interpersonal relationships such as social sciences, persuasive activities, literature, and trade management. This situation becomes a challenge for lecturers in the study program to provide motivation to students to continue to learn and practice to improve their ability.

Teachers can help more than 50% of students with FD cognitive style who tend to respond a global problem focused on the environment as a whole. This is because their perceptions are easily influenced by the environmental manipulation. This is done by utilizing a conducive campus environment and a representative reading room that will affect students to be better. The average score of students' mathematical thinking ability was 67,59 with C^+ grade. The distribution of qualification of the value of mathematics education students who took the geometry course can be seen in the following table.

TABLE I. DISTRIBUTION OF MATHEMATICAL THINKING ABILITY QUALIFICATION

No.	Qualification	Frequency (f)	Percentage (%)	Description
1	A	12	41,38	Pass
2	A-	0	0	Pass
3	B+	0	0	Pass
4	B	4	13,79	Pass
5	B-	0	0	Pass
6	C+	0	0	Pass
7	C	4	13,79	Pass
8	D+	2	6,90	Not Pass
9	D	5	17,24	Not Pass
10	E	2	6,90	Not Pass
Total		29	100,00	

Based on Table I above, there were 31,03% students who met the pass criteria with the mean that still has not reached 75% of the number of students. It appears that the mathematical thinking ability of the mathematics education students who took the geometry course is not satisfactory when it is viewed from the average and the criteria of students who passed. Students who took the geometry course on the early semester are not accustomed yet to solve different geometry problems with exercises. Another thing is it is possibly the geometry problems which were solved is the ability of analysis where based on opinions Bloom [10] it is one of the most abstract higher order thinking skills. Stein and Lane [4] reveal that high-level mathematical thinking capabilities use complex, non-algorithmic thinking to solve an unpredictable problem and use different approaches to existing tasks or exercise samples so that not all students are able to complete this type of problem.

The students mathematical thinking ability based on the cognitive style can be seen in Table II.

TABLE II. DISTRIBUTION QUALIFICATION OF STUDENTS MATHEMATICAL THINKING ABILITY BASED ON COGNITIVE STYLE

No	Qualification	Frequency (f)		Percentage (%)		Description
		FI	*FD*	*FI*	*FD*	
1	A	7	5	58,3	29,4	Pass
2	B	2	2	16,7	11,8	Pass
3	C	1	3	8,3	17,6	Pass
4	D+	2	0	16,7	0,0	Not Pass
5	D	0	5	0,0	29,4	Not Pass
6	E	0	2	0,0	11,8	Not Pass
Total		12	17	100,0	100,0	

Table II shows that 16% of students who have FI cognitive style did not fulfill the pass criterion while students who have cognitive style FD who did not meet pass criterion were 41,2%. This means that more than 75 % FI students have met the pass criterion, but FD students did not meet such this big percentage. This is in accordance with the opinion of Slameto [8] who states that in certain subjects from various studies conducted showed that students with FI cognitive style prefer fields that require analytical skills while those with FD cognitive-style tend to choose areas involving interpersonal relationships. Therefore, FI cognitive style students ability to think mathematically is better than FD cognitive style students.

To know the effect of cognitive style on students' mathematical thinking ability, the data were analyzed using SPSS software. The value of the relationship between the ability of mathematical thinking and cognitive style was 0,438. This value of the relationship indicated that the relationship between mathematical thinking ability and cognitive style is sufficient. The value of R square or determination value obtained that the percentage of the influence of independent variables (cognitive style) to the dependent variable (cognitive style) was 19,1%, while the rest was influenced by other variables. The regression model that can be used to predict the ability of mathematical thinking with cognitive style is Y = 41,879 + 2,958x.

IV. CONCLUSION AND SUGGESTION

Based on the results and discussion above, it can be concluded that students mathematics education mathematical thinking ability who took geometry course in the odd semester of 2016-2017 academic year is in qualification of C+ grade and there is significant effect between cognitive style and students mathematical ability.

Preferably in the process of studying, the lecturers of mathematics education department provide more analysis and cognitive style exercises as a consideration in maximizing the students thigher order thinking ability.

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Indonesian Language Skills through Somatic, Auditory, Visually, Intellectually Learning Model

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***Abstract*—The objective of this research is to explain the learning model using SAVI (Somatic, Auditory, Visually, Intellectually). It came from the underlying consideration that Curriculum 2013 brings up personal experience through observation activities (listening, seeing, reading, speaking), associating, asking, concluding, communicating, and presenting. Therefore, it is remarkably expected that the effectiveness of interaction, comprehension, and acquisition are to be made. Considering that matters, teachers are expected to make changes on learning paradigm. In that case, teachers should commit on the willingness to utilize recent effective learning models.**

Keywords—SAVI, Language Skills, Curriculum 2013

I. INTRODUCTION

A fun learning and generate maximum learning achievements happen when the teaching and learning activity has already adjusted between methods and appropriate learning models provided by the learners conditions so that in the implementation of teaching and learning activity students feel comfortable and not bored. SAVI learning is a learning which emphasizes that learning must utilize all five senses owned by the students. SAVI term itself stands for Somatic which means body movement where the learning was experiencing and doing; Auditory which means that learning must be through listening, focusing attention, speaking, presentations, argumentation, expressing opinions, and responding; Visually which means that learning must use eyes sense through observing, drawing, demonstrating, reading, using the media and props; and Intellectually means the learning must use the thinking skills, learning must use concentration of the mind and practice using it through reasoning of thought, investigating, identifying, finding, creating, constructing, problem solving, and implementing.

The problem that often occurs when learning Indonesian language is the wrong learning way. It can affect the number of students who still have learning difficulties that resulting not maximum achievement in learning Indonesian language. However, basically, Indonesian language which is taught aims to help and train the four Indonesian language skills namely listening, speaking, reading, and writing.

In the current learning pattern, children are required to be more active from mentors or educators. There are many factors that can affect it, one of which is confidence because in the world of education, especially for the students, self-confidence is the key to a successful and happy life. For instance, a student who is reserved and cannot express his/her feelings has a duty to give a presentation. Of course, for students who are passive, this is not an easy task, and it needs his/her own struggle to carry out this task. Apart from that, it means that without training on the four skills, there is a possibility on risk of failure or not doing optimal job. Physical movement increases mental processes. Parts of the human brain involved in movement of the body are located right next to a part of the brain used for thinking and problem solving. Therefore, blocking the movement of the body means blocking the mind to function optimally.

In SAVI approach, students are actively in learning such as experimenting, observing, and presenting the material they are getting. Then, the process is resolving the problem based on the knowledge or science that has been obtained by the students during the learning. Involvement in the study will interest students in learning. In addition, with the help of instructional media such as props and students worksheets as an intermediary for the transfer of materials, students can describe all the things so that they get better understanding on the material and get help on train their mindset to understand the concepts learned.

Curriculum 2013 emphasized the importance of the balance of competences attitudes, skills, and knowledge. This is in line with the language skills required through continual learning. It started from the improved knowledge of types, rules, and context of a text. Then, it is followed by the skills of presenting a written and oral text either planned or spontaneous, and lead to the formation of the attitude of modesty and precision of language and attitude award against Indonesian as the nation's cultural heritage.

Indonesia Curriculum 2013 has a structure similar to the structure of the curriculum of the countries all over the world. It was built through three main objectives, namely knowledge, skills and attitude development. Curriculum 2013 has a Core Competences (CC) and the Basic Competences (BC) which were built through a holistic curriculum concept. This holistic curriculum can be viewed through CC, BC, and indicators that give students access to learn holistically. The students learn to understand the concept (cognitive), practice to use appropriate language skills, and determine the attitude toward environment simultaneously through various types of texts learned (social process or genre). Curriculum 2013 is also recognized to play the vital role as a vehicle to express feelings and thoughts aesthetically and logically. In line with that role, learning Indonesian language presented in the book with a text-based both verbal and written by placing Indonesian is a vehicle to express feelings and thoughts. In the textbook, various ways of presenting feelings and thoughts in various types of text are described.

Textbooks are minimal effort the students must do to achieve the expected competencies. In accordance with the approach used in the Curriculum 2013, students are accustomed to seek other learning sources. Teachers are asked to increase and adjust the absorption of students with the availability of the activities of students' language. Teachers must enrich the teaching and learning with the creation in the form of other activities that are relevant and are sourced from the social environment, culture, and nature.

Textbooks in Curriculum 2013, in particular the Indonesian language subject, are text based designed. The learning approach activity-based learning is with learning steps in accordance to a scientific approach. In addition, the assessment of learning used authentic scoring. Understanding against type, rules, and context of a text are taught so that students catch the meaning contained in a text and present feelings and thoughts in a text form that is appropriate. Based on this background, the researchers conducted this research entitled "Development of Language Skills Through The effectiveness of the Model Somatic, Auditory, Visually, Intelectually (SAVI)".

II. Indonesian Language Learning in Schools

Education emphasizes systematic and rigorous control of the learning process to provide flexibility to learners to develop their learning strategies. Learning a language is essentially a learning to communicate. Therefore, learning the language is directed to improve the ability of students in communication, both verbal and written. This is relevant to the curriculum in 2004 that the competence of language learners targeted into four sub aspects, namely listening, speaking, reading, and writing [1].

One of the main objectives of language teaching is to prepare students to conduct meaningful interactions naturally. In order for the language interaction can be meaningful for students, language learning program needs to be designed in depth. It is the learning design program that relies on contextual, constructive, communicative, and integrative, and quantum based on the students basic competence. Indonesian language ability means Indonesian students skill in using it as communication tool [2]. Being good in language means skilful listening, speaking, reading, and writing in Indonesian language. To live with Indonesian language and literature means students have knowledge of Indonesian language and literature, and have a positive attitude toward language and literature Indonesia.

III. SAVI Learning Model (Somatic, Auditory, Visually, Intellectually)

SAVI learning is a learning which emphasizes that learning must take advantage of all the sensory organs possessed by students [3]. Learning is not automatically increased by having people stand and move here and over there. However, combining physical movement with intellectual activity and the use of all the senses can have a big impact on learning. The approach can be used is the SAVI approach. Learning to use SAVI is a learning approach that combines physical movement with intellectual activity with the use of all the senses that can have a big impact on learning [3].

SAVI learning approach lead to a concept called Activity Based Learning (BBA). Activity-based learning (BBA) means moving physically active when learning, by utilizing the senses as much as possible, and making the whole body and mind involved in the learning process [4]. Conventional learning tends to make people physically inactive in the long term. Learning can be optimal if the four characteristics of SAVI are in a learning event. For example, people will be able to learn a little bit by watching presentation (Visually), but they can learn much more if they can do something when a presentation is in progress (S), to talk about what they are learning (A), and think about how to apply the information in presentation to their work (I). In other words, the brain accepts the fact from senses then interpreted with related information. So, the facts can be interpreted from the merger of the information. In accordance to the SAVI stands for itself, then its characteristics are four parts:

(1) Somatic

It is associated with learning to move and doing. So Somatic is a learning that utilizes and involves the body.

(2) Auditory

This is learning to speak and hear. This can be interpreted in learning, teachers should encourage students to discuss what they are learning, translating their experience with sound, talking to them when solving problems, making the model, gathering information, or creating personal meanings.

(3)Visually

It is learning by observing and drawing. There are more devices in our brain for processing visual information than all the other senses.

(4) Intelectually

It is learning to solve problems and contemplate them. Students do activity/something with their minds internally when using intelligence to reflect an experience and create relationships, meaning, purpose, and value from the experience.

IV. Aspects of Language Skills

Aspects of language skills includes four of the following skills [5]:

(1) Listening skill

Listening is one type of language skills included as the receptive. Thus, listening is not only the skill to listen but also to understand the activities. There are two types of situations in listening, listening interactive situation and the situation in a non-interactive listening.

(2) Speaking skill

Speaking is one type of spoken language skills that is productive. Relatively with speaking skill, there are three types of situation namely interactive, semi-interactive and non-interactive.

(3) Reading skill

Reading is one type of diverse language skills that are receptive as well. Reading skill can be developed alone or separated from listening and speaking skills. However, to people who have literacy tradition that has evolved, reading skill is frequently developed by integrating reading skill with listening and speaking skills.

(4) Writing skill

Writing is one type of language skills that is productive. Writing can be claimed to be the most complicated language skill among other language skills. Writing is not only copying the words and sentences, but also developing and pouring thoughts in a structure of regular posts.

V. Curriculum 2013

The curriculum is an education device is the answer to the needs and challenges of society [7]. Semantically, the curriculum is always associated with learning activity. Conceptually, the curriculum is educational device which is a response to the needs and challenges of society.

The strategy for improving the effectiveness of learning in the Curriculum 2013 emphasizes personal experience through observation (focusing attention, seeing, reading, and listening), associating, asking, concluding, communicating, and making presentation. Thus, the effectiveness of the interaction, the effectiveness of the understanding, and the effectiveness of absorption are expected to be created. Basically, effective learning is the learning process which is not only focused on the outcomes of learners, but also to what an effective learning process capable of delivering behavior change and apply it in their lives [6] .

Curriculum 2013 is a replacement of Kurikulum Tingkat Satuan Pendidikan (KTSP), while according to [7] Curriculum 2013 is refinement and strengthening of KTSP. Thus, the Curriculum 2013 is the latest in the world of education in Indonesia after KTSP [8]. Curriculum is a device of the subjects taught at educational institutions. The curriculum is a plan drawn up to launch the process of learning under the guidance and responsibility of the school or educational institution and its staff faculty.

According to some sources above, it can be concluded that a curriculum at least contains of (a) the person in charge, (b) actors, (c) plans, (d) content, (e) means, (f) activities/ processes, and (g) guidelines. These components constitute a unity in teaching and learning, both inside and outside the classroom. The curriculum main components are syllabus and Lesson Plan. Syllabus is a framework element of educational courses presented in a logical rule. Components of syllabus includes: identity, core competency, indicator, learning materials, learning, assessment, allocation of time, and learning resources. Meanwhile, the Lesson Plan is an agenda related to teaching plan. Teaching plan is designed in accordance with the syllabus which refers to the content standards. Lesson plan components include: the identity of subjects, grade/semester, the main subject, the allocation of time, learning objectives, basic competency, learning materials, teaching methods, and learning resources. The syllabus and lesson plan are suited to the learning approach that will be used.

One aspect that was perfected in Curriculum 2013 is a graduate competency standard (SKL). SKL is the criterion regarding the qualifications of graduates capabilities that include attitudes, knowledge, and skills. SKL is the main reference for the development of content standards, process standards, assessment standards of education, educational standards and educational personnel, facilities and infrastructure standards, management standards, and financing standards. The scope of basic competence in Indonesian subject is divided into three, namely attitude domain, knowledge domain, and skill domain [4].

The attitude domain of the social aspects of Indonesian language is different for each class. KD focuses on honest character, caring, loving the homeland, the spirit of nationalism, democratic, creative, polite and confident when performing speaking activity both orally and written. Knowledge domain and skill domain in the Curriculum 2013 implemented is text based learning. Literacy competency is a core competency learning of Indonesian language to solve life problems using text as the primary means of communication.

VI. Learning Strategies in Textbook

Learning strategies should be aimed at facilitating the achievement competences which have been designed in curriculum documents so that every individual can become lifelong independent students. In turn, they become an essential component for realizing a learning society. To achieve the quality that has been designed in the curriculum document, learning activities need to use principle-centered learning, develop students' creativity, create pleasant and challenging condition, has charged ethics, aesthetics, and logic, as well as provide learning experiences that vary through the implementation of various strategies and methods of learning, fun, contextual, effective, efficient, and meaningful.

Curriculum 2013 adheres to the basic view that knowledge can not be moved away from the teacher to the students. Therefore, learning must regard to the opportunity given to students to construct knowledge in their thinking process [7]. The learning process happens internally on students. The process appears due to outside stimulus provided by the teacher, peers, environment, or due to curiosity. The learning process can occur as a combination of inner and outer stimuli. In the process of learning, teachers need to develop both stimuli on students. In the study, students were facilitated to engage actively in developing the potential itself into competence. Teachers provide learning experiences of students to perform a variety of activities that allow them to develop their potential to be applied competence in curriculum documents or more.

The Curriculum 2013 developed two modes of learning, namely direct and indirect process. Direct process is a process of education in which students develop the knowledge, thinking, and skills through direct interaction with learning resources designed in syllabus and lesson plans in the form of learning activities. In direct learning, students do activities to observe, ask, gather, associate and communicate what is already found in the analytical work. Meanwhile, indirect learning is the education process that occurs during the direct learning process but it is not designed directly in specific activities. Indirect learning associated to the development of values and attitudes. In the process of learning the Curriculum 2013, all activities that occur during learning in school and beyond in curricular and extracurricular activities there happen learning process to develop the moral and behavior associated with an attitude.

Either learning directly or indirectly, learning occurs in an integrated manner and not separated. Direct learning regarding to learning that concern with KD is developed from KI-3 and KI-4. Both of them are developed simultaneously in the learning process and become a platform to develop the KD-1 and KI-2. Indirect learning regarding to learning involving KD is developed from KI-1 and KI-2 [8].

In the learning practice of Indonesian language books, the students are given the priority to learn in groups, in pairs, and independent. Principally, learning in the classroom is only to convey basic knowledge and provide the foundations for the deepening of the material to carry out the task group, in pairs, and independent. Curriculum 2013 textbook encourages the use of a variety of learning resources which are references, objects and/or materials used for learning activities in the form of print and electronic media, speakers, as well as the physical environment, natural, and socio-cultural.

VII. Assessment in the Textbook

Scoring in textbook can be done using tests and non-tests in written and oral form, observation of performance, attitude measurement, assessment of the work in the form of assignments, projects and / or products, the use of portfolio and self-assessment [2]. Assessment is a series of activities to acquire, analyze, and interpret data about processes and student learning outcomes are carried out systematically and continuously, so it becomes meaningful information in decision making. Related to students learning in the process of teaching and learning Indonesian, assessment is done by:

(1) Assessing the exercises performed by students. Assessment of any kind of text into independent tasks can be done by the students in pairs to provide a circle/underline on the indicators that reflect desired aspects. This activity educates students to appreciate the work of friends and provide support for improvement efforts, and the teacher's task to check these pairs ratings to find out about the formation of attitudes, knowledge, and skills in each lesson type of text. Paired learning outcomes in terms of quality of the learning process and results as well as the cooperation of students are a major concern in assessment.

(2) Formative assessment and summative. Mid-term assessments can be done after the students learn some kind of texts. Summative scoring at the end of the first and second semesters is done after the students learn all types of text in the book. The form of tests is provided by teacher.

(3) Assessment of students learning progress are done by providing a statement of self-assessment as a means of preparing the syllabus.

(4) The reporting functionality of portfolio is to demonstrate mastery of the language and to provide learning which already or are in progress.

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The Development of the Assessment Instrument for Biography Text Learning

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Abstract— **Learning assessment instruments are tools used in the process of collecting, analyzing, and interpreting information regarding students 'ability in learning. Teacher assessment instruments which are used in assessing the ability of students of the biography text in SMAN 6 Banjarmasin include rubric assessment of knowledge and skills, performance, and daily quizzes. However, learning assessment instruments used are still insufficient. The specific objectives of this developmental research were (1) to describe the developed product in the form of assessment instrument for Biography text learning at tenth grade of high school, (2) to describe the trial results, and (3) to describe the revisions of the product. The research method used was research and development proposed by Borg and Gall, with some modification into four steps, namely: (1) analysis of needs, (2) the making of the initial product, (3) expert validation and field testing, and (4) the final product. The data were analyzed by using qualitative and quantitative data analysis techniques. The subjects involved in this research were assessment expert, education practitioners, and students. The results of this development research showed that the assessment instrument already met the aspect of validity, reliability, and practicality that assist teachers.**

Keywords—Development, The Assessment Instrument, Biography Text, Learning

I. INTRODUCTION

Biography text is a text that tells about a person's life written by someone. This text is one of the texts in the 2013 Curriculum being taught at tenth grade of high school. It is important to be taught since via text biography, students can analyze the character or the figure better in the biography text.

Biography text learning, as text-based curriculum in Indonesian context, is implemented in schools based on the 2013 curriculum, a current Indonesian curriculum [1]. Teacher teaches students ranging from the introduction of the structure to the characteristics of the language of the text. The learning objectives of the instruction carried out are based on the competences listed in the curriculum, ranging from Basic Competence 3.14, which is rating thing that can be followed from biography text to Basic Competence 4.15, which is compiling a biography text [1][2]. However, in practice, students do not fully follow the rules in accordance with the structure. When students are asked to learn in accordance with structure, they find it difficult to pour their thoughts. For example, they encounter problems when they are asked to retell the text content that has been read by using their own language and when they are asked to rewrite the text of the biography.

Assessment of learning is the process of collecting, analyzing, and interpreting information regarding students' ability in learning [3]. In a series of the process, a tool to measure the students' ability of so-called assessment instrument is required. Referring to such understanding, it can be concluded that learning assessment instruments are tools or set of tools that are used in the process of collecting, analyzing, and interpreting information regarding students' ability in learning [4][5][6].

The assessment instruments which are used in assessing students' ability of the biography text in SMAN 6 Banjarmasin include rubric assessment of knowledge and skills, performance, and daily quizzes. In practice, first, the teacher always gives an explanation to students before they do exercise and evaluation. On the implementation of performance and daily quizzes, the teacher always gives students a chance to ask if students have not yet understood the meaning of the given problem. However, the assessment instruments used are still insufficient since the assessment instructions are vague, the questions are unclear and the assessment criteria on the rubric assessment of knowledge and skills are not detailed. These weaknesses are found from interviews with teachers of Indonesian language, analysis of teachers' lesson plans, and analysis of student's book of Indonesian language class for tenth grade.

Learning assessment instruments that are used still have weaknesses, so the learning assessment instruments, which meet the requirements of a good learning assessment instruments, are needed in order that teachers are able to measure the ability of the students appropriately. Learning assessment instruments are needed in the form of a test and rubric capable of measuring students' ability appropriately. The learning assessment instruments definitely should be equipped with guidelines/manual of learning assessment instrument, so it is easily implemented by teachers and students [7]. The researchers focused on developing learning assessment instruments for biography text with the following Basic Competencies: 3.14. Rating things that can be followed from the text of the biographies, 3.15 Analyzing aspects of linguistic and semantic in a biography text, and 4.15 Compiling a biography text. This research was aimed at developing the assessment Instrument for biography text learning at tenth grade of high school, particularly at SMAN 6 Banjarmasin and describing the results of the product development.

II. METHOD

Due to the limited materials, place, and time to do the research, the researcher has done some modifications on the steps of the research based on the theory of Borg and Gall [8]. These modifications simplify the steps of research into four steps, namely: (1) analysis of needs, (2) the making of the initial product, (3) expert and field testing, and (4) the final product. These steps are described further in the section research and development procedures.

The research development procedures were based on four stages, namely needs analysis stage, the stage of manufacture of the product, the initial stage of experts testing and field trials, and the stage of the final product. The final product stage was the stage of the initial product revision which then produced the finished products [9].

First, the needs analysis phase was the first phase which was conducted by the researcher before making the initial product. Activities at this stage served to find the problems that exist in SMAN 6 Banjarmasin, and to find the solution of the problem. The needs analysis stage included four activities, namely: (1) conducting interviews with Indonesia language teachers; (2) conducting an analysis of the lesson plans used by Indonesian language teachers; (3) conducting an analysis of the textbooks used by the students; and (4) conducting studies of libraries by examining various sources, books on assessment of learning, books about Indonesian language learning for the 2013 curriculum, and books about the text of the biography.

The second stage was the initial stage of product manufacturing. At this stage, the researcher create product specifications which later developed into the early draft product based on a needs analysis. The specifications of this product covered aspects of validity, reliability, and practicality. After the initial product specifications were complete, the researcher developed it into the design of the product, and then the product designs were developed into earlier products. The initial product that has been finished was then validated by expert assessment and education practitioners.

The third stage was the product trial. The trials were divided into two, namely: expert validation and field trials. Expert validation was conducted by assessment test expert. Field trials were conducted by education practitioners and students. From the expert validation and field test, feedback was obtained in the form of numerical data (score) and verbal (suggestions) feedback used to undertake the revision of the product.

The fourth stage was the final product. The last stage was the revision phase which resulted in a finished product of assessment instrument for Biography text learning. At this stage, the researcher did a revision based on assessment and advice obtained from test results of expert validation and education practitioners. The researcher conducted a revision on the product based on the parts of the product which got suggestions of improvement.

The purpose of products trials was to know the validity, reliability, and practicality of the resulting product. The design of the product trials included: trial design, location, time, data types, data collection instruments, and data analysis techniques.

The first one was the design of the trial. The design of this trial was directed at students of class X from SMAN 6 Banjarmasin as the main target. Trials were carried out to an assessment expert, education practitioners, and students. Assessment from experts and practitioners of education served to assess the tests and assessment rubrics. The students as the main target were requested to do the test. After the students have finished working, they were asked to provide feedback of the test that has been given.

The second one was the location and time of trials. The expert validation was carried out in STKIP PGRI Banjarmasin. Product trials, for education practitioners and students, were conducted in SMAN 6 Banjarmasin. Time trials were adjusted with schedules of the expert, education practitioners, and the students.

The third one was the subjects of the trial. There were three subjects in this development research, namely: lecturer, teacher, and students. The test expert was a lecturer who is competent in the field of competency based assessment. The instruments given to the teacher are in the form of products and product eligibility assessment guidelines. Tenth grade students of SMAN 6 Banjarmasin as the main target in this research were asked to do the test. When they were finished working on the test, the students were given a questionnaire of practicability to assess the test that has been administered.

Fourth is the data type. Data on this developmental research is divided into two, namely: the qualitative data in the form of verbal data and quantitative data in the form of numerical data. The verbal data is a record of the results of the initial needs analysis and advice of expert assessment and education practitioners. Numerical data is obtained from the assessment of expert assessment, education practitioners, and students. This data will be used by researchers in doing the revisions of the product.

The fifth was data collection instrument. This development research used data collection instruments in the form of guidelines, a table of analysis, interviews and questionnaire form. Interview guidelines were addressed to teachers used in the needs analysis stage to obtain information about the activities of Basic Competency Assessment 3.14 Rating thing that can be followed from the text of the biographies, 3.15 Analyzing aspects of linguistic and semantic in a biography text, and 4.2 Compiling a biography text. Table analysis was used to analyze students' book and teachers' lesson plans. Questionnaire form was addressed to the expert assessment, education practitioners, and students used at the stage of products trials.

Sixth, the techniques of data analysis in this development research were divided in two, namely: qualitative and quantitative data analysis techniques. Qualitative data analysis techniques were used on the data from interviews with the Indonesian language teacher, analysis of lesson plans, analysis of student's book and suggestions from expert validation and product trials. Quantitative data analysis techniques were performed using the percentage formula of assessment instrument feasibility.

The collected data were subsequently interpreted. The interpretations were based on the following criteria [7].

TABLE I. CRITERIA OF THE DEVELOPED INSTRUMENT

TEST RESULTS			FOLLOW-UP
Categories	**Percentage**	**Qualification**	
4	85%-100%	Highly feasible	Implementation
3	75%-84%	feasible	Implementation
2	55%-74%	Pretty Decent	Revision
1	< 55%	Unfit	Revision

III. RESULTS AND DISCUSSION

Development results section contains (1) a description of the product, (2) trial results, and (3) the revision of the product. Further detail is presented as follows

A. Product Description

Based on a needs analysis through interviews, analysis of teacher's lesson plans, students' book analysis, the researcher made the assessment instrument consisting of three basic competencies that were equipped with the manual use of assessment instruments. These basic competencies include: 3.14 Rating thing that can be followed from the text of the biographies, 3.15 Analizing aspects of linguistic and semantic in a biography text, and 4.15 Compiling a biography text. The developed product included three aspects, namely: validity, reliability, and practicality.

The assessment instruments developed were in the form of test descriptions, practical test, and assessment rubrics. On Basic Competency 3.14, the test description and assessment rubrics were used. In this description, there are two test questions focusing on the understanding of the structure and the content of the biography text (orientation, events and issues, as well as reorientation) and the depiction of superior characters (the way of direct depictions, depictions through the action of the character, and depictions through the description from other characters). The description of rubric assessment test serves to assess the results of the work of the students in doing the test. The description of rubric assessment test included aspects that are assessed, signs of answers, maximum score, details of the score, and the score obtained.

On Basic Competence 3.15, descriptions test, practical test, and assessment rubrics were used. In this description, there were nine test questions focusing on the inferential understanding and evaluation understanding. On this particular test, there was a question focusing on understanding the reorganization (retelling the content of biography text). The description of rubric assessment and practical test serve to assess the results of the work of the students of both tests in analyzing aspects of linguistic and semantic in a biography text. The description of rubric assessment test included assessed aspects, signs of answers, maximum score, details of the score, and the score obtained. Rubric assessment practical tests include assessed aspects, descriptors, the maximum score, details of the score, and the score obtained.

B. The Results of Test Validity, Validity of Assessment Rubric, and Reliability of the Test

Expert validation was conducted to assess the validity of both description and practical test. The Basic Competence of description tests includes Basic Competences 3.14 and 3.15, while the Basic Competence of practical test included Basic Competences 3.15 and 4.15.

TABLE II. THE RESULTS OF THE VALIDITY OF DESCRIPTION TEST FOR THE BASIC COMPETENCE 3.14 RATE THING THAT CAN BE FOLLOWED FROM THE BIOGRAPHY TEXT

No	Criteria for the Assessment	Percentage (%)
1	The validity of the content	75
2	The validity of the contruction	75
Average		75

TABLE III. THE RESULTS OF THE VALIDITY OF DESCRIPTION TEST FOR THE BASIC COMPETENCE 3.15 ANALYZING ASPECTS OF LINGUISTIC AND SEMANTIC IN A BIOGRAPHY TEXT.

No	Criteria for the Assessment	Percentage (%)
1	The validity of the content	75
2	The validity of the contruction	75
Average		75

The average scores of validity assessment result from the expert on the test description for basic competence 3.14 and 3.15 were both 75% with the category proper to be implemented. The expert did not give feedback, so no revision was made.

Similarly, the average score of validity assessment result on the practical test for the basic competence 3.15 and 4.15 were also 75% with the category proper to be implemented.

TABLE IV. THE RESULTS OF THE TEST VALIDITY FOR THE BASIC COMPETENCE 3.15 ANALYZING ASPECTS OF LINGUISTIC AND SEMANTIC IN A BIOGRAPHY TEXT.

No	Criteria for the Assessment	Percentage (%)
1	The validity of the content	75
2	The validity of the contruction	75
Average		75

TABLE V. THE RESULTS OF THE VALIDITY OF THE PRACTICAL TEST FOR THE BASIC COMPETENCE 4.15 COMPOSING A BIOGRAPHY TEXT

No	Criteria for the Assessment	Percentage (%)
1	The validity of the content	75
2	The validity of the contruction	75
Average		75

TABLE VI. THE RESULTS OF ASSESSMENT RUBRIC VALIDITY FOR BASIC COMPETENCY 3.14, 3.15 AND 4.15

Compo-nents	Basic Competen-ces 3.14 Description test	Basic Competen-ces 3.15 Description test	Basic Competen -ces 3.15 Practical test	Basic Competen-ces 4.15 Practical test
The confor-mance between the aspects	75	75	90	75
The accuracy of the answer keys with the question	75	75	75	75
The descriptor with the task	75	75	75	75
Average	75	75	80	75

Based on the assessment of the expert, the result of the validity of the assessment rubric for Basic Competences 3.14 and 3.15 showed the average score of 75%, respectively. Furthermore, the average score for the validity of assessment rubric for practical test based on Basic Competence 3.15 was higher, namely 80%. The same average score (75%) as the previous competences was also found for the validity of the assessment rubric for Basic Competence 4.15. No further revision was made since the expert did not provide further feedback and all the categories for all average scores showed that the product could be implemented for product trials. In addition to the validity results, the reliability result of the test based on Basic Competence 3.14 was 0.887, based on Basic Competence 3.15 was 0.859, and based on Basic Competence 4.15 was 0.805. These data indicated that the reliability of the test for each basic competence was high.

C. The Results of the Test Practicality

For the practicality aspect of description test for Basic Competence 3.14, the assessment expert gave the average score of 75%, while the educational practioner gave the average score of 80%. Similarly, the average score of 75% was given by the assessment expert to the practicality aspect of description test for Basic Competence 3.15, and the average score of 80% was given by the practitioner on the same aspect.

TABLE VII. THE PRACTICALITY OF THE TEST

Validator	Basic Competen-ces 3.14 Description test	Basic Competen-ces 3.15 Description test	Basic Competen -ces 3.14 Practical test	Basic Competen-ces 3.15 Practical test
Expert	75%	75%	75%	75%
Practioner	80%	80%	80%	75%

D. The Results of the Practicality of Assessment Rubric

TABLE VIII. THE RESULTS OF THE PRACTICALITY OF ASSESSMENT RUBRIC

Compo - nents	Valida tor	Basic Compete ces 3.14 Descrip tion tes	Basic Compe tences 3.15 Descri ption test	Basic Compe tences 3.15 Practi cal test	Basic Competen s 4.15 Practi cal test
1	Expert	75	**75**	75	**75**
	Practio ner	90	**75**	80	**75**
2	Expert	75	**75**	75	**75**
	Practio ner	90	**75**	80	**75**
3	Expert	75	**75**	75	**75**
	Practio ner	90	**75**	80	**75**

Assessment experts and education practitioner also assessed the practicality of the assessment rubric of description test and practical test. Based on the results of expert's assessment, the practicality of the assessment rubric for description test based on Basic Competence 3.14 gained the average score of 75%. The educational practitioner gave higher average score to this aspect, namely 90%. Moreover, same average scores of 75% were given by the expert and the practitioner to the practicality of the assessment rubric for description test based on Basic Competence 3.15. The practicality of the assessment rubric for the practical test based on Basic Competence 3.15 gained the average score of 75% from the expert and 80% from the practitioner. Same average scores of 75% were subsequently given by the expert and the practitioner for the practicality of the assessment rubric for the practical test based on Basic Competence 4.15. Thus, with high average scores, the assessment rubric for each basic competence was stated proper to be used.

E. The Results of the Test Practicality from the Students

The students as the main targets and users in this research gave their feedback of the test which has been administered to them. Based on the assessment of the students on the practicality for description test based on Basic Competence 3.14, the average score was 80% and the students stated that the text and the test items were easy to understand. Subsequently, the average score of 78% was given to the practicality for description test based on Basic Competence 3.15. Besides providing assessment, the students also indicated that the test and the test items presented for this basic competence were easy to understand. For the practicality of practical test based on Basic Competence 3.15, the students' responses resulted in the average score of 82%. Similarly, the average score of 82% was obtained for the the practicality of practical test based on Basic Competence 4.15.

Table IX. THE RESULTS OF THE TEST PRACTICALITY FROM THE STUDENTS

Aspect	Basic Competen-ces 3.14 Description test	Basic Competen-ces 3.15 Description test	Basic Competen-ces 3.15 Practical test	Basic Competen-ces 4.15 Practical test
1	80	80	80	80
2	80	75	85	85
3	80	75	85	80
4	80	80	80	80
Average	80	78	82	82

F. Product Revision

Revision of the product was the stage in which the product was revised based on the assessments and feedback from the assessment expert, education practitioners and students. The aspects of the revision included aspects of the validity and practicality, while reliability aspect was not considered for the revision.

Based on the results of development, the instrument developed met the instrument development criteria that is feasible, based on the results of validity, reliability, and practicality of at least 75. This shows that the instrument can be used in learning. It is in line with the experts' opinion [7] that the instrument of the learning assessment must meet the requirements of a good learning assessment tool so that the teacher can accurately measure the students' ability.

IV. CONCLUSION

Based on the results of this development research, the assessment instrument already met the aspect of validity, reliability, and practicality. This indicates the instrument is feasible using in assessing students' ability in mastering lesson about biography text, analyzing the aspects of linguistic and semantic in a biography text, and compiling the text of biography.

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The Assesment of High Order Thinking Skills of Undergraduate Students in Biology Education Department

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***Abstract*—High order thinking skills include critical, logical, reflective, metacognitive, and creative thinking. They are activated when individuals encounter unfamiliar problems, uncertainties, questions, or dilemmas. Successful applications of the skills result in explanations, decisions, performances, and products that are valid within the context of available knowledge and experience and that promote continued growth in these and other intellectual skills. This research aimed to identify high order thinking skills of undergraduate students in Biology Education Department. This research was descriptive research (at the first academic year 2016/2017) in Biology Education Department, Universitas Lambung Mangkurat. This instrument was validated by expert judgment and tested toward 50 students. The results showed that the ability to analyze (C4), the ability to evaluate (C5), and the ability to create (C6) respectively were 31.81%, 69.88 %, 50.21 %. Overall the high-level thinking skills of students at Biology students is better.**

Keywords: assesment, high order thinking, undergraduate students, biology education

I. INTRODUCTION

Education is a conscious process to transfer knowledge, insight, and experience to develop intellectuality. Biology learning requires an active role of learners based on scientific processes and ways of thinking based on facts. According to the assumption from learners, Biology is the science of rote and unbeneficial for their life. Biology emphasizes more on teaching and learning activities. Science of Biology develops the concepts and skills of learners' process with various teaching methods that are appropriate with the study materials that have been taught.

Biology education is one of the study programs in the Faculty of Teacher and Education that has students with different backgrounds. The differences in the background of learners underlie the differences in each learner's level of thinking ability. High-level abilities are the highest cognitive processes that learners have through complex processes and learning processes in their school.

High-level thinking as the transfer process of a problem and the problem is sought by the solution using critical thinking [1]. The cognitive level of the taxonomy Bloom, namely; understanding (C2) and applying (C3), as well as higher order thinking at the level of analyzing (C4), evaluating (C5), and creating (C6) [2].

Implementation of the learning process in the achievement of high-order thinking skills is less encouraging. The design curriculum in Indonesia leads to the extent of the material, so learners are directed to completion of the material. Learners are only asked to remember and memorize the material. In addition, based on assessment system with low cognitive level tests the students have a separate problem for the development of high-level thinking ability, even the national exam is considered as a medium for measuring the success of learners in high-level thinking.

High order thinking skills include critical, logical, reflective, metacognitive, and creative thinking. They are activated when individuals encounter unfamiliar problems, uncertainties, questions, or dilemmas. Successful applications of the skills result in explanations, decisions, performances, and products that are valid in the contexts of knowledge and experience.

High order questions with rich questions are needed to improve logical reasoning and thinking students, especially in the classroom learning process. Learners will use the knowledge, understanding, skills they possess, and they will connect the problems they have with the new situation that arises.

The profile of learners' level of thinking can be known through the testing of learners in solving the problems presented. High Level Questions (HLQ) are essential in identifying students' level of thinking. Based on the background, this research aimed to measure high-order thinking skills.

II. METHOD

The research was descriptive in order to identify and describe the thinking ability of educational biology students. The approach used was a quantitative approach. This research only measured the ability of high-level thinking (cognitive).

The research was conducted in Biology Education, Faculty of Teacher Training and Education Universitas Lambung Mangkurat, for three months (January-March) in the second semester of 2016/2017.

The research subjects were students of Biology Education FKIP ULM from 2016 batch. The research instrument was objective test. This research yields the overall average of learner's ability, maximum score, and minimum score. The average calculation uses the following equation:

$$\mu = \frac{\Sigma x}{N} \quad (1)$$

Where are μ = average score, Σx = amount of score learners, and N = amount of learners

The data analysis of students' ability was done using Microsoft Excel program. The criteria were divided into five categories. The establishment of graduation standards or competency achievement standards was adapted from Tanwey [3]. Reference used is as follows.

TABLE I. CRITERIA FOR ACHIEVING COMPETENCY STANDARDS

No	Average Scores	Category
1.	$90\% \le x$	A (very high)
2.	$75\% \le x < 90\%$	B (high)
3.	$60\% \le x < 75\%$	C (medium)
4.	$40\% \le x < 60\%$	D (low)
5.	$x < 40\ \%$	E (very low)

III. RESULTS AND DISCUSSION

The assessment results showed that the thinking ability of Biology Education students from 2016 batch in the second semester of 2016/2017 was included in the low category. The average score of the ability can be seen in Table 2.

TABLE II. THE RESULTS OF BIOLOGY EDUCATION STUDENTS' ACHIEVEMENTS AND THEIR LEVEL

Cognitive Level	Percentage (%)	Category
C3 (application)	39.39	Low
C4 (analysis)	31.81	Low
C5 (evaluation)	69.88	Medium
C6 (synthesis)	50.21	Low
Average	**47.77**	Low

Based on Table 2, the percentage of students who have cognitive levels of C3, C4, and C6 in the low category, while the percentage of students who have cognitive level C5 was in the moderate category. The average percentage of all students was at low category. It is because the Biology students emphasize the process skills. Appropriate learning strategies for learners should be involved optimally (intellectually and emotionally).

Cognitive abilities at C5 level indicate that the students produce unique communication, produce a complete plan or activity, and produce a set of well abstract relationships, while the ability of applications, analysis, and evaluate are low, These results indicate the students do not have a high level of thinking ability.

Activities that use and familiarize the workings of the brain place its expertise that includes analysis, conclusion, and evaluation which are easy in enhancing high-order thinking skills [4].

Thinking skills are not only generated from college learning, but thinking skills start from the secondary school level and the relationships of the various fields of study. Other factors that cause low-level thinking ability are the learning process and repetition rate obtained from high school. Lessons learned in secondary schools have not led learners to high-level thinking targets. The teacher training exercises do not reflect the students' high-order thinking skills, the studenys are only given the ability to pass and complete the national exam questions.

Learning that supports high-thinking ability of learners is the replacement of learning patterns that provides the active participation of learners. Good Biology learning requires the development of science skills, the science process, and the attitudes of learners to science

IV. CONCLUSION AND SUGGESTION

The average percentage of students' high-order thinking ability reached 47.77%, included in the low category. The evaluation ability (C5) had a relatively high percentage, while the low ability was C4 (31.81%), C3 (39.39%), and C6 (50.21%), respectively.

Further research needs to conduct an interview on students, so that factors causing students' low level of thinking can be identified. In addition, the measurement of affective and psychomotor abilities of learners needs to be done. Advanced research should use subjective test instruments with open answers.

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Creating Innovation in Education by Using Value Analysis System

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***Abstract*—Human being are social creatures that cannot be separated from the other creatures. In their life, they are required to think because they will always socialize and interact with others. As a result, this will give an impact on the increasing needs and will also arise various problems as well as dynamics of a complex life either individually or in groups. To overcome this situation, a nation or country can be said to be developed if the citizens think actively, solve problem creatively, and find solutions innovatively. Therefore, creating innovation in education is very important because the quality of innovation can solve complex problems. One of the ways to create innovation in education is using value analysis system. This article was written with a qualitative approach on the study of theoretical analysis. The benefits of using the value analysis system are improving and changing aspects including Theology, Ethic, Aesthetics, Physical aspect, Logic, and Theolologic.**

Keywords—Education Innovation, Value Analysis System

I. INTRODUCTION

The era of globalization is one of the modernization developments characterized by an interdependence. Interdependence in this case is characterized by increasing sophisticated means of communication and interaction, which can rise the competition in ideological, political, economic, social and cultural aspects. It can also rise the dynamics and problems of life which are more complicated and complex. The era of globalization is often expressed as the era full of challenges and opportunities for cooperation. In facing the new world which is full of change and the dynamics, the situation today has brought variety of implications for many areas of life, including the demands and the development of communication and social interaction in a process of development of science and technology as the result of innovation.

In writing this article, a qualitative approach to the study of the theory of theoretical analysys was used. This article focuses on the study about *"Creating Education Innovations by Values System Analysis"*. Before proceeding into the study of Creating Education Innovations by values system analysis, characteristics of innovation and values system should be explored first. The characteristics of innovations explained by [1] are as follows:

- *Relative Advantage,* is the degree that an innovation is perceived as better or superior then ever existed. This can be measured by various factors such as economic, social prestige, comfort and satisfaction. The more relative advantage felt by adopters, the faster the innovation can be adopted.
- *Compatibility,* refers to the degree that an innovation is considered to be consistent by prevailing values, past experiences, and needs of adopters. For example, if a particular innovations or new ideas are not appropriate with the values and norms, the innovation cannot be adopted easily.
- *Complexity,* is the degree that an innovation is regarded as difficult to understand and use. Some specific innovations can be easily understood and used by adopters and some are otherwise. The more easier the innovation is understood by the adopters, the faster an innovation can be adopted.
- *Trialability,* is the degree that an innovation can be tested to certain extent. An innovation that can be tested in real settings will generally be quickly adopted. So, in order to rapidly adopted, an innovation must be able to express its superiority.

Subsequently, the innovative approaches which have life values system can be described, cognitively, within six systems of values:

(1) Theological value, which is reflected among other things in the Almighty God, Pillars of *Iman* (6) Pillars of Islam (5) Praying, monotheism, charity, forgiveness, prayer, sincere, repentance, *ijtihad*, *khusyu istikamah*, and *jihad fi sabililldh*.
(2) Value ethical-legal, which is reflected among other things in a respectful, kind/humble, loyal, trustworthy, honest, responsible, good faith, fair faithful, peace, patience, forgiveness, helpfulness, tolerance and harmony.
(3) Aesthetic value, which is reflected among others, in a state of nice, clean, beautiful, pretty, sweet, charming, harmonious, romantic, and love. Value logical-rational, which is reflected in logic/match between facts and conclusions, right, appropriate, clear, tangible, identity/characteristics, process, and conclusion match.
(4) Physical-physiological value which is reflected clearly in its elements, functions, size, strength, changes, location, origin, cause and effect.
(5) Teleological value which is reflected embodied in a useful, beneficial, according to the function,

developing/developed, regular/discipline, integrative, productive, effective, efficient, accountable, innovative [1].

II. Theoretical Basis

In Islam, human as individual and member of society has the rights to do, to act and to behave appropriately by volition of the will and freedom. However, human is also bound by the norms, values, regulation and law in society, even by the provisions of the applicable in religious beliefs [2]. This is what distinguishes humans as social beings with other creatures. Humans created by God as social beings who need social relationships and interactions with others to solve the problem. It means that humans can establish fraternity or brotherhood (*ukhuwah*) as one of the teachings that gets important attention in Islam.

From the description, human can be described as a social creature who has interdependence and mutual need and interact and work together to solve problems. The problem solving (solutions) should have wisdom as recent findings (innovation).

Innovation is a new invention that was discovered by an individual/or groups both in the form of services and goods which have use value and benefits for improving and changing to a better life than previous life.

Furthermore, education is a learning process based on the interaction between educators and learners for achieving certain objectives [3], so education is a process of various activities of the body and soul in effort to reach certain purposes through the process of thinking and creative as well as productive activities in solving problems. The effort should be made to find something that is useful and valuable (innovative).

The complexity is a complex issue that must be solved and sought as root of the problem and seek a solution in solving the problem. It is expected that educators and learners can be active thinker, creative, innovative and productive in finding a solution to the existing problems. Moreover, value system is the norm as a benchmark of an innovation that has a role and function for the adopters or users or for interested party so that it has benefits for the improvement and change either individually or in groups [1].

III. Discussion

All of the problems demand a solution by the humans because every human being is given the ability and physical and psychological strength. Humans can solve problems if they would think and use the skills they have. This case needs no motivation of forming human commitment and consistency in thinking in order to solve problems with effective and efficient solutions.

Motivation exists to form the commitment and consistency to be active and creative thinker. People can activate the five senses, namely sight, hearing, smelling, tasting and touching. The five senses as tools to transport the data and information that can be processed by the brain into a source of knowledge as a source or material innovation.

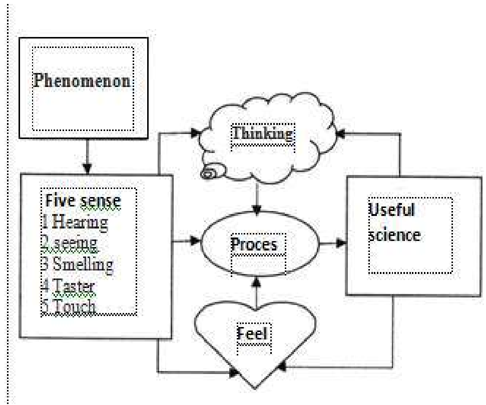

Fig. 1. Transferring the material senses innovation

To create an innovation with creative thinking in solving complex problems, the innovators must be able to think about (1) the advantage *(distinct)*, whether related to the effectiveness, efficiency, productivity, flexibility, relevance and continuity, or a goods or services that have been there *(Innovation).* (2) the norms or rules that are related with ethics *(attitude)* and aesthetic *(art)* which have been appointed by users or adopters of innovation in order to have relevance and benefits. (3) the level of complexity that an innovation should be easy, simple, practical, flexible, logical *(logic)* and can be adopted and developed. (4) the quality and excellence possessed by the results of innovation (5) concrete result of innovation which can be observed and perceived by the five senses so that the values and their benefits *(teleological)* can be felt.

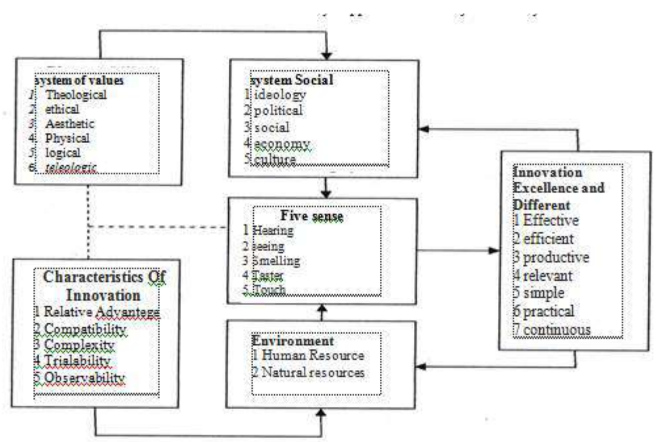

Fig. 2. Education Innovation by Approach of Values System Analysis

IV. Conclusion

Creating educational innovation in the complexity of the value system analysis is an activity of the role and functions of the five senses as sources or material to think actively, creatively and productively, so an innovation can be created that has value and benefits including effective values, efficient, productive, relevant, flexible, elastic, simple, practical, and continuous.

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The Analysis on the Quality of Test Items of the Summative Test

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***Abstract*—This study aimed to determine the quality of grains from the Final Exam of Junior High School, in Balangan Regency subjects Citizenship Education Year 2015/2016, which is indicated from the level of difficulty, discriminator index, and the effectiveness of the distractors. The subjects of the study were 200 students of junior high schools in Balangan Regency. The objects of the study were 50 summative tests items and the answer key. The data from documentation were analyzed by deploying the ANATES program version 4.1.0 to investigate the item difficulty, discriminator index, and the effectiveness of the distractors. The findings of the analysis revealed that: (1) based on the level of difficulty, there were 23 very easy items (46%), 11 easy items (22%), and 16 medium items (32%); (2) based on item discrimination, 21 items (42%) were categorized as poor discriminator, 16 items (32%) were categorized as fair discriminator, 11 items were categorized as good discriminator, and 2 items were categorized as very good discriminator; (3) based on the effectiveness of the distractor, functioned poorly was 12 items (24%), fair distractors are 16 items (32%), good distractors are 13 items (26%), and very good distractors are 9 points (18%).**

Keywords—Item Difficulty, Item Discriminator Index, Effectiveness Of The Distracters, Test Item

I. Introduction

Teachers as the main component in education are required to balance the development of science and technology in society. It is because teachers have an important role in shaping the intelligence of the community, in the educational environment. Education must create qualified human resources, both scientifically and mentally. Therefore, it takes teachers who are professional in educating students, who are superior and qualified. Professional teachers are teachers who have a number of competencies that can support their duties.

Law of the Republic of Indonesia Number 14 Year 2005 on Teachers and Lecturers article 10 paragraph 2 mentions that there are four competencies that must be owned by a teacher, one of which is the pedagogic competence obtained through professional education. In pedagogic competence, teachers are required to conduct learning evaluation activities. Evaluation requires teachers to measure and assess the level of achievement of a program that has been implemented. This is in accordance with the Regulation of the Minister of National Education No. 41 of 2007 on Process Standards stating that "Evaluation is done by educators on the learning outcomes to measure the level of achievement of competence learners, and it is used as the progress report of learning outcomes and to improve the learning process." In the learning process, evaluation is one of the important components and steps that must be taken by the teacher to assess the effectiveness of learning [1].

Evaluation as a value-setting process relates to the performance and work of learners [2]. Evaluation is a measurement and assessment activity. Assessment is carried out after measurement and measurement is the basis of the assessment [3]. Measurement is defined as the scoring of student learning outcomes. Assessment is a systematic activity in collecting information about the process and learning outcomes of learners in order to make decisions based on certain criteria and considerations [1]. An evaluation tool commonly used in teaching and learning is a test. The test is a way or procedure that needs to be taken in the framework of measurement and assessment in education [4]. The test is as a task or a series of tasks [5]. Furthermore, it is said that the task can be in the form of assignment tasks or commands that must be done by students, so the value obtained symbolizes the behavior or achievement of learning outcomes of learners.

School final exams is part of the evaluation that aims to measure and assess the competence of students, so teachers can determine whether the students can pass or not. Therefore the questions used should be quality questions. One attempt to develop test questions with good quality is to analyze the items. The item analysis is the process of collecting, summarizing and using information from the learner's answer to make decisions about each assessment [2]. The item analysis aims to identify good, fair, and poor questions [6].

The activity of analyzing the items is one of the "obligations of every teacher". It is considered an obligation because each teacher in the end must be able to provide information to the institution or to the students themselves about how far the mastery and the ability that has been achieved by students to the materials and skills about the subjects that have been given. Reality on the ground often indicates that the grades obtained by the students from the test results are still low. The low test results of the students are not only caused by the low ability of students to answer the problem, but also because of the low ability of teachers in doing evaluation and compile the test tool/evaluation tool.

Evaluation tools in the form of written tests should have the characteristics or requirements as a good evaluation tool, among which must meet the requirements of the level of difficulty, discriminating power, and effectiveness of the distractor. Therefore, analyzing the items should be a series of learning activities that can not be left behind. So far, analysis of the item is rarely done, especially about the School Final Exam made by the teacher. Therefore this research was very important to do. Thus, later it can be obtained the picture of how the quality of exam questions in Balangan Regency, especially for the subject of Pendidikan Kewarganegaraan (civic education) in Junior High School.

II. Methods

This research was an evaluation research, where the design and evaluation procedure in collecting and analyzing data are done systematically. This study aimed to determine the value or benefits of an educational practice. Evaluation in this research was conducted on civic education Final Test in state junior high school in Balangan Regency academic year 2015/2016.

Research subjects were junior high school students in Balangan Regency with a sample size of 200 people. The object of research was School Final Examination (UAS), which amounted to 50 questions, answer key, and answer examinees. Data were obtained by documentation technique and analyzed by computer to see level of difficulty, discrimination power, and effectiveness of distractor usage. The analysis of items with the computer is a quantitative item questionnaire with the calculations of computer programs [11]. This method was appropriately used because the calculation accuracy rate is higher than the manual processing with the calculator. In this research the computer program used was ANATES program version 4.1.0.

III. Result And Discussion

A. Result

1) Difficulty Level of Test Items

The difficulty level of the item is the opportunity to correctly answer a question at a certain level of learners' ability. The criteria to interprete the results of the item are as follows: 00.00 - 25.00 is very difficult category; 26.00 - 45.00 is a difficult category; 46.00 - 65.00 is included in the medium category, 66.00 - 85.00 is included in the easy category, and 86.00 - 100.00 is very easy.

TABLE I. Distribution of Test Items Based on the Difficulty Level

Numb	difficulty level	Number of Questions	Items	%
1	Very easy	23	1,3,4,7,8,13,15,16,21,25,26,33, 34,35,36,37,39,41,42,43,46,48, 49	46
2	Easy	11	2,5,6,11,17,18,19,22,23,28,38	22
3	Medium	16	9,10,12,14,20,24,27,29,30,31,3 2	32
4	Difficult	0	-	0
5	Very difficult	0	-	0

Based on the results of the analysis of the final examination of the State Junior High School in Balangan Regency The academic year of 2015/2016 subjects of civic education, from 50 items, which is very easy about 23 items (46%), 11 items are easy items (22%), and 16 items are medium categories (32%). Distribution of test items based on difficulty can be seen in the Table I.

2) Discriminating Power

Discriminating Power is the ability of the problem in differentiating smart students with students who are less smart. The interpretation of discriminating power is as follows: 00.00 - 20.00 is poor discriminator; 21.00 - 40.00 is included in fair discriminator; 41.00 - 70.00 is a good discriminator, and 71.00 - 100.00 is very good discriminator.

The analysis results of Civic Education final exam for State Junior High School, in Balangan Regency, the academic year 2015/2016 as follows: 21 items (42%) were categorized as poor discriminator, 16 items (32%) were categorized as fair discriminator, 11 items were categorized as good discriminator (22%), and 2 items were categorized as very good discriminator (4%). The distribution can be seen in the Table II.

TABLE II. Distribution of Items Based on Discriminating Power

No	Discriminating Power	Number of Questions	Items	%
1	Poor	22	1,3,8,13,15,16,17,21,2 5,26,29,31,33,34,36,39 ,41,42,43,46,48,49	44
2	Fair	16	4,6,7,11,14,18,19,22,2 3,24,27,30,35,37,38,44	32
3	Good	10	2,5,9,10,20,28,40,45,4 7,50	20
4	Very good	2	12,32	4

3) Effectiveness of Distractor Use

The effectiveness of the distractor works best when it is chosen by at least 5% of test takers [3]. A distractor not chosen by testee at all means that the distractor is poor, too conspicuous and misleading. On the other hand, as a distractor it has a great appeal to test takers who lack understanding of concepts or lack of material control. The indicators used to determine the effectiveness of the use of the distractor areas follows:

TABLE III. Criteria for Determining Effectiveness of Distractor Use

No	Distractors that Work	Criteria
1	0	Poor
2	1	Fair
3	2	Good
4	3	Very good

The results of the analysis by using Anates program version 4.1.0 shows that 12 items (24%) were poor distractors, 16 item (32%) were fair distractor, 13 item (26%) were good distractors, and 9 item (18%) were very good distractors.

Distribution of test items based on the effectiveness of the distractor use can be seen in Table IV.

TABLE IV. DISTRIBUTION OF TEST ITEMS BASED ON DISTRACTOR EFFECTIVENESS

No	Distractor Effectivenes s	Number of Questions	Items	%
1	Poor	12	1,11,16,29,37,40,41,42, 45,46,47,50	24
2	Fair	16	2,4,8,9,12,15,17,19,21,22,2 6,27,31,33,38,48	32
3	Good	13	3, 5,6,7,10,13,18,25, 30,34,36,43,44	26
4	Very Good	9	14,20,23,2428,32,35,39,49	18

B. Discussion

1) Level of Difficulty

The difficulty level of the item is the opportunity to correctly answer a question at a certain level of ability. Problem level is a matter of how difficult the degree of difficulty problems [1]. Furthermore, it is said that a matter is said to be good if it has a problem level that is proportional). So, the problem is not too easy or too difficult. In other words, a good question is a matter that has medium difficulty. This is understandable because if the problem is too easy, it does not stimulate students in solving problems. Conversely, if the problem is too difficult, it causes students not to have a passion in working on the problem because it is beyond the reach of students' abilities.

The results of the difficulty level analysis of the Final School Exam for junior high school in Balangan Regencyon the subject of Citizenship Education are 23 very easy items (46%), 11 easy items (22%), and 16 medium items (32%).

The test item is declared good if it has a level of difficulty in accordance with the purpose of the test [7]. For example, for the purposes of the semester exams, items with moderate difficulty are used, for selection items with high difficulty level are used, and for the purposes of diagnosis difficult items are used. The level of difficulty is related to the purpose of the test, and the items used for the semester exam should have a moderate level of difficulty [8].

If referring to some of the above opinions, that a good question is a matter that has a moderate degree of difficulty, then the final examination of State Junior High School in Balangan Regency for Civic Education showed that only 16 items (32%) that meet the criteria, while the rest items are easy and very easy.

Follow-up after the items were analyzed in terms of their difficulty are as follows [9]:

- Items that are categorized as good (medium difficulty level) can be directly recorded in the question bank.
- Categorized items are very difficult, there are three possible follow-up actions that can be done: (1) the items are discarded or dropped and are not released in the next learning result test; (2) researched, tracked and traced the cause of items difficult to answer by the testee. Afterwards it is done to make the item reusable in the learning result test; (3) the items are used in tests of very strict nature (selection tests) so that it can be stored in a question bank separately.
- There are also three possible follow-ups for items in the easy category: 1) the items are discarded or dropped and are no longer issued in the learning result test; (2) re-examined, traced to determine the factors that cause the item can be answered correctly by almost all the testees. Once known to be repaired, the item is to be re-issued to find out the level of difficulty of the item; (3) used in loose tests, in the sense that a large part of the testee pass in a selection test. Under these circumstances, it is wise if item items in the category are easily excluded in the selection test.

2) Discriminating Power

Discriminating power is the ability of a test item to distinguish between students who are high-ability and who are low-ability [6]. The higher the discriminator index of questions, then the problem is able to distinguish between students “who are smart” and “who are less smart”. This analysis is to examine the items with the aim to know the ability of the test item in distinguishing students who are categorized as capable with students who are classified as less capable [10]. In this case, if an item is given to a capable student, the outcome will show high achievement, and if given to a weak student, the outcome will be low.

The results of analysis using ANATES version 4.1.0. are as follows. Items classified as poor discriminator are 21 items (42%). Items belonging to fair discriminator are 16 items (32%). The items belonging to the good discriminator are 11 items (22%), and the items classified as very good discriminator power are 2 items (4%).

It is very important to know the discriminating power of the item [4]. One of the bases in compiling the test item of the learning result is the assumption that the ability of the testee with each other is different and the test result test item must be able to give test results that reflect differences in ability among testees.

A good item is an item that can distinguish clever students and students who are less clever. In this case, test items can be answered correctly by students who are clever. The problem is said to have no discriminating power if the matter is tested to high achieving students, and the result is low [10]. However, if given to children with weaker ability, the results are higher. Thus, a test item that does not have a discriminating power will not produce a result that matches the actual students’ ability. Therefore, if the problem does not have a good discriminating power, there will be peculiarities.

From the description, it can be said that the discriminator of School Final Exam for State Junior High School, Balangan Regency, 2015/2016 academic year, on Civic Education subjects, are 42% categorized as poor discriminator.

The follow-up after analyzing the test’ discriminating power are as follows [9]:

- Items that have a good discriminator are stored in question bank. These items can be reused during upcoming learning test.
- Items with a low discriminator can followed up by using two possibilities: (1) traced for later repair and then reused in future learning test in order to know if the discriminating powere is increased or not, (2) discarded.

- an item whose negative discriminating power should be discarded because of its low quality.

3) The effectiveness of the distractor use

Distractor analysis is conducted for multiple choice tests, which have answer options of 3 to 5 [8]. In multiple-choice question, there is one correct answer and some wrong answers or distractors. Arifin (2013: 279) states that a good item is the distractor chosen by the test participants evenly. Conversely, items that are poor distractors are not evenly selected. A distractor works well if the deceiver is at least selected by 5% of the test participants or more chosen by the lower group [6]. In this study, items are said to be good if at least one item has two good distractors.

The effectiveness of the distractors was analyzed by using ANATES version 4.1.0. Th results indicated that the poor distractors are 12 items (24%), fair distractors are 16 items (32%), good distractors are 13 items (26%), and very good distractors are 9 item (18%).

Follow-up after the distractor effectiveness analysis are as follows [3]:

- The distractors are accepted because they are good. This means that all distractors on the item have been selected 5% of the test participants.
- The distract is rewritten if it is not good. This means that the distractor has not performed its function properly (distractor chosen less than 5%).
- The distractors are rejected because they are not good. This means that the distractors are absolutely not selected by the test participants (0%).

Referring to the above opinion, it can be concluded that from the 50 items of the School Final Examination on Civic Education for junior high school in Balangan Regency, all of 12 items must be replaced.

4) Item Quality Based on Level of Difficulty, Discriminating Power and Effectiveness of Distractor Use

Determining the quality of the item is done by analyzing together the characteristics of the item assessment (difficulty level, discriminating power, and effectiveness of the distractor). The quality of the item is divided into three categories: good, fair, and poor. The criteria used are (1) The item is said to be good if the item meets at least two of the three criteria (difficulty level, discriminating power and effectiveness of distractor); (2) The item is said to be medium/fair if it meets only one of three criteria; (3) Item is said to be poor if it does not meet all criteria.

The analysis results of the School Final Exam on Civic Education for junior high school in Balangan Regency, 2015/2016 school year showed that good quality items are 12 items (24%), fair items are 18 items (36%), and poor items are 20 items (40%). Follow-up which should be done after knowing the quality of the items is as follows:

- Good quality items can be directly inserted into the question bank. So, it can be reused for future learning test.
- The items that are not good enough cannot enter the problem bank because they have not fulfilled the characteristics of the good question. In this case, the item can be fixed first according to the failure indicator.
- The poor items cannot enter the question bank and should be replaced with the new ones.

The item analysis provides the following benefits: (1) determining the defective or not properly functioning test items, (2) increasing the items' quality through the three components of analysis, namely level difficulty, discriminating power, and distractor, and (3) revising items that are not relevant to the taught material marked by the number of test takers who cannot answer a particular item [11].

IV. Conclusion

The analysis results of the final exam on Civic Education subject for junior high school in Balangan Regency academic year 2015/2016 showed that the test has 23 very easy items (46%), 11 easy items (22%), and 16 medium items (32%). The analysis results of the discriminator were that 21 items (42%) were categorized as poor discriminator, 16 items (32%) were categorized as fair discriminator, 11 items (22%) were categorized as good discriminator, and 2 items (4%) were categorized as very good discriminator. The results of the distractor effectiveness analysis showed that the distractors that functioned poorly were 12 items (24%), fair distractors were 16 items (32%), good distractors were 13 items (26%), and very good distractors were 9 items (18%). The results of a thorough analysis of the exam shows good quality items consisting of 12 items (24%), unfavorable items consisting of 18 items (36 %), and bad items consisting of 20 items (40%).

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Characteristics of School Examination Test of Biology Subject

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***Abstract*— The results of the analysis of a test is indispensable for making the policies that should be done by a teacher in improving the quality of teaching and learning. This study aimed to describe characteristics of the school examination for Biology subject in Banjar Regency in the year of 2014/2015. The quantitative analysis was based on modern test theory using software version MICROCAT Big steps 2.30 on the response of the students' answers to the tests made in the Department of Education and Ministry of Religious Affairs. The results showed that the tests made in the Ministry of Religion have suitability items with the model of Rasch and better quality than the tests made in the Department of Education. Both tests had a level of difficulty that was good, discriminating power which was unacceptable, and the distribution of response answers that was not good. Statistics showed that the reliability of items was preferential while the reliability of persons was weak. Moreover, it was still found the students who responded inconsistently.**

Keywords—Biology, Characteristic, Examination

I. INTRODUCTION

Curriculum, learning process, and assessment are very important three-dimensions in education and interrelated between each other [1]. Assessment can be used as a measuring tool for teachers and students in relation to the analysis of the success rate of the learning process [2]. The analysis is indispensable for the creation of policies that should be done by a teacher to improve the quality of teaching and learning process [3].

Data of assessment utilization results are very useful, not only for teachers but also for students, principals and education supervisors in order to improve the development of education in schools both in terms of planning, executing or implementing, assessment, monitoring, or determining the outcomes of education [4].

Learning achievement test is a test tool in education that at least provides four functions, namely to evaluate students, motivate and help students, provide feedback for teachers, and develop instruction [5]. The test which is not yet standardized will provide information about the students' ability that is bias and inaccurate so that the data obtained are still doubtful [6].

Multiple choice question is a kind of objective test that is most widely used by teachers [7]. This test consists of a question that refers to the matter subject (stem) and a set of two or more options that consist of possible answers from the statement. The best answer is an answer key (key) and the other is called by distractors [8]. This matter is very versatile type for use because it can measure a wide range of learning outcomes ranging from simple to complex, can be adapted to most types of subjects, is very easy to apply, and the majority of standard tests use this form [9].

Levels of cognitive complexity and depth of knowledge become important aspects in learning outcomes assessment standard because they are used at the level of matter in the blueprint for a summative test [10]. One of international studies regarding students' cognitive ability is TIMMS (Trends in Mathematics and Science Study) which states that the average percentage of correct answers in a question of understanding is always higher than the percentage of correct answers on the question of the application and reasoning [11]. This is not in accordance with science learning process that has characteristic of scientific process or scholarly work based on the ability to think and problem resolution [12].

Broadly speaking, the analysis of items is divided into two, namely the approach of classical test theory and item response theory. In classical test theory, level of difficulty and discriminating power largely determines the quality of items. However, the characteristics of the item which is resulted by classical test theory changes depending on the group of examinees [13] [14]. The analysis model of achievement test that is based on item response theory is more credible [15].

Item response theory is a theory of general statistics regarding the exam and test characteristics and how those characteristics attributed to the ability as measured by the questions in the test. The response of students to the item can be measured dichotomous and politomus [16]. If the data are scored in dichotomous, the use of Rasch models for tests analysis is very appropriate [17]. Rasch model application in the development of the test can be an excellent tool in evaluating performance because it can make a selection matter so well that the results are good and valid [18]. In addition, this model will produce an independent measurement [19].

Rasch models show the degree of difficulty on item response theory in an objective assessment. This model is able to prove the validity and can be used to replace the factor analysis on classical test theory and test for undimensional on the written test [20]. Analysis of this model can be done with the help of a computer program, one of which is a program Bigsteps and Winsteps [21][18][22]. Mathematically, the characteristic of function item in Rasch models expressed by Hambleton, Swaminathan, Rogers (1991), Fahmi (2011), and Ratnaningsih & Isfarudi (2013) in the following equation[16][23][24]:

$$P_i(\theta) = \text{with } i = 1, 2, ..., n \quad (1)$$

Information:

Pi (θ): Opportunities enabled participants answered correctly θ can answer correctly the first item.
θ: the level of ability of the test taker
bi: the difficulty level butirke-i
e: natural numbers whose value approaches 2,718
n: number of items in the test
D: constant-value of 1.7 as a standard deviation of distribution logistics

Opportunities for someone to answer an item correctly is a function of the ability of the participants and the level of difficulty of the grain. The value of b indicates a point on a scale of standard capabilities (0.1) where it is likely to give the correct response was 0.50 (meaning 50% chance to be able to answer the item correctly) [25]. Level of difficulty of items moves from - ∞ to + ∞. Nevertheless significant value typically moves on a scale of -3 to +3 in logit units (log odds units). Otherwise good grain is grain that has a difficulty level ranges from -2 up to +2 [16].

II. Methods

This research is non experimental quantitative research using descriptive methods implemented in Banjar district. The data source is the answer sheets of students on tests made in the Department of Education and Ministry of Religious Affairs of Banjar district. The population in this study were 557 students who gave the response on the school exam tests student on science subjects (Biology material) at the school year 2014/2015. The population consisted of 381 students response from junior high school and 176 students response of MTs. The students' answers were analyzed quantitatively using MICROCAT program Big steps 2:30 version.

The primary variable of this study was characteristic of Biology items used on school exams in Banjar district. Sub research variables are wright (map of persons and items), item (item fit, item measure, Ptbis, item option frequencies, quality), abilities' students (person fit, person measure), and a summary of the analysis.

III. Result and Discussion

A. Map of Wright (map of persons and items)

Based on the analysis of Big steps program, wright map obtained from tests made in the Department of Education and Ministry of Religious Affairs of Banjar regency is shown in Fig. 1.

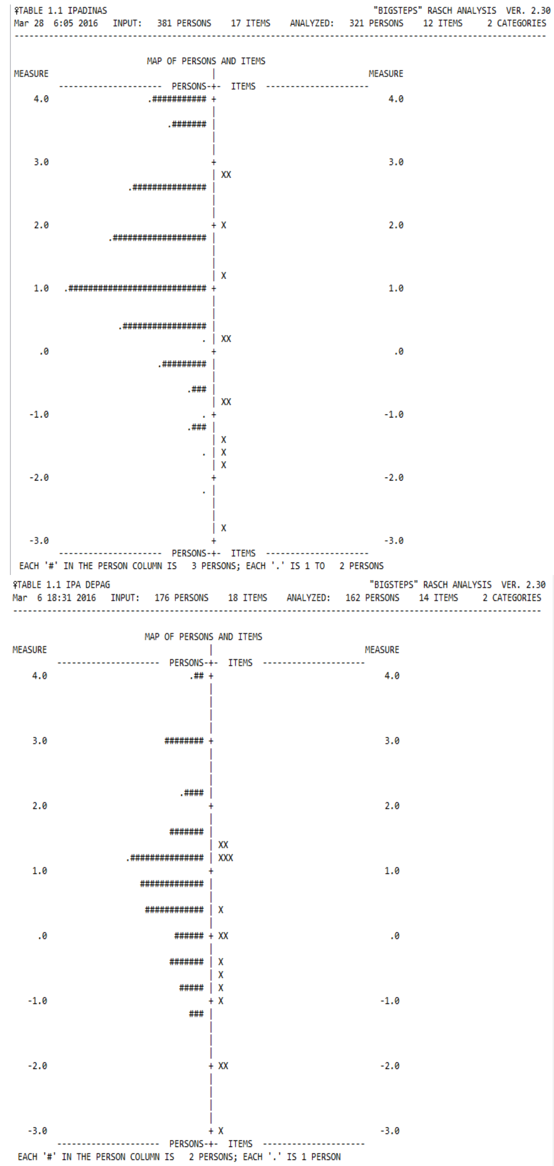

Fig. 1. Map of *Wright* Test made in Department of Education and Ministry of Religious Affairs in Banjar district

Fig. 1 shows a blank intervals (> 3 logit and> 2 logit) on the map of test items made in Department of Education and Ministry of Religious Affairs. In addition, there were the vacancy of person maps in the interval (-3 to -2) on tests made in the Ministry of Religion. Accordance with the opinion [32], it indicates that the tests made in the Department of Education and Ministry of Religious Affairs of Banjar district does not function optimally if it is imposed on students who have a high level of ability and tests made in the Ministry of Religion with a low difficulty level works less optimal. Therefore, tests are made by the Department of Education and Ministry of Religious Affairs of Banjar district cannot measure all students' abilities. Follow-up to do is that test developers need to add some points on the test that have a high difficulty level in order to fill the void interval and eliminate items that are less functional.

B. Items

Characteristics of test items made in Department of Education and Ministry of Religious Affairs of Banjar district can be seen in Table 1.

TABLE I. CHARACTERISTICS OF ITEMS

The Test Maker		D	K
Item fit	Amount	12	15
	Percentage	70.59	83.33
Item measure	High	2	-
	Moderate	9	13
	Low	1	2
Item Difficulty		-2.79-(2.88)	-5.41-(1.39)
Indeks of Discrimination		0.06-0.26	0.09-0.31
Distribution of the option	Good	4	8
	Not Good	8	7
Quality	Good	9	13
	Enough	3	2
	Not Good	5	3

a. *Source: Data Processing Result

Information:
D: Education Office of Banjar District
K: Ministry of Religious Affairs of Banjar District

Based on the results, the test items made in Education Office were not good while the test items made in Ministry of Religious Affairs were good, but equally not at 100% so that the two tests still have items that do not fit [26]. Based on the opinion [19], the items that do not fit show misconceptions about the items. Items that fit with the model mean the items function consistently with what is expected by the model [27]. Further research is needed on the causes of problems that do not fit according to the rules-writing and make repairsment before re-testing.

Based on the results, level of difficulty in the two tests was good even though they still found the questions that were very difficult and very easy [26]. The follow-ups to do by test developers are as follows: First, the items included in the medium difficulty level is included in the question bank and can be removed again in a test of learning outcomes in the future. Secondly, items which have a high degree of difficulty can be discarded, reexamined, and any time can be used in the tests, which were very tight as a selection test. Third, items with low difficulty level also have three possibilities, namely being discarded, reexamined, or can be used in the tests that are loose in the sense that most of the testee will pass in these tests[28].

The discriminating power of both tests had low values. Although [26] states that the value of the discriminating power is good [26] as it does not have a negative value, but according to [29], the discriminating power of the two tests was unacceptable because it had a value $\leq$0,40[29]. Follow-up to do is revise the item, put it forward again in the upcoming achievement test, and then analyze it again whether the discriminating power is increasing or not. The other follow-up is to dispose of the item.

In accordance with the results of [26], the distribution of answers from the both tests was not good. Follow up on the results of the analysis is that selection of answers that have been able to function properly can be used again on the upcoming tests, but those not functioning properly can be revised or replaced with other options [26]. This is accordance with what expressed by [26], that the questions whose the response distribution is unfavorable needs to be revised [29].

The percentage of question which is not good on the test made in Education Office and Ministry of Religious Affairs of Banjar district sequentially is 29.41% and 20%. The classification [30] and both the quality of the test were good [31].

C. Test Participant

Characteristics of testee on the exam 2014/2015 school year are presented in Table 2.

TABLE II. CHARACTERISTICS OF TESTEE

The Test Maker		D	K
Person fit	Amount	355	155
	Percentage	93.16	88.07
Person measure	High	89	30
	Moderate	200	107
	Low	92	30
Student Level		-2.24-(4.45)	-1.15-(3.78)

b. Source: Data Processing Result

Percentage of less than 100% indicates that there is still a testee who was inconsistent in answering the questions. Rasch modeling can detect their response patterns that do not fit, the mismatches answers given based on the ability compared to the ideal model [19]. The information of response pattern that does not fit can be known further by looking at schallogram. Through the matrix Guttman, the direct cause of the pattern of response is not appropriate. Further research is needed on the causes of students who have no appropriate response and the follow up is necessary on those students according to the results of causes analysis.

Testee capability is divided into low, medium, high, according to classification of [19]. Students who have the medium ability was more than those with the low and high ability. The average ability of the test taker in analysis results is different from the results of the estimation. This is because the results of the analysis only calculate a score which is not extreme, both minimum and maximum, whereas the data contained some test takers who have the maximum score.

D. Statistics Summary

Statistical summary of items and the test taker is presented in Table 3.

TABLE III. STATISTICS SUMMARY

The Test Maker		D	K
Item	Measure	1.24	0.86
	SEM	0.84	0.69
	INFIT MNSQ	1.00	1.00
	OUTFIT MNSQ	0.87	0.99
	Reliability	0.47	0.57
Testee	Measure	0.00	0.00
	SEM	0.18	0.20
	INFIT MNSQ	1.00	1.00
	OUTFIT MNSQ	0.87	0.99
	Reliability	0.99	0.97

c. Source: Data Processing Result

Statistics summary shows that the average ability of the test taker is higher than the level of difficulty of the questions. Reliability learners are weak while reliability is a special item. Moreover, it has good conditions for measurement [19],[32]. Thus, the test made in the Department of Education and Ministry of Religious Affairs of Banjar Regency has the testees' ability that is higher than the level of difficulty of the test were tested. Testees' answer consistency is not good although it has good conditions for measurement.

IV. CONCLUSION

Characteristics of the test at the school exam for Biology subject at Banjar district in 2014/2015 have match items with the Rasch model, have good difficulty levels, unacceptable discrminating power, and answer distribution which was not good. The quality test was pretty good, special test reliability was found, and reliability of the test participants was weak. Moreover, there were still students who responded inconsistently.

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Analysis of Students' Process Skills and Chemistry Learning Outcomes

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Abstract*—Generally, teachers have implemented certain learning model without considering how the students are accustomed to the learning model. They often face difficulties to reach learning objective, including process skills optimally. This research aimed to describe the students' process skills and learning outcomes after they are involved in chemistry learning by using gradual inquiry learning through the steps of direct instruction, guided inquiry and free inquiry. This research implemented pretest-posttest pre-experimental design in grade 11 of SMA Negeri 1 Martapura. The research data were collected by using test, questionnaire, and observation. The finding showed that students perform the development in their process skills as well as learning outcome significantly. Guided inquiry is the most recommended model as its greatest performance in achieving learning outcome. In addition, students have given a good response to the implementation of gradual inquiry model. According to this finding, to implement inquiry learning model which requires thinking ability and self-learning, we have to consider the students' learning habitude and their characteristics to ensure how the learning will be started by direct instruction, guided inquiry or even free inquiry.

Keywords*—Gradual Inquiry, Process Skills, Learning Outcomes, Student Response

I. Introduction

The 2013 Curriculum of Indonesia has been designed to train students various process skills, skills used by students to discover knowledge. The skills are reflected in the use of scientific approach that involves observing, questioning, exploring, associating knowledge and data acquired, and communicating activities the learning outcomes that constitute the part of process skills. Learning process with scientific approach aims to build the students' knowledge through a series of scientific activities based on fact or phenomena that can be explained with logic or certain reasoning.

Ausubel differentiated between learn to discover and learn to get. In learning to get, students just receive, so they just need to remember which in turn it can be easily forgotten. On the other hand, in learning to discover, concept is discovered by students by themselves. In discovering the concept, students associate new information with relevant concepts that is found in their cognitive structure so that the information can be meaningful and easily to recall [1].

Learning with a series of scientific activities will also give chance to students to develop their intellectual ability as the part of mental process, so students are not just pushed to master the knowledge, but they are encouraged to use their potential to acquire the knowledge. In the process of learning based on constructivism, students learn more by themselves and develop their creativity in acquiring a new understanding. Therefore, in order to enable students to use their potential optimally, their process skills should be developed. Involving process skills in learning can help students in learning science concepts [2], so that with the increasing of their process skills it is expected that their mastery of science concept also develops.

Process skills can be developed using inquiry learning. Inquiry-based learning can improve students' process skills significantly [3], [4] and [5]. Supporting the aforementioned finding, [6] report that correlation was found between inquiry learning and science process ability.

Gradual inquiry leaning model is learning model based on how much guidance or scaffolding is given by teacher gradually during learning. There are two inquiry steps, guided inquiry and free inquiry. In this research, before applying gradual inquiry, in the beginning step of the learning students used direct instruction strategy to train and accustom scientific activities in inventing knowledge. According to [7], how much guidance or scaffolding is given by teacher in the learning process really depends on the development level of students' intellectual. As learning strategy from direct instruction, guided inquiry to free inquiry draws the more decreasing of guidance or scaffolding.

Teacher's scaffoldings cause students to do and understand more things compared with the effect if students learn alone. It can help students to reach their zone of proximal development, so they can complete their learning assignments that should be finished. The scaffoldings can be hint, warn, stimulus, resolve problem to the learning steps, giving example or others to make students able to grow independently [1]. According to many researchers' findings [8], guided inquiry approach also provides more direction to students who may be poorly prepared to tackle inquiry problems without prompts and instruction because of lack of experience, knowledge, or because they have not reached the level of cognitive development required for abstract thought. The guidance provided by the instructor's questioning should provide that instruction and therefore lower student frustration levels while still maintaining a high level of intellectual challenge.

Many research conducts have been investigated to compare inquiry and non-inquiry approach such as [8], [9] with the separated students' group to investigate whether they are more effective than other in science learning. Conversely, this study implemented guidance level needed by the senior high school students while involving chemistry leaning process with inquiry model. This research showed the inquiry level applied subsequently. This research measured the learning outcome indicator and process skills as the effect of gradual inquiry learning process.

II. Method

Research design used in this study was One-Shot Case Study. The research samples were 30 students from class 11 of SMA Negeri 1 Martapura determined by cluster random sampling from other 6 intact classes.

This study was divided into three periods. At the first period, the students were taught using direct learning process. At the second period, the students were taught using guided inquiry, and at the third period, the students were taught using free inquiry with continuous learning materials starting from solubility and solubility product constant to colloid learning material.

Test was used to measure the students' learning outcome and process skills. There were also observation sheets to evaluate students' process skills, psychomotor skills, and affective aspect during learning. In addition, questionnaire was used to know the students' responses toward the implementation of learning model. All the instruments were evaluated in terms of its content validity by the experts. The whole questions had CVR score = 1 (bigger than CVR minimum score that is 0, 99) indicated that the whole questions were valid. The reliability of the chemistry test was on the high category (r = 0, 76).

The collection of data was assisted by two teachers as observers during the research. The collected data were then analyzed descriptively.

III. Results

Fig. 1 shows students' process skills after they were involved in inquiry learning process gradually. Students' skills tend to develop during involved learning process using guided inquiry model and tend to reduce during involved learning process using free inquiry model. The lowest students' process skill was defining variable operationally.

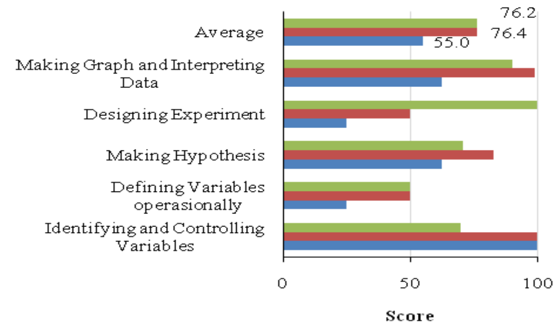

Fig. 1 Students' process skills during learning period to period; ■direct instruction; ■guided inquiry, ■free inquiry

Mean of the students' process skills during involved learning process was compared with final process skills shown on Table 1. The mean score of the students' skills during the learning process was 69.2 in good category, while the mean score of final test result was 75.2 in good category

TABLE I. Students' process skills during and After Learning Process

Process Skills	Score			Category
	Observation during learning (O)	Test (T)	Average (O,T)	
Identifying and controlling variables	90.0	89.0	89.5	Exellence
Defining variables operasionally	41.7	62.0	51.8	Poor
Making hypothesis	72.0	63.0	67.5	Moderate
Designing experiment	58.3	90.0	74.2	Good
Making graph/table and interpreting data	83.9	72.0	77.9	Good
Average	69.2	75.2	72.2	Good

Criteria:
80-100 = Exellence; 70-79 = good; 60-69 = moderate; 0-59 = poor

Fig. 2 shows the result of students' cognitive learning outcome in chemistry which includes solubility and solubility product constant to colloid concepts; the affective learning outcome which includes responding, valuing, organizing and characterizing; and the psychomotor learning outcome which includes indicators of using dropper drop, measuring cup and filter paper according to the laboratory activities that did them during the lesson

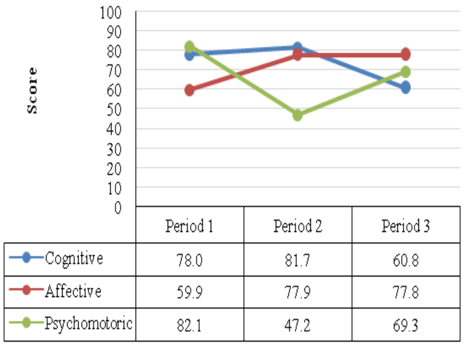

Fig.2 Students' learning outcome

Fig. 3 indicates that the majority of students, 82% responded positively to the application of this inquiry model gradually.

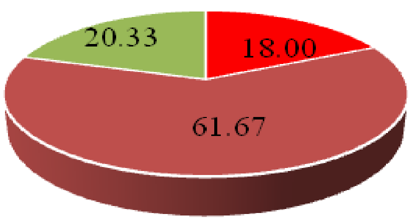

Fig. 3 Students' response to application of inquiry learning model gradually ■very positive; ■ positive, ■ moderate response

Fig. 4. shows that most of the students like to follow learning with free inquiry model, followed by guided inquiry and direct instruction. However, based on Fig. 5, the students' learning model most suitable for the chemistry learning is guided inquiry.

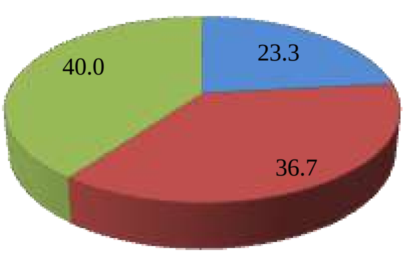

Fig. 4 Learning Model was preffered by students ■direct instruction; ■guided inquiry, ■free inquiry

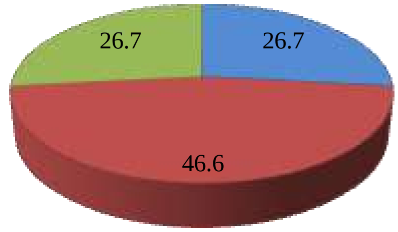

Fig. 5 Learning model was appropriate to chemistry learning ■derect instruction; ■guided inquiry, ■free inquiry

IV. DISCUSSION

A. *Process Skills*

Implementation of direct instruction model in the first learning period is intended to familiarize students in applying process skills to find concepts. The implementation of guided inquiry model has improved the students' process skill from the previous period i.e. learning with direct instruction model, then in the 3rd period study which was with the free inquiry learning model where their process skills were relatively stagnant. These results illustrate that students are still experiencing learning difficulties using free inquiry with minimal teacher roles to develop process skills. Free Inquiry requires student self-reliance.

The students' process skill is used to define variables operationally. This result is in line with the findings of [10] that process skill indicator that junior or senior high school students master poorly was to make hypotheses and operational definitions. The operational definition is a definition of the research variables that reflects how to measure the certain variable. Students' skill in defining variables operationally is indicated by their ability to define how to measure a variable when something about research is described. For example, in the case of process skill test [11], the variable of evaporation number can be defined operationally in various ways e.g. the time it takes for a certain amount of liquid to vaporize, the volume of liquid evaporating over a period of time, or the time of the liquid evaporating within a certain time.

Problem:

Thibo wanted to show his friend that the size of the container affects the vapor speed of water, when heated.

(1) He prepares a container of the same type of material, but with varies of size.

(2) Each container is filled with the same amount of water.

(3) Each container is heated for 30 minutes with the same amount heat

(4) Next he measured the amount of water left in the container.

How is the vaporization rate of water measured in this investigation?

A. By measuring the amount of water in each container after heating for 30 minutes.

B. By using different container sizes to boil water

C. By calculating the time it takes for water to boil on each container

D. By determining the difference between the initial and final water counts over a given time in the 30 minute range.

The scores of process skills, making definition variable operationally and designing experiment, which students acquire during learning, were lower than test scores. The scores were in contrast to other components in which the value of process skills were higher than the results of the process skill test (Table 1). On a written test of process skills, the choice of answers was available in the problem posed so that students did not need to define variables operationally themselves but simply to choose the right option. Meanwhile, according to Fig 1, the skill of designing experiment was the most successful when using direct instruction learning model. This case showed that procedural knowledge was difficult for students and required more detailed guidance and gradual training to master it.

Ref [12] found different results that students' learning outcomes and process skills using guided inquiry learning models were better than students who studied using the free inquiry model. This is because students learning using free inquiry models cannot adapt to learning with investigative activities without preparing them with a basic knowledge of investigation. Ref [13] explains if students are required to study like scientists, students must learn how to find. Inquiry learning requires some basic skills such as exploring information from various sources, discussing, and working in groups. Therefore, learning based on investigation or inquiry should be accustomed gradually consonant to students' cognitive development levels and skills. Many experts argue that inquiry instruction may not be the best approach for increasing science literacy, particularly for students who are not consonant to their cognitive development to meet the challenges it provides [14], [15].

If the students already had sufficient basic skills of inquiry, they would be able to conduct free inquiry even with more optimal results than guided inquiry. Free inquiry gives an opportunity to determine focus of problem to be studied and not limited to just what the teacher given. Ref [16] concluded that learning in a laboratory using free inquiry strategy improves student process skills more effectively than guided inquiry learning strategy.

In general, inquiry-based learning strategy has been proved able to prepare students' process skills. The students' process skills have increased after the students are engaging in inquiry-based learning activities. The greatest improvement are measuring skill, classifying/correlating skill and hypothesizing skill. The pretest and posttest scores for each indicator increased from 23 to 35, 27 to 40 and 13 to 30, respectively [5]. After the implementation of guided inquiry lab approach, students demonstrated a significant improvement in science literacy skills and process skills 4% and 2% greater gains, respectively compare to traditional labs curriculum [8].

B. Learning Outcomes

1) Cognitive

Fig. 2 present the students' cognitive learning outcomes after participating in direct instruction, namely 78 or good category. Their learning outcome after learning with guided inquiry was 82 or excellence, while after free inquiry decreased to 60 or medium category. This findings are in line with other studies that improvement in learning outcomes using inquiry learning is higher than using free inquiry models [17], [18].

Teacher's guidance to focus students on learning materials during direct instruction and guided inquiry resulted well-organized materials to be learned. It is hypothesized to help students to construct their knowledge and memories easily [19]. It caused their average score of cognitive learning outcomes after participated guided inquiry learning higher than their average score in free inquiry learning.

In free inquiry learning strategy, the students were expected to find and solve problems themselves. During this study, they faced difficulties to find the problems to be solved, so they were confused. Learning with guidance will be more effective than learning without guidance because the former can minimize students' tendency to get negative results as a result of misconception or incomplete knowledge [19]. Using similar strategies in junior high school students showed that cognitive learning outcomes in free inquiry strategy achieved the lowest average scores than in guided inquiry strategy or in expository strategy.

2) Psychomotor

The results showed that students were able to achieve the best psychomotor skills when the learning applied direct instruction model. In the first period, the teacher demonstrated laboratory skills to students before the experiment began, then students followed according to this instruction. It was proved able to reach students' psychomotor skills to excellence category. This achievement was higher than the next learning period, guided inquiry or free inquiry model.

At the second period of learning, guided inquiry learning, teacher reduced her guidance or scaffolding. The teacher no longer demonstrated experiments in front of the class, but only gave guidance to students through worksheet and monitored their learning activities. By teacher's guidance, the students tried to find chemistry concept of common ion effect in precipitation through experimenting. However, only some students were involved actively in laboratory experiment. Consequently, it caused students' psychomotor skills score decrease to 47 or poor category. The students' psychomotor skills during the second period of learning were lower than the previous period. These findings also prove that procedural knowledge requires direct instruction strategies for students to achieve optimal learning outcomes.

At the third period, the students were required to learn independently while the teacher acts as a facilitator in the classroom. Motivation and guidance from teachers were not or minimally given during the experiment. Students were asked to design experiments and gather information as much as possible from the handbook or the internet by discussing in their groups. Only two groups were ready with the gathered information to begin chemistry experiment while the others, four groups, only imitated their friends work and they did not know the treatment and chose to ask the teacher or friends in spite of seeking information from other sources. This proves that generally students are ready to learn independently although facilities for obtaining information such as chemistry books and Wi-Fi networks have been provided by schools. Nevertheless, through free inquiry learning all the students become more active and more motivated than the second period of learning so that the score of students' psychomotor skills achieved 69 or in moderate category.

The different finding has been reported that there was no difference in psychomotor learning outcomes between students taught with guided inquiry and those taught with free inquiry [18], and psychomotor achievement is higher in guided inquiry based learning than in free inquiry-based learning [21]. Ref [18} argue that laboratory skills of students will be seen if students are involved in experimental activity. Otherwise, if the students are passive, laboratory skills will decrease as well as their psychomotor learning outcomes. Providing guidance in the form of a more elaborate work procedure will minimize the decrease in psychomotor learning outcomes as it improves student activity during experimenting.

Students who have been trained of inquiry activities will have basic knowledge and skills to conduct investigation independently. When teacher's guidance is gradually reduced the students' ability to do inquiry activities will increase. Otherwise, when the teacher's guidance is reduced suddenly or not given at all, it will tend to give a negative results because students are not motivated to follow the learning activities due to their incomplete knowledge and skills. Ref. [22] suggested that students' learning motivation with the application of guided inquiry method is higher than free inquiry. It is in contrary with this research which found that students 'psychomotor learning outcomes during the experimental activities in free inquiry model is higher than guided inquiry.

3) Affective

Students' affective learning outcomes improved after a gradual inquiry learning model was applied. During application of direct instruction model, the students' affective learning result was the lowest of subsequent periods, achieving 60 or in moderate category. At the second period, guided inquiry learning, the students' attitude increased from the previous period. The learning model requires students to be more active in discussing with their group. By discussion students learn to defend and accommodate opinions of others. It is one of the factors that make affective scores increases from previous periods. The average score of affective learning outcomes at the second period was 78 or in good category. There was no significantly different in affective learning outcomes between learning chemistry using guided inquiry model and free inquiry model. The finding is supported by [23], that there was no significant difference in students' psychomotor as well as affective learning outcomes when they were taught using a guided inquiry and free inquiry learning strategy.

The inquiry learning model gives opportunity to students to develop conceptual understanding freely through inquiry activities in their group. Discussion activities in preparing or interpreting data as steps of investigation activities increase students' social interaction. Students who are active in the discussion have reached *the responding stage of affective domain* meanwhile students are required to organize (organizing level of affective domain) when they have difference opinions to the others. Therefore, by teacher's guidance or not, the students' affective learning outcomes tend to be a positive.

Ref. [24] concludes that learning with the application of guided inquiry method is more effective to improve students' cognitive, psychomotor and affective learning outcomes than experimental method. Inductive strategies in guided inquiry method can increase students' interest to follow the learning, while deductive strategy in experimental method can reduce their curiosity because experimental method is just to prove the known theory.

Popham in Ref. [25] explains that affective domain determines the students' success in learning. Someone who has no interest in a particular lesson will find it difficult to achieve learning outcome optimally and vice versa. This research indicates that as the students' affective learning outcomes increase, psychomotor learning outcomes, process skills, and students' cognitive learning outcomes also tend to increase. Other researcher [26] requires 2 years of research to prove that there is a change in student attitudes during the study and their procedural knowledge between free inquiry models and guided inquiry.

This gradual application of inquiry model leads to full involvement of students in learning process that may produce the expected instructional effects. In addition, during engaging students in learning process, they seem enthusiastic and interact intensively with other students as well as teacher. It may provide an affective domain achievement including social skills. Ref. [9] found that relative to non-inquiry laboratory activities, inquiry instruction seemed to promote significantly more student cohesiveness in the classroom. Students cited numerous examples of a supportive environment, in which peers helped each other to find solutions and reason through problems, and showed respect for others' opinions. Meanwhile in the non-inquiry laboratory students offer examples related more to dividing work assignments than in working as a collective and supportive team.

Most of the students responded positively to the lesson by using gradual inquiry model. The students preferred the application of free inquiry models to the others. This indicated that the students enjoyed the freedom of expressing themselves in learning. However, for those who have no independent learning habits, free inquiry strategy is less appropriate, especially to achieve the standard of learning outcomes.

Based on the learning outcome data and students' responses in this research, the most appropriate learning model is guided inquiry. The students tend to choose guided inquiry as a model that is considered suitable for chemistry learning. By guided inquiry, students still have opportunity to seek their own knowledge under teacher's supervision that helps them to elaborate chemistry concepts.

Students who are given some kinds of guidance act more skillfully during the task, are more successful in obtaining topical information from their investigational practices, and score higher on tests of learning outcomes administered after the inquiry. These benefits are largely independent of the specificity of the guidance: even though performance success tends to increase more when more specific guidance is available, learning activities and learning outcomes improve as much with specific and nonspecific types of guidance. The effectiveness of guidance applies equally to children, teenagers, and adolescents [27]. The students' inquiry skills were significantly improved after they participated in the series of the inquiry learning activities. The students made significant progress in identifying causal relationships, describing the reasoning process, and using data as evidence. They showed slight improvement in evaluating explanations. This findings also indicate that teacher's support and co-participation of more competent others have played a crucial role in students' achievement. Teachers have provided scaffolds through questioning, guiding, and modeling to support students' engagement of explanatory activities [28]. The findings of this research reveal that guided inquiry is the best strategy to facilitate senior high school students in chemistry learning. However, when the students have gained more experience in doing inquiry, they take more responsibilities for their own learning and teacher takes more role of facilitator.

V. CONCLUSION

The implementation of gradually inquiry model has achieved students' process skills as well as learning outcomes (understanding chemistry concept, affective and psychomotor skills) significantly. Students have given good responses to the implementation of gradually inquiry model. According to the research findings, guided inquiry is the most recommended model due to its greatest performance in achieving learning outcome. Inquiry learning should be applied gradually from full guidance to minimum guidance or free guidance in accordance with students' readiness.

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English Tenses and Conventions in Research Report Writing

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***Abstract*—Appropriate use of English tenses and conventions is a must for students who write their thesis in English. It is imperative whether they are aware of the appropriateness to translate their research activities into a written form that conform to the expectations of scientific and academic community. A survey was conducted to 65 out of a population of 124 students of the English Education Study Program of Universitas Palangka Raya who were writing the draft of their research report. The survey was done to obtain data on the use of English tenses and conventions in the Introduction part of their thesis research report writing. The results showed that the inappropriateness of the use of English tenses and conventions occurred due to the lack of understanding on the appropriate use of the English tenses and conventions in the Introduction Part. They used incorrect tenses in stating the arguments and in quoting previous research results. They did not provide a clear setting to move from the general area toward more specific topic of the research. They could not differentiate report-oriented style from research-oriented style in communicating the information about their research.**

Keywords—English Tenses and Conventions, Report Writing

I. INTRODUCTION

Writing a thesis or research report is a must for undergraduate students of English Education Study Program at Universitas Palangka Raya, Central Kalimantan, Indonesia. Thesis writing is a compulsory requirement to get a predicate of a *Sarjana Pendidikan Bahasa Inggris (*Bachelor of English Education*)*. Besides, students are also required to write a research report for certain courses along with their academic activities. Regarding the demands of research report writing, the students are expected to have the ability in writing appropriate research report in English. The ability includes using appropriate tenses to state the activities whether they will be done in the future or they have been done in the past; understanding the conventions in report writing structure; and choosing the appropriate writing styles. Due to the different nature of Bahasa Indonesia and English, the students should be able to switch their thinking and mindset of the way of writing the research reports in English. Although there are quite similar research writing conventions, the students are probably missing to set the ground of the research even in the Introduction Part of the report in English.

Writing a research report in English can be potentially problematic for the majority of students of English Education Study Program of Universitas Palangka Raya. The confusion of using appropriate English tenses and conventions were found due to the interferences of students' first language. In English, certain kinds of tenses have to be used for certain occasions and time lapse of activities [1]. Such problem becomes bigger since they just translate all the research activities from their first language into English in which both languages are quite distinctive in syntactical structures and conventions. To avoid misleading understanding, they should be able to think in English rather than thinking in Bahasa Indonesia and then translating it into English. Such problem influences the structure in the research report writing in English.

Tenses play a very important role in English. Tenses are included in language components of structure and determined the time when the action is done by the agent in the sentence [1][2]. In research report writing, tenses indicate the time when the research activities are carried out. It is very essential to use appropriate tenses based on the information delivered to readers in order to avoid confusion of the activities done in the research. In Introduction Part of research report, the dominant employed tenses are simple present tense and present perfect tense to state the background of the research.

Based on the handouts of the University of Melbourne (2012) and the University of North Carolina (2014), in Introduction Part present tense is used to introduce and explain the topic of research to set the research background, and present perfect tense is used to describe and to relate the phenomenon occured in the topic. The understanding of those will determine whether the Introduction Part provides reasonable ground for the readers to read further. The lack of undestanding on this field will lead the students' writing become misleading since the Introduction Part should include some stages to maintain clarity of information for the readers [3]. Moreover, the information can be assumed unclear when it is not presented properly. The combination of these problems reflects the inappropriateness of the Introduction Part of students' report writing that needs to be overcome.

The ability to write up the results of research in the form of thesis is a key to success of university students. This statement has long been put forward by [4] who state that writing up the research results is to report to the scholarly community all what have been done in conducting the research. The Introduction Part of the report, besides using particular tenses, also applies specific rules or conventions to be set up. The mastery of the language convention in English plays an important role. By mastering the language convention, they are able to translate their research activities into written form that conform to the expectations of the English-speaking scientific or academic community. The English language conventions involve matching linguistic forms to rhetorical purposes, which means conforming the grammatical structures which are "specific" in terms of scientific writing. Potential grammatical structures to be problems in research writing include misuse of verbs, dictions, articles, prepositions, and particles [5].

Five stages of sequenced information which are typical conventions in the Introduction part in writing a research report [6][7][8][9]. The first stage is stating the general statement(s) about the topic of research to provide readers with a *setting* for the problem to be reported. In the second stage, more specific statements are stated in brief about the aspects of the problem *already studied* by previous researchers. The *need for more investigation* is then stated in the third stage; followed by the fourth stage of specifying the *purpose or objectives* of the study. In the last stage of the Introduction, there are optional statement(s) about the *value or justification* for carrying out the study.

Using appropriate tenses and standardized conventions in writing an English research report is a must for those who want to convey the information to the readers of research being done. Since the task is writing in English, the writers of the research report follow tenses for certain part of report and conventions to make the infomation be precisely caught by the target audience. In presenting the information, the conventions can interfere the style of writing [10]. He explains that the conventions convey the discourse of information and they should be communal. It is very possible that conventions in writing can emerge as the style of a writer or it can be attached whenever the writers of the research report write another report (or it can be conducted under the requirements of publication). The conventions which give the writers way to avoid the errors occur when writing a research report should be under the writers' consideration. The classic errors that should be avoided when following the conventions are described by [11], such as: unobvious subject or object, excessive prepositonal phrases, judgemental adjectives, and the expression of belief. The need of correct quoting activities can be included in the case of expression of belief and the way of making quotations is under the consideration.

The researchers view that it is important to consider the effects of misusing the English tenses and conventions in the Introduction Part in writing a research report. It is considerable to have the Introduction Part as the writing sample, since it is the first part of a research report and is frequently viewed as the important part to continue to read and to shape the following parts of a research report. If the understanding can be gained in the first part, it will be easier to use appropriate tenses, conventions, and writing styles for writing the following parts or chapters.

The existing research is designed to reveal the reasons why the students have misunderstanding in the use of the above rules. The student's way of thinking and writing will be the main source of data to provide general view of how to write an English research report. Based on the reasons above, the researchers are eager to design and conduct a survey research to map the students' perception in using appropriate English tenses and conventions. Therefore, the objective of the research is to investigate and analyze the students' perception on the use of English tenses and conventions on the Introduction Part in research report writing.

II. METHOD

The research was conducted in a survey research design to picture the students' opinions or perceptions as the main source of data toward the topic under the research. The research approach used was qualitative approach in which the analysis and conclusion were drawn qualitatively and quantatively.

The subjects involved in this research were the students of the English Education Study Program of Universitas Palangka Raya, Central Kalimantan, Indonesia who were taking the course of Scientific Writing and who have submitted their research report drafts. The total research subjects were 65 students out of 124 students. They were mostly students of the sixth semester who have previously taken Structure and Writing courses.

The procedure of data collection done is presented as follows:

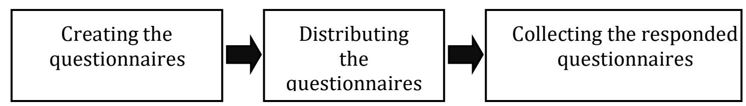

Fig. 1. The Procedures of Data Collection

Sixty-five open-ended questions were distributed to the students who became the research subjects. The questionnaire was constructed based on the theories proposed by [6][7][8][9] the five stages of writing a research report in English, which consisted of 16 statements. In the questionnaire, statements 1 and 2 asked the difficulties in following the 5 stages and language conventions in research report writing. Statements 3, 4, and 5 pictured the problems in writing research setting (stage 1). The following statement 6 was about the difficulties in writing the more specific concept or topic already studied (stage 2). The difficulties in citing or quoting were asked in statements 7, 8, 9. and 10. Statements 11 and 12 asked the difficulties in writing the need for more information (stage 3). Difficulties in writing specific objectives (stage 4) were stated in statements 13, 14, 15 and 16. The last two statements 17 and 18 asked the difficulties in writing research justification and using modal verbs.

The questionnaire was constructed in Bahasa Indonesia to make the students easier to give their responses. Regarding the issue of ethics in research, the questionnaire returned by the students remained no name, as it was also done to avoid bias in the process of analyzing the questionnaires.

The researchers employed the model of qualitative data analysis based on [12] to analyze the data, i.e. the students' responses on the questionnaire. The model of the data analysis procedure of the research is presented as follows:

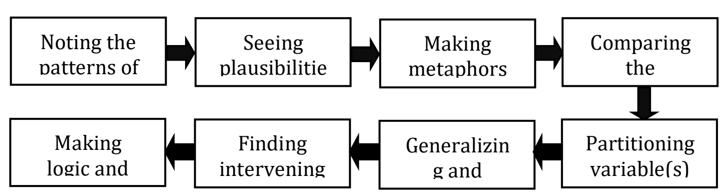

Fig. 2. Data Analysis Procedure

Firstly, the trends of the students' responses were pictured. Secondly, all of the students' responses on the questionnaires were read to see some plausibilities, then some criteria based on the information obtained from all responses were created and counted to make the comparison and to see variables existing among the responses. After partitioning variables, the generalization of the responses was made. Then, the generalization of data was compared to the existing intervening variables to meet the research conclusion. Firstly, the trends of the students' responses were pictured. Secondly, all of the students' responses on the questionnaires were read to see some plausibilities, then some criteria based on the information obtained from all responses were created and counted to make the comparison and to see variables existing among the responses. After partitioning variables, the generalization of the responses was made. Then, the generalization of data was compared to the existing intervening variables to meet the research conclusion.

III. Result and Discussion

After analyzing and calculating the responses, some information were obtained as the research findings referring to the statements in the questionnaire. They are summarized as follows:

TABLE I. QUESTIONNAIRE ANALYSIS

Statement	Total Response			Percentage		
	Yes	***Doubtful***	***No***	***Yes***	***Doubtful***	***No***
Difficult to:						
follow 5 stages in research report writing in English	25	25	15	38	38	24
follow language convention in research report writing in English	35	25	5	54	38	8
understand how to write *research setting (* stage 1)	10	25	30	16	38	46
relate *research setting* with general idea	9	31	25	14	48	38
use appropriate tenses in stage 1	11	24	30	17	37	46
write *more specific concept or topic already studied* (stage 2)	22	28	15	34	42	24
quote using *weak author prominence*	20	20	25	31	31	38
quote using *information prominence*	20	21	24	31	32	37
quote using *author prominence*	16	25	24	25	38	37
use appropriate tenses in quoting previous studies	9	34	22	14	52	34
relate *the need for more information* with the present study (stage 3)	26	20	19	40	31	29
use appropriate tenses in stage 3	14	27	24	22	41	37
relate *specific objectives* (stage 4) with research statement or problem	25	15	25	38	24	38
write stage 4 using *statement sentences*	15	20	30	23	31	46
write stage 4 using *question sentences*	15	25	25	24	38	38
write stage 4 using *appropriate tenses*	15	30	20	23	46	31
write *justification* (stage 5) of the importance of the present study	13	26	26	20	40	40
write stage 5 using appropriate *modal verbs*	11	27	27	18	41	41

Based on the results displayed in Table 1, it can be stated that most of the subjects found problems in writing the Introduction Part. The total number of students who answered "Yes" and "Doubtful" was higher than those confidently answered "No" on the difficulties of writing research report in English. Since the total number of "Yes" and "Doubtful" responses was dominant among the answers, it can be concluded that the students mostly failed to write appropriate Introduction Part of a Research report in English. The main problems emerged were the misuse of tenses, unclear background setting, incorrect quoting, and inappropriate way of communicating the information. These findings provide the chances for the researchers to find out the reasons behind their problems. Because of the needs to look for the reasons, the students' responses above need to be patterned.

Further analysis was conducted to capture the patterns as the information of the source of difficulties (problems). Then, the activities of comparing and clustering were aimed at finding the reasons underlining the the subjects' responses. After finishing further analysis of the questionnaires, the researchers wrote down the patterns mostly pictured based on the responses given. Besides, the plausibilities of the responses were at the same time considered. Finally, the patterns were clustered according to the sources of problems in writing the Introduction Part of an English research report. The patterns are noted as in the following figure:

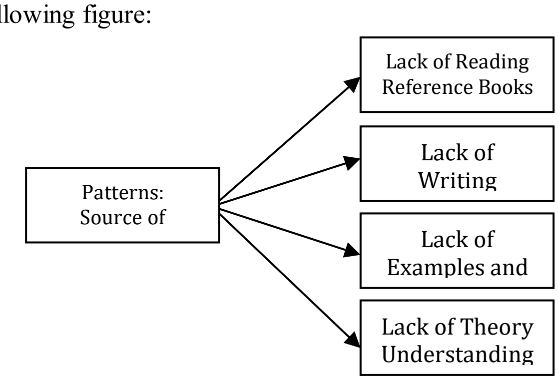

Fig. 3. The Patterns and Clusters of Students' Responses in the Questionnaire

Based on the analysis of total students' answers, the patterns obtained were made on the students' responses in the questionnaire. Those patterns revealed the reasons why most of them found difficulties in writing the Introduction Part. Although some intevening variables might influence the ability to write, the responses showed quite similar answers towards the same statement. The four patterns were categorized as the major clusters, and they were analyzed to cope with all the responses given in the questionnaires. The four were assumed as the underlining causes that influenced the students to answer "Yes" and "Doubtful" and also the problems they faced.

As stated previously, in order to report the research which has been done, mastery of English tenses and convention is a must [4]. Lack of reading the guidelines and the reference books was one of the causes that interfered the students not to be successful in writing clear background setting. In the Introduction Part, the students were asked to follow the five stages as suggested in the guidelines by [6][7]. Based on the reasons given, less reading led the students to incorrectly follow the five stages in the Introduction Part. The five stages were clearly described in the guidelines, and the students needed to follow them. Several students who stated not having any difficulties in understanding the five stages said that they carefully followed the guidelines that finally they gained the understanding. Refering to the lack of reading, it was assumed that the students who were unable to construct the background properly did not give themselves more time to read or to check the guidelines or reference books. Besides, the problem of misusing the tenses was also due to the lack of reading. Willingness to do some checks on the appropriate tenses used for certain part can easily determine the tenses to be used.

In regard to the ability of writing clear background setting, the students seemed confused of providing ideas or information needed. This is in line with [3] that to maintain clarity of information for the readers to read, some stages of report writing should be followed. Majority of the students were not used to or not familiar with writing the ideas that clarity of information for the readers was missing. This was due to the fact that writing research report was not their habit. Since writing research report was not the usual activities for them, they seemed confused and doubtful whether what they have written in the background was the required one. Since the ability of good writing is not instant, the students need to have more practices under the advisory of the lecturers. Some of them stated that they have never practiced writing research report. It was quite surprising since they have been in the sixth semester and have got Structure and Writing courses as the basic skills in writing. Considering in what the semester they are, they should have experienced in writing such research reports as they have already finished the assignments or projects given by lecturers on the previous courses. Therefore, having less experience and habit in writing become one of the reasons marking the problem in writing the information on the background setting.

Majority of the students' responses showed having insufficient examples and explanations were one of the causes influencing them to be unable to provide good writing of the Introduction Part, including the background setting and the way of quoting. They stated that the examples and explanations were not adequately given in classroom activities. Hence, they were hard to construct the complete picture of the kind of the Intoduction Part to be written. The gulity feeling that what they were writing was not the required one made the students needed to crosscheck with the examples, that they wanted more examples and explanations to be provided. Relatively similar reasons answered the problem of misused tenses and conventions. This is line with [5] that potential problems in research writing occur due to misuse of verbs (modals) and diction. The confusion of determining the appropriate tenses to be used in certain parts or information could be minimized by providing more examples so the students could refer to them while writing. Providing more examples and giving more explanation (or more exercises on tenses) is assumed to be able to help the students write the appropriate tenses and conventions in the Introduction Part.

The theories of tenses and conventions certainly influenced the students' basic knowledge of writing research report in English. The lack of those theories led the students to the confusion of determining the tenses to be used in the Introduction Part. The effect then emerged as the students could not understand how to deliver the information in the appropriate grammar format to approach the readers. The theories of tenses and convention were not directly taught in Scientific Writing course; they should have been acquired in the previous courses. As also stated by [2], such knowledge of the theories became fundamental since the students' reasons of failing in choosing the appropriate tenses and conventions mostly related to the understanding of the theories. Students should be able to switch their mindset to think directly in English rather than thinking in Bahasa Indonesia and transferring it into English. Some other students felt it was easy to determine the appropriate tenses and convention due to their previous adequate experiences and fine understanding of grammar. It means the students who mostly felt difficult to do the same did not experience and stucturize the knowledge they have got in the previous courses. On the other hand, some other students stated that they could easily follow the examples on the guidelines and reference books. Besides, their basic knowledge of the tenses and conventions also influenced the correct way of quoting. It would make them easier to understand the change of tense in doing quoting that they could find the appropriate tenses and conventions for each subpart to convey information in the Introduction Part.

In brief, the analysis results of the questionnaire above show information of the students' abilities in writing the Introduction Part of a research report in English. It can be concluded that most of the students (more than 50%) have several basic problems in writing a good and clear Introduction Part for their research report. The problems deal with the inability to use tenses and conventions properly, the incorrect way of quoting, the incorrect writing of research setting, and the inappropriate orientation of research writing. It could be restated that factors related to the previous knowledge and experiences were considered as the intervening factors that influenced writing a research report in English.

IV. Conclusion and Suggestion

The sources of pr The sources of problems are basically emerging from the lack of knowledge and unfamiliarity with the five steps in writing the Introduction Part. Since writing is a productive skill, regular practice is required. The understanding of following the five steps and of setting a clear and reasonable research background can be acquired gradually when the students read much and practice a lot. The understanding cannot be separated from the availability of supporting references related to academic wiriting. The problems on the use of tenses can be viewed from the students' inability to understand English grammar as it becomes so structurized in making the statements based on the time lapses. The ability of quoting may be improved if the students understand and refer to the rules of making quotations based on their reference books and guidelines. Since the way of communicating ideas can be different for each student, there is no strict style to be followed in writing, as long as it is still in the corridor of academic writing. The ability to differentiate the use of words, dictions, and the effectiveness of the sentences written is a need for the target readers to understand.

Viewing that writing a good research report in English is very crucial for academic purposes, findings in the research can be a reflection for the education practitioners to put more serious consideration towards the problems. The results may give a basic decision to make more sophisticated research writing report guidelines. For the lecturers, the problems may become the targets of improving the teaching objectives, for example, by directing the activities in academic writing course to analyze the Intoduction Part of research reports, to practice the tenses used in the Introduction Part, and to make restatements or citations, to paraphrase, or to summarize the provided quotations. In other words, familiarity with research report writing, that is, the use of tenses and conventions, as well as much practice in writing and reading more would be a great help to avoid further difficulties.

The research has a very limited source of data on the student's perceptions or opinions dealing with the five stages in writing the Introduction Part of a research report in English; therefore, further analyses are still needed to give more reliable results.

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Improving Creative Thinking Skills by Implementing Project Based Learning on Human Organ System Material

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***Abstract*—This study aimed to implement Project Based Learning (PjBL) model to improve creative thinking skills of students in class XI of SMK Farmasi ISFI Banjarmasin. The method used in this research was quasi-experiment with pretest-posttest control group design. The subjects were students of class XI SMK Farmasi ISFI Banjarmasin consisting of 70 students. The data were analyzed by Anacova with pretest as covariate. Then, the students' responses on project based learning model were also investigated during the implementation of the model. This research instruments were interview, documentation and tests. The results of the data analysis showed that the significant values was 0.000 from pretest, posttest and corrected model. Students' critical thinking skills were improved using Project Based Learning (PjBL) in class XI SMK FARMASI ISFI Banjarmasin.**

Keywords: Creative thingking skills, Human System, Learning Project

I. INTRODUCTION

Regarding the implementation of the 2013 Curriculum, the Minister of Education and Culture of Indonesia has issued a new regulation on the Graduate Competency Standards for each level of primary, elementary and senior high schools as outlined in the Regulation of the Minister of Education and Culture No. 54 of 2013. The regulation states that the Graduate Competence standard is a criterion of graduate qualification that includes attitude, knowledge, and skills.

Based on the results of the preliminary interviews by the researcher on senior high school students, it was found that in general, the students perceived that Biology lesson is difficult and they tend to memorize Biology concepts.

One of the most influencing factors in the implementation of the Biology learning process in the education unit is the learning difficulties experienced by students in learning some abstract Biological materials, such as human organ systems that cannot be seen directly. This resulted in many students who are less able to understand the material. Learning difficulties also cause students' low achievement in daily tests and semester test. Therefore, in the learning process, it is necessary to have appropriate learning model to teach the abstract material.

Learning model is a plan or a pattern used as a guide in planning learning in the classroom or tutorial learning [1]. This model is a characteristic that is raised in learning as a step to implement learning in the classroom. Learning model must be in accordance with the material which is taught because each material or concept has its own characteristics. A particular concept must use a particular model as well. If suitable model is not used, learning activities become ineffective and this condition affects students' understanding. Models of teaching are actually models of learning [1]. As we help students acquire information, ideas, skillss, value, way of thinking and means of expressing themselves, we are also teaching them how to learn. This means that teacher must help students in obtaining information, ideas, skills, ways of thinking, and in expressing their own ideas. Therefore, teacher does not give the material directly but direct students to find themselves.

The use of appropriate learning models and approaches in Biology learning is expected to be a solution as well as to achieve the learning objectives effectively and efficiently. The project-based learning model is one of the learning models recommended by the 2013 curriculum development team. In the 2013 curriculum, we recognize the basic competencies derived from core competence (KI standing for Kompetensi Inti in Indonesian language) 3, which is knowledge, and basic competencies derived from core competencies (KI) 4. Project-based learning model is usually used to achieve the learning objectives derived from KI 4 in addition to achieving the goals of KI 3.

Project-Based Learning (PjBL) is expected to accommodate KI 3 and KI 4 in Biology learning since PjBL supports constructivistic theory that rests on the idea that students build their own knowledge in the context of their own experience. The focus of the PjBL is on the key concepts and principles of a discipline, involving students in problem-solving activities and other meaningful tasks, giving students the opportunity to work autonomously, constructing their own learning, and producing products of their work. This involved all the senses, nerves, and physical aspect of students. PjBL learning has the following steps: determining fundamental questions, designing project planning, preparing schedules, monitoring students and progressing projects, testing results, and evaluating experiences. PjBL learning generally has guidance, planning, creating, and processing steps [2].

Learning with creative thinking skills is a process that is used when we bring new ideas. It combines previous unfinished ideas. Creativity is a product of one's creative thinking. When one implements creative thinking in a learning practice, this can make learning meaningful so memorizing concepts of Biology material will be easy to do. Based on the research background, the researcher tried to do a learning experiment by implementation of PjBL model to improve creative thinking skills on human organ system material.

II. METHOD

This research used quasi-experiment design since this study used all subjects in the intact study group who were given treatment, not using random sampling. The subjects in the study were 70 students of class XI in SMK Farmasi ISFI Banjarmasin. The independent variable in this research was Project-Based Learning model, while the dependent variable was creative thinking skills.

The collection of data in this research was conducted by using observation, interview, documentation, and tests. The data analysis used in this research is as follows: (1) To test the effect of implementation PjBL model to students' creative thinking skills, covariance analysis (Anacova) with pretest value as covariate was used by means of SPSS version 18.0; (2) To analyze the effect of implementation of PjBL model to learning outcomes, gain score was used.

III. FINDINGS AND DISCUSSION

The analysis results of students' creative thinking skills after the implementation of project based learning on human organ system material in class XI of SMK Pharmacy ISFI 2016/2017 are presented in Fig. 1 as follows:

Dependent Variable:perlakuan

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	11.443[a]	17	.673	5.815	.000
Intercept	.011	1	.011	.092	.763
pre	2.741	1	2.741	23.676	.000
gender	.374	1	.374	3.232	.078
post	10.950	15	.730	6.306	.000
Error	6.135	53	.116		
Total	188.000	71			
Corrected Total	17.577	70			

a. R Squared = .651 (Adjusted R Squared = .539)

Fig 1. The analysis results of students' creative thinking skills after the implementation of PjBL on human system material

The researcher used Anacova test to analyze the data Based on the results of the data processing, the obtained significance value for the posttest variable was 0.000. Since the value is far below 0.05, H_0 was rejected. It can be concluded that at the level of confidence 95%, there was the effect of PjBL on the students'' creative thinking skills. To know the effect of different treatment to students' creative thinking skills simultaneously can be seen from number of significance in section of corrected model.

It can be seen that the significance value is 0.000. Since the value of significance is far below 0.05, then H0 was rejected. Therefore, at 95% confidence level, it can be concluded that simultaneously learning with PjBL model gave an effect on students' creative thinking skills. PjBL helps students in learning the knowledge and skills through authentic tasks. The learning, environment, content, and tasks that are relevant, realistic, authentic, and present the natural complexity of the real world are able to provide students' personal experience with powerful suggestive message.

Likewise teaching is not an activity of transferring knowledge from teacher to student, but an activity that allows students to build their own knowledge. This is in accordance with project-based learning that in fact is more emphasis on students doing and making a work in accordance with the material being studied. This is what makes students then think creatively to create a work that can be a medium of learning for materials that are difficult for them to understand.

Creativity that is applied to this research was the creativity that focused on the product. Creativity is the ability to create new combinations of social meaning [3]. From these two definitions, creativity not only creates something new but may be a combination of something that already exists

TABLE I. MEAN SCORE OF STUDENTS' LEARNING OUTCOME FROM PROJECT BASED LEARNING

Class	(KKM)	Mean of Pretest	Mean of Postest	Gain
Control	70	60.94	80.83	19.89
Experiment	70	61.14	90.37	29.23

Based on the data at Table I, the mean score of learning result from the control class was 19.89 while the mean score of learning result from the experimental class was 29.23. From the results, it can be seen that the mean score of learning outcomes from the experimental class was greater than the control class, so it can be concluded that the implementation of PjBL more effectively improves learning outcomes than conventional learning. The implementation of PjBL can improve creative thinking skills and the learning outcomes.

This study was also in line with the results of ref [4] that PjBL successfully improved academic achievement, with a deep understanding on the teaching materials, and increased motivation in learning. Consistently, the research results of the U.S. PjBL was able to increase the motivation of students and provide an overview of all level [5]. Research results in America show that project-based learning has shown satisfactory results [6].

PjBL is a teaching approach developed based on the principles of constructivism, problem solving, inquiry-research, integrated studies and reflection that emphasize the aspects of theoretical studies and applications [7]. The PjBL learning model facilitates students to develop a project both individually and in groups to produce a product-such as portfolios [8] or journals [9] whose results are then presented and revised.

To support the activities of PjBL in the learning process can use various resources / including through observation and reflection of activities [9]. The implementation of PjBL can facilitate the level of participants' independence [7] and foster student achievement and performance [10].

In addition to the curriculum and competencies that have been established in schools, learning media and models should not be too difficult to use and understand to facilitate students and teachers in learning activities. In this research, the material of the human organ system must be mastered by the students, not only for the achievement of the curriculum but according to the results of dominant observations that students find it difficult to understand the material. Project-based learning in this research facilitates students in designing a project in the form of images media of the human organ system designed by the students themselves within the specified time in accordance with the concept being taught. In the end, students will understand the concept of the human organ system because it has been studied, designed in the form of drawing, and then presented from the project work they did and created. This kind of learning process will increase the students' creativity because the teacher gives students freedom in designing their work.

IV. CONCLUSION

Based on this current research, it could be concluded as follows. The implementation of project based learning improved students' creative thinking skills. As the significance value is 0,000>0.05 at 95% confidence level, it can be concluded that simultaneously learning with PjBL model has an effect on students' creative thinking skills. The implementation of project based learning increases students' learning outcome. It could be seen from the the mean gain of learning outcomes from the experimental class which was greater than the control class. Thus, the implementation of PjBL more effectively improves learning outcomes than conventional learning.

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Pattern Generalization by Elementary Students

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***Abstract*—This paper presents the strategies used by fifth and sixth grade elementary students when they faced problem on pattern generalization. The samples were 3 elementary school students from grade 5 and 6. Students were given a problem of pattern and asked to make generalizations on the given pattern. The data were analyzed to describe the strategies used by students in solving the problem of generalizing patterns. The results indicated that the students were able to generalize on a pattern and start using mathematical symbols in solving problem. The results also revealed that the students used effective strategies to solve the problem of generalizing patterns. Although pattern generalization is not a new concept for elementary school students, it is considered important because pattern generalization can help students learn arithmetic thinking to algebraic thinking so that students are able to produce rules that can be used to determine any value of the pattern.**

Keywords—Pattern Generalization, Algebraic Thinking, Problem Pattern)

I. INTRODUCTION

Patterning activities can help students from arithmetic thinking to algebraic generalization and produce rules that can be used to determine any value of the pattern [1]. Researchers have demonstrated that patterning activities can encourage students to construct a variety of generalization [2], [3], [4], [1], [5], [6], [7]. However, sometimes generalizations that students do often turn out to represent a false reasoning [1]. The failure in generalizing of patterns happens because students do not recognize the relationship between the patterns [8]. Therefore, recommendations are provided regarding the learning of algebra [9]: begin the learning of algebra early (in part, by building on students' informal knowledge), integrate the learning of algebra with the learning of other subject matter (by extending and applying mathematical knowledge), include several different forms of algebra thinking (by applying mathematical knowledge), build students' naturally occuring linguistic and cognitive powers (encouraging them at the same time to reflect on what they learn and to articulate what they know), encourage active learning (and the construction of relationships) that puts a premium on sense-making and understanding.

The importance of establishing the students' understanding of algebraic ideas through informal knowledge that students brought to school includes the notion of pattern [9]. The kindergarten students aged 5-6 years reveal a unique fact. It was found that these children indicated early algebraic thinking [10]. These children already recognized the number more than 20 and could perform addition and subtraction with it.

Therefore, it is important to learn how students solve the problem of patten generalization. In this study, the research question is 'how do students solve the problem on the given pattern?'

II. THEORETICAL FRAMEWORK

The term"pattern" means any regularity which is replicated [11]. The objectives of learning about patterns are as follows. For grades 3 through 5, students are expected to "describe, extend, and make generalizations about geometric and numeric patterns; represent and analyze patterns and functions using words, tables, and graphs [12].

The framework is based on the research conducted [4]. In conducting research by involving students from grade 8 on the problems of the pattern, students' strategies can be divided into two types: based on trial and error and commonality on a given problem. Students' ability to generalize lies in how they pay attention to local commonality and then generalize these similarities in a given term.

Evidence from teaching experiments has shown that elementary-school students are able to identify the rules or patterns and use them to predict the next values of the given pattern [13], [14], articulate the general rule verbally [13] [15][16] and symbolically [13][15][16][17][14]. In Indonesia, for elementary students, generalizing the concept of pattern has begun since first grade i.e by knowing and predicting patterns of simple numbers by using image/concrete objects. The generalization is regarded as an important component of activities and developing a generalized algebra is regarded as one of the important goals in mathematics [20]. Through generalization, the general characteristics of the object can be identified so that objects with special characteristic can be classified together. Generalization means carrying reasoning, or communication to a level where the focus is no longer on the cases or situations itself, but the pattern, procedure, structure, and relations among them [9].

III. Method

The samples were students from grade 5 and 6 (2 from grade 5 and 1 from grade 6) in Fastabiqul Khairat Samarinda Islamic Boarding School. Students were given a problem of pattern and asked to make generalizations on the given pattern.

Qualitative data from student work and in-depth interviews were analyzed to describe the strategies used by students in solving the problem of generalizing patterns.

IV. Result

Given cubes stickers problem:

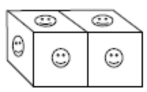

Fig. 1. Cube stickers problem [6]

Students were asked to determine how many stickers were needed if there were 7 cubes, 9 cubes, 49 and n cubes (cubes glued together as in the pictures and one sticker places on each exposed face of each cube. Every exposed face of each cube must have a sticker, so in fig. 1 would need 10 stickers).

Subject 1

Subject 1 gave the following answer:

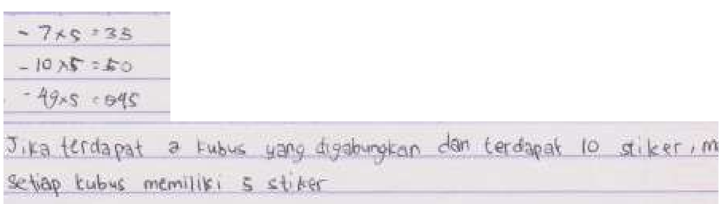

Fig. 2. The answer from the first subject

The following is the interview script between the researchers and the student:

Researcher: How do you determine how many stickers are needed for 7 cubes glued together?

Sudent: Here (pointing the problem of cube sticker), there are 2 cube glued together, need 10 stickers, so 1 cube need 5 stickers. If there are 7 cubes you need 7 times 5 sticker"

Researcher: How about 9 cubes?

Students : You need 9 times 5.

Researcher : how about 49 cubes?

Student : 49 times 5.

Researcher : How about n cubes?

Student : I don't understand.

Researcher : for example, your friend ask you, how many stickers are needed for 5 cubes?

Students : 5 times 5.

Researcher : I understand, if your friends asked you to determine how many stickers are needed, just multiplied by 5.

Students : Yes, you just multiplied by 5.

According to [9], the strategy used by subject 1 can be categorized as whole-object strategy, in which students use multiplication in the previous stage to calculate the number of stickers needed. Students do not consider that if cube is glued, the stickers are not counted.

Subject 2

Subject 2 gave the right reason:

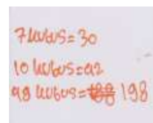

Fig. 3. The answer from second subject

When confirmed:

Researcher : How do you determine how many stickers are needed for 7 cubes that glued together?

Student : The first and the end there were 5 stickers (pointing first cube dan the last cube), and then you count, if there 7 cubes, there are 2 cubes in the fist and the last cube, so you substract by 2, the rest are 5, multiplied by 4 and then you add 5+5.

Subject 2 was able to determine the sum of stickers needed for any given cube and able to see that for two cubes that are glued together, the sticker does not count.

Subject 3.

Subject 3 gave explanation for her answer:

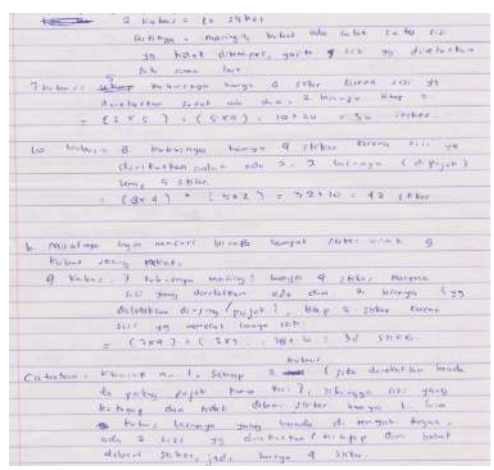

Fig. 4. Explanation from subject 3

When confirmed, she could explain her answer:

Researcher : How do you determine how many stickers are needed for 7 cubes that glued together?

Student : Because the cubes glued together, you not given sticker. So, if there are 7 cubes,there must be two cubes at the edges and there are 5 stickers and the glued sides have 4 stickers.

Researcher: How if there are 100 cubes?

Students : like this, there must two cubes at the edge have 5 stickers, the remaining 98 have 4 stickers.

Subject 3 were able to identified that for cubes that glued together, the sides that glued together does not need stickers.

V. Conclusion

Students from fifth and sixth grades were able to represent generalization of pattern generalization verbally. These findings concur with those of [21], that elementary school students aged 8 years could think about the relationship between the two groups of data and represent it in a very abstract form. The results also reinforce the research conducted [2] that elementary school students are able to identify the rules or patterns and use them to predict the next values for the given pattern and being able to articulate the general rule verbally.

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The Measurement of Science Process Skills for First Year Students at Biology Education Departement

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Abstract*—A meaningful science teaching focuses on reconstructing knowledge and experience. One way for reconstructing knowledge is by using science process skill. It is an ability of students to solve problems. This research aimed to measure science process skills of first grade students at Biology Education Department. This research was descriptive research involving all of first grade students in Biology Department in academic year 2016/2017. The results showed that the easiest aspect for basic skill was measuring data and the most difficult aspects were classifying and inferring data. The easiest aspect for integrated skill was making data for investigation and the most difficult aspect were analyze investigation and identifying of variables.

***Keywords*—Biology Education Department, Measurement, Science Process Skill**

I. Introduction

Science broadly as lesson and translation of the physical aspects in a regular and systematic method, including all aspects produced by the method [1]. The aspects are not limited to facts and concept, but are expanded to the application of knowledge and process to change people's way of thinking. Learners develop an experience to prompt and test hypotheses. Then, learners have to try and communicate the outcome of the experiment orally. Written skill is combination of the process and products and intertwined between each other [2]. Science is built on three main dimensions of scientific products (the content of science, the concept of science and scientific knowledge), the scientific process (the process of doing science), and the scientific attitude (the characteristics of science and the view of science).

Learning Biology ideally should increase capacity as a product of the science, process science and attitude. In fact, in learning Biology implemented in secondary and elementary, students use science as products and it will be meaningless without process of science.

A meaningful cognitive learning focuses on reconstructing knowledge and experience, so it only covers remembering or knowing factual knowledge [3]. It is an ability of learners to be able to solve problems, so it is related to material enrichment as a product. Strengthening natural science needs science process skill as a method of science itself. The event consists of a series of biological questions or tasks that involve the use of one or more process Skills.

Science process skills are the things that scientists do when doing science [4]. It means science process skills refer to what scientists do when they learn and investigate. Science teaches how to understand the phenomena like observing, concluding, measuring and experimenting. It is a reflection of the method used by scientists when generalizing scientific information [2].

Science skill process into 2 categories, namely basic skills and integrated skill. Basic skills consists of observing, classifying, measuring, inferring, predicting, and communicating, While integrated skill consists of variable identification, hypothesis construction, investigation analysis, data tabulation, variable definition, investigation design and experiment [4]. These skills can be accessed by applying them to a series of lab station activities.

Mastery of the learning material is not the main objective, yet the most important thing is changing behavior [5]. Teacher give limited teaching only convey the subject matter to teach as the process of set environment to change of teaching paradigm. Teacher's experience for teaching science is related to the orientation as education experts to change behavior. Thus, science process skill can be taught at the previous level education [2]

Biology education department consists of many backgrounds for students, covering origin areas, education level and habits. Students on the first grade at academic year 2016/2017 consists of 40 females and 7 males. They come from various origins, not only from south Kalimantan but also from other areas. They have different education levels. Most of them come from science class of high schools, and some of others are from vocational high schools. Therefore, the problems in this research was "how are the science process skills of first year students in Biology education department? The purpose of this research, was to measure science process skills of the first year students in Biology education department.

II. Method

This research was descriptive research. It can be explained as a statement of affairs as the research present the results without getting any control from the researcher, namely the description mastery of science process skill. The approach used in this was quantitative approach. The research was conducted on the Biology Education Department, Universitas Lambung mangkurat for two months, from January to March in academic year 2016/2017.

The subjects of the research were students from Biology education department .Technique analysis was : (1) scoring of each test item, (2) grouping the score into three categories, and (3) making the frequency of each category suppressed by the following formula .

$$p = \frac{f}{N} X100\%$$

F is frequency being searched for the percentage. N is the total number of frequency. P is percentage points. The research data were analyzed by using the Microsoft Excel.

III. Results and Discussion

The results of these measurements on students' basic sceince process skills are summarized in Table 1.

TABLE I. THE PERCENTAGE OF STUDENTS' BASIC SCIENCE PROCESS SKILLS

No	SPS	Type	Percentage
1	Observing	Basic	55.68
2	Classifying	Basic	35.23
3	Predicting	Basic	51.14
4	Communicating	Basic	63.64
5	Hypothesizing	Basic	59.09
6	Informing	Basic	28.41
7	Measuring	basic	86.36

Based on Table 1, the highest basic skill is ability to measure. Measuring ability uses standard measures or estimations to describe specific dimensions of an object or event. This information is considered as quantitative data. Thus, most of students had highest score.

The most difficult aspects were the ability for inferring and classifying. When student did inferring, they used formulating assumptions or possible explanations based upon observations. The last is ability to classify, in which the students did grouping or ordering objects or events into categories based upon characteristics or criterion.

The level of observation skill was the lowest skill. Highest skills include classifying and inferring skills [6]. Actually basic skills should have been mastered thoroughly by learners from elementary to senior high school.

The highest skill is the ability for measuring. Measuring aspect uses standard measures or estimations to describe specific dimensions of an object or event. This information was considered quantitative data. Most of the students had highest score for the ability to measure. Basic science process skills are interdependent, implying that investigators may display and apply more than one of these skills in any single activity [7].

The results of the measurements on integrated science process skills are summarized in Table 2.

TABLE II. THE PERCENTAGE OF STUDENTS' INTEGRATED SCIENCE PROCESS SKILLS

No	SPS	Type	Percentage
1	Identifying of Variables	Integrated	19.32
2	Organizing Data in Tables and Graphs	Integrated	88.64
3	Designing investigation	Integrated	50.00
4	Analyzing investigation	Integrated	18.18
5	Defining Variables Operationally	Integrated	21.80

Based on Table II, it is known that this study uses integrated skill covering 5 subskills. Integrated science process skills are immediate skills that are used in problem-solving [2]

The highest score was obtained by the ability to organize data in tables and graphs. The students are able to present and organize the collected data in tables and graphs. Moreover, the lowest score was obtained by the analyzing ability, investigating ability and the ability of identifying variables.

The aspect of analyzing investigation was done by interpreting data statistically, identifying human mistakes and experimental errors, evaluating the hypothesis, formulating conclusions, and recommending. The aspect of identifying variables is done by determining the types of variables. The variable being manipulated is the independent variable, the variable being measured to determine its response is the dependent variable, and all variables that do not change and may be potential independent variables are constants.

Student should be able to master whole science process skill. It is supposed to be learning of adapting science as the process. Science as the process is important for understanding the concept such conducting observations, making classifications, measuring, predicting and hypothesizing and constructing knowledge [8]. Giving training of science process skills can increase the academic achievement of students [9]. Learning activities should be directed at learning experience rather than oriented teaching for passing a test or national examination. it termed as teaching for the test [10].

IV. Conclusion

The highest percentage of basic science process skills was 86.36 % for the ability to measure data. The lowest percentages of the skilss were 28.42% for the ability to infer and 35.23% for the ability to classify. The highest aspect of integrated process science skills is organizing data in tables and graphs indicated by 88,64 %, while the lowest aspect was analyzing investigation indicated by 19.32 %, followed by identifying variables with 18.18 %

It is suggested to other researchers who are interested in doing the similar research to control earnest characteristic of learners in working on a test instrument. Besides, other researchers can add various factors, such divergent thinking, creative learning, and motivation.

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Developing Learning Trajectory Based Instruction of the Volume and Surface Area of the Block

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***Abstract*— Three components on a hypothetical learning trajectory (HLT) are (1) the learning goal, (2) the learning activities, and (3) the way of students' thinking and learning. A learning trajectory based instruction (LTBI) is defined as a teaching and learning trajectory that used HLT for instructional decisions. Although the research related to student learning in measurement of length, area and volume quite a lot, but the research related to student learning in connection between the measurement of length, area and volume is still relatively small. The researcher tried to develop a context which helps students to construct the formula of the volume and the surface area of block. In this paper, the researcher will present about the LTBI for grade five students about the volume and the surface area of the block used RME approach. According to Two methods to find the volume of the three-dimensional figure are (1) the space is packed with a three-dimensional array unit which is iterated in the three-dimension and we called as the packing method, and (2) the space is filled by iterating a fluid unit which takes the shape of the container and we called as the filling method. The method chosen by researcher to find the volume of block in this paper is the packing method. The type of the research used by the researcher in this study is the design research developed by Gravemeijer and Cobb. According to Gravemeijer and Cobb, there are three phases in the research development, namely (1) the preparation of the design, (2) testing the design, and (3) the retrospective analysis. The researcher' exposure in this paper is limited to the first stage of the design research developed by Gravemeijer and Cobb.**

Keywords*— *Hypothetical Learning Trajectory, Learning Trajectory Based Instruction, Realistic Mathematics Education (RME), The Packing Method.

I. Introduction

Reference [1] indicated errors made by grade 5 – 8 students in the volume measurement tasks using unit cubes are associated with some aspects of visualizing spatial abilities, such as the ability to "read" a two-dimensional representation of a geometrical object. In the study, students are asked to determine many unit cubes in a block that is presented in the two-dimensional image form (the sample question given to students can be seen in figure 1).

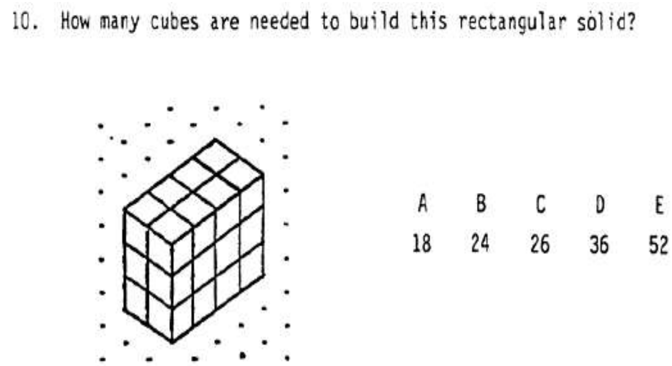


Fig 1. One of the questions that were developed by [1]

The choices in the test show the students' strategy in determining many unit cubes that form a block. Reference [1], there are four strategies producing the wrong answer which may be done by the students, namely:

1. If the students calculated the number of square shown in the picture on the test, then they will choose the option C.
2. If the students calculated the number of square shown in the picture on the test and doubled it, then they will choose the option E.
3. If the students counted the number of the cube unit shown in the picture, then they will choose the option A.
4. If the students counted the number of the cube unit shown in the picture and doubled it, they will choose the option D.

The problem type such as those developed by [1] also developed in Indonesia. This problem type is generally used to introduce the concept of the block volume and the cube volume as can be seen in figure 2. The researcher tried to interview three of 5th grade teachers in Yogyakarta to ask what mistakes are generally made by the students if they are given problems like in the figure 1. From the interview, the researcher is able to conclude that the common mistakes made by students in the grade 5 of elementary school are that they calculated the number of the square shown in the picture on the test and counted the number of the cube unit shown in the figure 2.

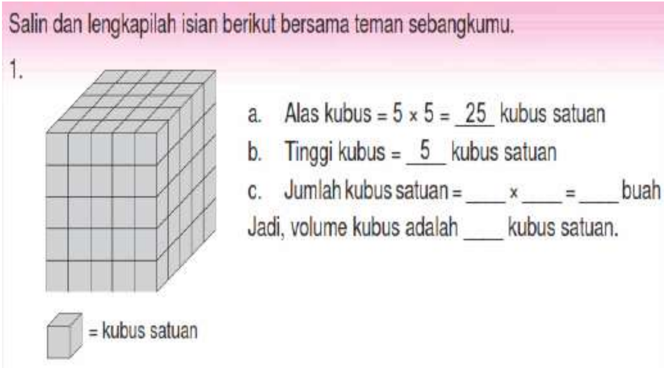


Fig 2. The example of a finding volume problem in the grade 5 elementary school textbook [2]

II. THEORETICAL FRAMEWORK

Simon is the first researcher using the term hypothetical learning trajectory (HLT) to represent the students' learning process from their prior knowledge until the learning objective is set by the teacher [3]. Reference [4] states that there are three components on a HLT, i.e.: (1) the learning goal, (2) the learning activities, and (3) the way of students' thinking and learning. Reference [4] names a trajectory as a hypothetical learning trajectory because the student's learning trajectory is unknownable.

According to Romber and Carpenter (1986 in [3]) the learning and the teaching are often seen as two sides of the same phenomenon, but often the studies carried out in these two areas are not connected to one another. One attempt to connect the research in both fields appeared in 2012 conducted by [3]. Their effort to combine research in both areas is to construct what they referred to as learning trajectory based instruction (LTBI). A LTBI is defined as a teaching and learning trajectory that HLT used for instructional decisions [3].

Reference [5], the volume can be found in two ways, namely:

1. The filling method which is filled the space object with liquid.
2. The packing method which is filled the space with other objects is smaller in size and had the same shape and size.

Reference [5], if the teacher knew about the development stage of students' conceptual understanding in the measurement of length, area, and volume, then teachers will be able to teach these topics.

The philosophy of RME is mathematics as a human activity. It meant learning mathematics should be able to make the students think that there is mathematics in human activities, and it is be used by them in real life [6]. So, the learning process of mathematics first of all should not be connected with mathematics as a deductive system that is well organized and formal, but it should be connected with mathematics as a human activity (Freudenthal, 1971, 1973, in [7). If the mathematics learned by the studentd is connected to a formal deductive system, then they will view that mathematics is resulted by the human thinking; it is an abstract thing and is not related to real-life. So, they will think that they cannot find mathematics and using mathematics in their life [6]

There are five main characteristics in the RME [7], [8] namely:

1. phenomenological exploration;
2. bridging by vertical instruments;
3. student contributions;
4. interactivity;
5. intertwining.

Reference [9] design research can be characterized as:

1. Iterventionist: the research leading to the design of an intervention in the real world.
2. Iterative: the research incorporates a cyclic approach to the design, evaluation, and revision.
3. Process-oriented: a model of research that avoids the measurement of inputs and outputs, focus on understanding and improving interventions.
4. Oriented to usability: the benefits of design are measured by looking at the practicality of the design for the user in reality.
5. Oriented to the theory: design (at least partially) made by theories that already exist, and field testing of the design contribute to the development of the theory.

According Gravemeijer and Cobb in [9] there are three phases in the design research, namely:

1. The first phase: preparation of trial design.
2. The second phase: trial design.
3. The third phase: a retrospective analysis.

III. METHOD

The type of the research used in this study is the research design developed by Gravemeijer and Cobb. Results of study presented in this paper are the first phase results. In this phase, the researcher conducted the following activities:

1. Assessing basic competencies already possessed by students before the students learnt about the volume and the surface area of the block based on the revised curriculum of 2013.
2. Reviewing basic competencies that students needed to have associated with the volume and the surface area of the block based on the revised curriculum of 2013.
3. Developing the hypothetical learning trajectory about the volume and surface area of the block using RME approach.
4. Developing the LTBI about the volume and surface area of the block using RME approach.

IV. RESULTS AND DISCUSSION

The assessment on the students' prior basic competencies is that the students have learnt about the volume and the surface area of the block based on the revised curriculum of 2013. The results are as follows:

1) *Grade 1:*
   a) Knowing two-dimensional and three-dimensional figure through a variety of concrete objects.
   b) Classifying two-dimensional and three-dimensional figure based on a certain property through a variety of concrete objects.
   c) Knowing and determining the length with the non standard unit using concrete objects or situations.
   d) Measuring the length of the object with the non standard unit using concrete objects or situations.
   e) Comparing the length of some objects using concrete objects or situations.
   f) Ordering some objects based on the length.
2) *Grade 2:*
   a) Explaining and determining the length (including the distance) on the standard unit and related to daily life.
   b) Measuring the length of the object (including the distance) on the standard unit and related to daily life.
   c) Explaining two-dimensional and three-dimensional figure based on their characteristics.
   d) Classifying two-dimensional and three-dimensional figure based on their characteristics.
3) *Grade 3:*
   a) Describing and determining the relationship between the standard units of length which are commonly used in daily life.
   b) Solving the problem related the relationship between the standard units of length which are commonly used in daily life.
   c) Explaining and determining the area and volume on the non-standard unit using concrete objects.
   d) Solving the problem related the area and volume on non-standard units using concrete objects.
4) *Grade 4:*
   a) Explaining and determining the common factor, the greatest common factor (GCF), common multiple, and least common multiple (LCM) on two numbers related to daily life.
   b) Solving the problem related to the common factor, the greatest common factor (GCF), common multiple, and least common multiple (LCM) on two numbers related to daily life.
   c) Explaining and determining the circumference and the area of the square, and rectangle.
   d) Solving the problem related to the circumference and the area of the square, and rectangle.

The reviewing basic competencies that students needed to have associated with the volume and the surface area of the block based on the 2013 revision curriculum are as follows:

1) *Grade 5:*
   a) Explaining and determining the volume of the three-dimensional figure using the volume unit (such as cube unit).
   b) Solving the problem the volume of the three-dimensional figure using the volume unit (such as cube unit).
   c) Explaining and finding the nets of the simple three-dimensional figure (such as cube and block).
   d) Making the nets of the simple three-dimensional figure (such as cube and block*).*
2) *Grade 8:*
   a) Differentiating and determining the surface area and the volume of the flat side three-dimensional figure (such as cube, block, prism, and pyramid).
   b) Solving problem related to the surface area and the volume of the flat side three-dimensional figure (such as cube, block, prism, and pyramid) and the combination of them.

4.1 The Learning Trajectory Based Instruction (LTBI)

1) Indicators of the teaching and learning process:
   a) Students can reinvent the volume definition and the volume formula of a block and a cube.
   b) Students can apply the volume definition and the volume formula of the block and cube to solve problems.
   c) Students can reinvent the surface area definition and the surface area formula of the block and the cube.
   d) Students can apply the surface area definition and the surface area formula of the block and the cube to solve problems.
2) The activities of a teacher and students:
   a) Activities to construct social norms in the classroom.

      The teacher provided the social norms that will be set up in the classroom, namely:

      1) If a student wants to inquire, express his or her opinion, answer questions, or provide feedback on an opinion from the other students, then the student need to lift his or her hand first, and the student can start talking when the teacher has given him or her the chance to speak.

2) If there is a student who is expressing his or her opinion, then the other students will hear his or her opinion.

3) If the teacher ask the students about their answers, then it does not mean their answers are incorrect, but the teacher wants to know how the student is thinking.

b) The problem exploration

1) Students are shown a pack of candy. It contains 10 grains of candy, but the students cannot know the number of candies in the pack.

2) Students are given the following problem: estimate "how many candies are in the pack?" This is an attempt to bring out the phenomenological exploration characteristics of RME.

3) To help students estimate the number of candies in the pack, the teacher can open a part of the candy wrappers, so they can look at two or three candies on the pack. This is an attempt to bring out the bridging by vertical instruments characteristics of RME.

4) The students are given time to discuss in a pair. This is an effort to bring out the interactivity characteristics of RME.

c) The class discussion

1) One student is asked by the teacher to explain to other students about what his or her strategy used to determine the number of candies in one pack. There are four possible ways expressed by the student, namely:

a) The Student measures the thickness of one candy and the pack of candy using a ruler or other measuring devices. After that, the student calculates the number of candies in the one pack to be the same as the length of a pack of candies divided by the thickness of one candy.

b) The student measures the thickness of two candies and the pack of candies using a ruler or other measuring devices. After that, the student calculates the number of candies in the one pack to be the same as the length of a pack of candies divided by the thickness of one candy and then multiplied by 2.

Note: each solution process made by the students for this problem in the RME is referred to as a model. This is an effort to bring out the students contributions of characteristics of RME.

2) Other students are asked to respond to what is presented by the student.

3) Teacher asks the other students who have different strategies to convey the idea.

4) Other students are asked to respond to what is presented by the student.

5) The teacher conducts a class discussion and guides the discussion so that students can gain the number of candies in a pack and understand that the volume of the three-dimensional figure (in mathematics) has the same meaning as the content of the three-dimensional figure (in the daily language). In this context, the content of one pack of candies represents the volume of a block.

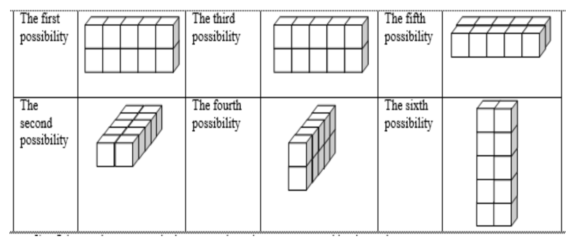
d) The problem of exploration

1) Students are asked to discuss in a pair about whether there is any other form of packaging that can be made to pack 10 candies.

2) The teacher can provide a number of units of cubes (instead of candy) to each pair to help the students in exploring the problem.

e) The class discussion

1) One student asked by the teacher to explain to other students, how other form of packaging can be made to pack 10 candies. There are six possible ways expressed by the students, namely:



Other students are asked to respond to what is presented by the student.

2) The teacher handles the class discussion and guides the discussion so that the students can see that the content of the pack of candies are 10, all these possibilities are the same thing instead of if returned to the context of the form of candy packaging, and the form of the packaging is different from the first candy packaging. This is an attempt to bring out the bridging by vertical instrument characteristics of RME.

f) The problem of exploration

1) Students are required to solve the following problem in a pair if they want to pack 10 candies. The teacher ask them "how much minimum paper do you need to pack 10 candies?".

2) The teacher can provide a number of unit of cubes (instead of candy) to each pair to help their students in exploring the problem.

3) If the students have difficulty, they can be helped by the following process:

a) Students are asked the number of sides in the candy packaging.

b) If the students can answer, then they are asked the number of sides that have the same molded sides in the candy packaging.

c) If students can answer, they are asked the form of each side of the candy packaging.

d) If students can answer, they are asked the way to find the area of the side.

e) If the students can answer, they are asked the way to find the area of paper required to pack the one candy packaging.

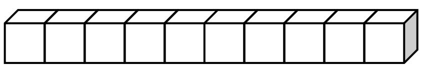
g) The class discussion

1) One pair of students is asked by the teacher to explain to other students, "how do they solve the problems?"

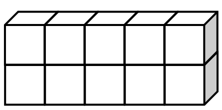
The students' possible answers are as follows:

Suppose the length of the side of each unit of cube is 1 unit of length.

If the packaging is made in the form below:



The minimum paper that needed to pack 10 candies = (4 × 10 × 1) + (2 × 1 × 1) = 40 + 2 = 42 unit area. If the packaging is made in the form below:



The minimum paper needed to pack 10 candies is = (2 × 5 × 1) + (2 × 5 × 2) + (2 × 1 × 2) = 10 + 20 + 4 = 34 wide units.

Thus, the minimum paper needed to pack 10 candies is the second packaging.

2) Other students are asked to respond to what is presented by the student.

3) The teacher handles the class discussion and guides the discussion so that students can see that the area of packaging needed to pack every form of the packaging is (2 × length × width) + (2 × length × height) + (2 × width × height). This is the formula for the surface area of the block.

This is an attempt to bring out the bridging by vertical instruments with characteristics of RME.

h) The problem of exploration

1) Students are asked to discuss the following problem in a pair if a company wants to make candy packaging in which one pack contains 24 candies, then what is the shape of candy packaging that may be made by the company and which one needs the minimum paper packaging.

2) The teacher can provide 24 units of cubes (instead of candy) in the teacher's desk or provide help with providing the laptop with Microsoft Windows on the desk in exploring the problem. The teacher cab draw 24 units of cubes by using the program and students can try to make the candy packaging.

i) The class discussion

1) One student is asked by the teacher to explain to other students about the way to solve the problem. There are six possible ways expressed by students, namely:

TABLE I. SIX POSSIBLE WAYS EXPRESSED BY STUDENT

Possibility	**Length**	**Width**	**Height**	**The Paper Packaging Area**
First	1	1	24	98
	1	24	1	
	24	1	1	
Second	1	2	12	76
	1	12	2	
	2	1	12	
	2	12	1	
	12	2	1	
	12	1	2	
Third	1	3	8	70
	1	8	3	
	3	1	8	
	3	8	1	
	8	1	3	
	8	3	1	
Fourth	1	4	6	68
	1	6	4	
	4	1	6	
	4	6	1	
	6	1	4	
	6	4	1	
Fifth	2	2	6	40
	2	6	2	
	6	2	2	
Sixth	2	3	4	52
	2	4	3	
	3	2	4	
	3	4	2	
	4	2	3	
	4	3	2	

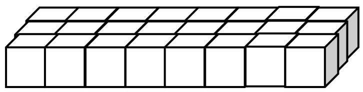
2) Other students are asked to respond to what is presented by the student.

3) The teacher handles class discussion and guides the discussion so that (a) students can view each event in each possibility in the same thing. It is not something different if we return to the packaging candy context, (b) the students can see that the packaging shape in every possibility is different from each other, (c) students can find that the number of the candy in each package is the number of the candy that make up the length of the packaging multiplied by the number of the candy that make up the width of the packaging multiplied by the number of the candy that make up the high of the packaging, and (d) the minimum paper

packaging is happened if the packaging shaped will like a fifth possibility.

This is an attempt to bring out the bridging by vertical instruments characteristics of and the student contributions characteristics of RME.

4) The teacher draws one of the possibilities, for example taken that length of 8 units, the width of 3 units, and the height of 1 unit. The image obtained is as follows:



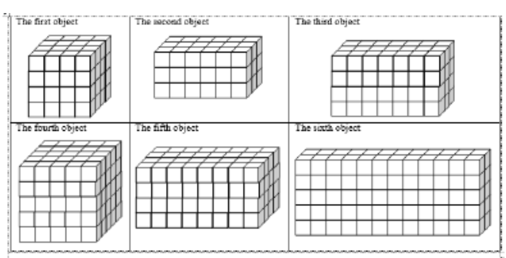
5) Students are asked to answer the following question if the contents of the candy packaging like in the picture that I created, “how many candies are there in one packaging?”

6) The teacher discusses this question in the classical situation so that students realize that the number of the candies in one package are 24 candies. It is necessary for the teacher to maka the students realize that the picture is a two-dimensional image, so no all of the cubes representing candies can be seen fully as a cube. This activity is intended for students to have the ability to "read" a two-dimensional representation of a three-dimensional object.

j) The problem of exploration

1) Students are required to solve the following problems:

Write the name, the volume, and the surface area of each three-dimensional object below!



2) If there are students who have difficulty in solving the problems, the teacher may ask the student to build the three-dimensional object from the picture by using unit cubes. After that, students are asked to calculate the number of unit of cubes that they needed to build the three-dimensional object.

3) If the students still count one by one when they find the number of the unit cubes that build the three-dimensional object, then the teacher will help the student. The way that can be used by the teacher to help the student is as followed:

a) The students are asked to build the first stage of the three-dimensional object using unit cubes.

b) The teacher asked the number of units of cubes you need to build up the first level of this object without counting one by one.

c) The teacher guides the students so that the students can find the number of units of cubes necessary to build the three-dimensional object, namely: the number of the units of length multiplied by the number of the units of width.

d) The students are asked the number of levels of the object.

e) If the students can answer this question, students are asked about the number of units of cubes needed to build the three-dimensional object.

f) The teacher guides the students so that they can find the number of units of cubes needed to build object, namely: the number of the length unit multiplied by the number of the width unit multiplied by the number of the high unit.

k) The group discussion and class discussion

1) If students finish in solving these problems, the students are required to discuss the results obtained with a seatmate.

2) The teacher asked six pairs to write down the discussion results that they got. Each student writes one solution for one problem.

3) The expected answers are as follows:

The first object is a cube. The volume of the object is $4 \times 4 \times 4 = 64$ units of volume, and the surface area of the object is $6 \times 4 \times 4 = 96$ units.

The second object is a block. The volume of the object is $6 \times 3 \times 3 = 54$ units of volume, and the surface area of the object is $(4 \times 3 \times 3) + (2 \times 6 \times 3) = 36 + 36 = 72$ units.

The third object is a block. The volume of the object is $7 \times 3 \times 4 = 84$ units of volume, and the surface area of the object is $(2 \times 7 \times 3) + (2 \times 7 \times 4) + (2 \times 3 \times 4) = 42 + 56 + 24 = 122$ units.

The fourth object is a cube. The volume of the object is $5 \times 5 \times 5 = 125$ units, and the surface area of the object is $6 \times 5 \times 5 = 150$ units.

The fifth object is a block. The volume of the object is $8 \times 4 \times 4 = 128$ units, and the surface area of the object is $(4 \times 4 \times 4) + (2 \times 8 \times 4) = 64 + 64 = 128$ units.

The third object is a block. The volume of the object is $12 \times 2 \times 5 = 120$ unit, and the surface area of the object is $(2 \times 12 \times 2) + (2 \times 12 \times 5) + (2 \times 2 \times 5) = 48 + 120 + 20 = 188$ units.

4) Other students are asked to respond to what is presented by the student.

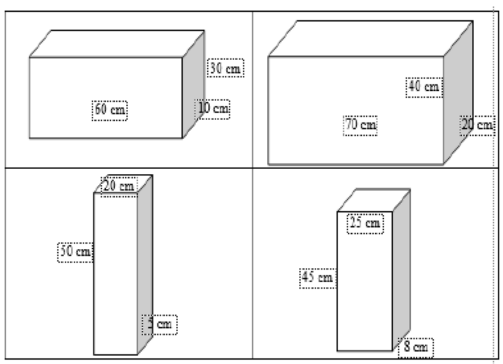
5) The teacher handles the class discussion and guides the discussion so that students can use their findings earlier about the number of units of cubes needed to build object, namely: the number of the length units multiplied by the number of the width units multiplied by the number of the hight units and the students can write down the volume of the cube = the length of the side × the length of the side × the length of the side and the volume of the block = the lenght of the length × the length of the width × the length of the height. In addition, students are expected also to be able to write down the surface area of the cube = 6× the length of the side × the length of the side, and the surface area of the block = 2 × (the long of the length × the length of the width + the length of the length × the length of the height + the lenght of the width × the length of the height).

   This is an attempt to bring out the bridging by characteristics of vertical instruments and the students' characteristics of contributions of RME.

l) The problem of exploration

   1) Students are required to solve the following problem:

      Determine the volume and surface area of these blocks.



   2) If students still have difficulty to understand how to calculate the volume and the surface area of the block, the teacher can help by giving the following question: If the unit cube of the length, width, and height is 1 cm, then "how many unit cubes are needed to make up the length, width, and height of the blocks in the above problems?'. If the students can answer this question, then students are asked "how many unit cubes are needed to fill the blocks in the problem.

m) The group discussion and class discussion

   1) If students finish in solving these problems, the students are required to discuss the results obtained with a seatmate.

   2) The teacher asks four pairs to write down the discussion results that they got. Each student writes one solution for one problem.

   3) The expected answer is as follow:

      The volume of the first block is 60 × 10 × 30 = 18000 cm ^{3}, and the surface area of first block is (2 × 60 × 10) + (2 × 60 × 30) + (2 × 10 × 30) = 1200 + 3600 + 600 = 5400 cm^2.

      The volume of the second block is 70 × 20 × 40 = 56000 cm ^{3}, and the surface area of the second block is= (2 × 70 × 20) + (2 × 70 × 40) + (2 × 20 × 40) = 2800 + 5600 + 1600 = 10000 cm^2.

      The volume of the third block is 20 × 5 × 50 = 5000 cm ^{3}, and the surface area of the third block is (2 × 20 × 5) + (2 × 20 × 50) + (2 × 5 × 50) = 200 + 2000 + 500 = 2700 cm^2.

      Volume beams fourth = 25 × 8 × 45 = 9000 cm3, and the surface area of the beam four = (2 × 25 × 8) + (2 × 25 × 45) + (2 × 8 × 45) = 400 + 2250 + 720 = 3370 cm2.

   4) Other students are asked to respond to what is presented by the student.

   5) The teacher handles class discussion and guides the discussion so that students can use their previous findings, to solve these problems.

      This is an attempt to bring out the bridging by characteristics of vertical instruments and the students' characteristics of contributions of RME.

V. CONCLUSIONS

There are four conclusions can be made from the above explanation, namely:

1. The method used by the researcher in helping students to construct the meaning of the block and cube volume is the packing method.
2. The context developed by the researcher in LTBI to aid students in constructing the meaning of the block and cube volume and the way to find the block and cube volume is to determine the number of the candy in one pack and the packaging shapes that can be formed to pack the number of the candies.
3. The context developed by the researcher in LTBI to help students in constructing the meaning of the block and cube surface area and the way to find of the block and cube surface area is to calculate the minimum paper packaging area required to pack one candy packaging.
4. To improve LTBI that has been developed by the researcher in this paper, the researcher still needs to try out the LTBI in the real class.

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Mathematical Ability of Elementary School Students Based on Cognitive Style and Gender

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***Abstract*—The development of mathematical ability of elementary school students is very important. Education in elementary school is a foundation in mathematical ability at a higher level. In fact, many things can affect students' mathematical ability both physically and mentally of the students. The facts underlying this study were the mathematical ability of elementary school students based on cognitive style and gender. Therefore, the purpose of this study was to examine the cognitive style and gender of the elementary school students' mathematical ability. The employed method was survey method. The subjects of this study consisted of 141 elementary school students on the fourth grade. These elementary school students were scattered in five districts in Banjarmasin. The instruments used were mathematical ability items and Group Embedded Figure Test (GEFT) to determine the cognitive style. Analysis of quantitative data in this study used SPSS 23.0 program. The conclusions that can be drawn from this study are the students' mathematical ability with field independent cognitive style were higher than the students with field dependent cognitive style; there was a significant relationship between mathematical ability and cognitive style in elementary school students. Boys' mathematical abilities were not significantly higher than girls. However, the average mathematical ability of boys was higher than girls. Furthermore, there was no relationship between mathematical ability and gender in elementary school students. Judging from the number of students correct answer on the questions of stuffing in algebraic form, the average students who answered correctly on all questions was 69.9% and the classification was good enough.**

Keywords—Mathematical Ability, Cognitive Style, Gender

I. INTRODUCTION

Mathematics is one of the compulsory subjects in the curriculum of primary and secondary education. This is because mathematics is a knowledge that can improve the ability to think and solve daily problems and the workplaces [1]. The higher the level of education, the higher the high order thinking skills needed. Mathematical ability in elementary school students is a foundation to support thinking skills at higher levels. This is because mathematical concepts are structured in a hierarchical, structured, logical and systematic from the simplest to the complex concept [2].

Mathematical ability is the ability to do mathematics that is measured in the categories of quantitative ability, causal ability, spatial ability, qualitative ability, as well as inductive and deductive abilities [3]. According to the Organization for Economic Cooperation and Development (OECD), fundamental mathematical capabilities among others are communication, mathematicing, representation, reasoning and argument, devising strategies, using symbolic of formal and technical language and operations, and using mathematical tools [21]. Furthermore, mathematical ability is a complex ability that students need to possess in solving mathematical problems.

In fact, there are many things that affect students' mathematical abilities both physically and mentally. In this respect, it is interesting to note that two of them are cognitive styles and gender. Things that affect how students learn can be a way of processing and interpreting information obtained in the classroom. The cognitive style itself is recognized as an important psychological dimension that refers to the difference in the way individuals acquire and process information [4]. The ability to solve math problems in a variety of different ways is influenced by cognitive style [5]. Cognitive style also describes a personality dimension that influences attitudes, values, and social interactions. Furthermore, the improvement of the cognitive processes in students requires attention to the characteristics of each individual student [5].

The cognitive style dimension in this study particularly focuses on field dependent (FD) and field independent (FI). The fundamental difference between these two cognitive styles is seen on how students perceive a problem. Students with FI cognitive style tend to be more analytical in looking at a problem than students with FD cognitive style [6]. Another fact mentioned that students with FD cognitive style find difficulties in processing, but easy to interpret when the information is manipulated according to context. They will be able to separate the stimuli in context, but the perceptions are weak when the context changes [7]. Meanwhile, students with FI cognitive style tend to use internal factors as direction in processing information and perform tasks which are not sequentially [7]. In the other words, students with FD cognitive style prefer to solve problems in a predetermined manner, whereas students with cognitive style FI are more analytical and free to express with ideas in solving problem.

Furthermore, gender in mathematics learning is also interesting to discuss. If we hear the word "gender", it is often associated with sex (male and female). In fact, the meaning of gender differs from sex. Based on the Oxford English Dictionary, gender refers to differences in men and women based on cultural and social differences (masculine, feminine, or neutral), whereas sex refers to biological (natural) differences as men and women [8]. In other words, gender is considered as a social construction and gender differences are considered contextually and non-permanently bound, as they are not genetic [9]. Based on some studies, for example, the study conducted at Australian elementary school students on the students aged 8-11 years, the mathematical ability of boys is superior to girls [10]. This is similar to the research of mathematical ability in elementary school students in Germany [11]. The report of PISA 2015 states that gender differences in science tend to be small, but on average in 33 OECD member countries, the top-performing students in science of boys are bigger than girls. However, Finland is the only country where girls are more likely top performers than boys [22].

This difference in mathematical ability based on gender is because girls have less spatial experience outside school than boys. Many girls are less likely to explore their potential to think spatially unless the spatial thinking which is taught in the school curriculum [12]. In addition, girls who are superior in mathematical communication skills (verbal) are more motivated and organized in learning. Further, boys are superior in reasoning and have better mathematical and mechanical skills while women are superior in accuracy, precision, thoroughness, and thoughtfulness. This distinction is not real at the elementary school level, but becomes more apparent at a higher level [12].

Based on the description above, the purpose of this study are:

1) To examine the relationship between mathematical ability and cognitive style at elementary school students.
2) To examine whether the mathematical ability of students with FI cognitive style is higher than students with FD cognitive style.
3) To examine the relationship between mathematical ability and gender at elementary school students.
4) To examine whether the mathematical ability of boys is higher than girls.

II. Method

The research method is a procedural part as an effort to answer the research problem. This study was conducted as an attempt to examine mathematical skills based on cognitive style and gender in elementary school students. To answer this research question, quantitative survey research was done by providing mathematical ability test and Group Embedded Figure Test (GEFT).

A. Research Subject

The subjects of this study were 141 elementary school students in Banjarmasin taken from five samples: 35 students in North Banjarmasin, 23 students in South Banjarmasin, 29 students in Central Banjarmasin, 25 students in West Banjarmasin, and 29 students in East Banjarmasin. The five samples have the same character that is the fourth grade students who have studied the material related to this research. The students come from five different schools from each sub-district in Banjarmasin.

B. Data Collection

Data collection in this study used a test instrument: a multiple choice test and a short-answer test to measure the mathematical ability, and Group Embedded Figure Test (GEFT) to determine the cognitive style of students in each school. The multiple choice test of 25 questions were standard questions taken from the national mathematics exam in 2015. The five short-answer test is a matter of algebra with two of them were open-ended questions. The time given for this test was 90 minutes.

Furthermore, the Group Embedded Figure Test (GEFT) is a standard test used to determine the level of a person's cognitive style [13] [14] [15]. This test consisted of three parts for 15 minutes. Part 1 was part of the exercise, which contained 7 relatively easy forms. Parts 2 and 3 contained 9 forms each. Only sections 2 and 3 were scored, with the highest score of 18. This cognitive style dimension consisted of dependent fields (scores 0 to 9) and independent fields (scores 10 to 18). Each correct answer was given a value 1. Problem solving is considered "true" if the student succeeds in finding a simple form in a complicated form. The found form must have the same size, comparison, and direction. The reliability coefficient of GEFT has been calculated by previous research with Cronbach alpha, which was 0.84 [16]. This means that GEFT reliability belongs to high reliability.

III. Results And Discussion

The results of this study were quantitative data obtained through mathematical ability test and Group Embedded Figure Test (GEFT). Data were obtained from 141 elementary school students in Banjarmasin city. Prior to further inferential statistical testing, normality and homogeneity test were performed on independent variables (mathematical ability of students) with SPSS 23.0 program. The normality test of this study was performed by Kolmogorov-Smirnov test, with Asymp value. Sig. 0.05 which means that the data were normally distributed. Then, the homogeneity test data used Levene test with Sig. value 0.161 which means that the data were homogeneous. After the assumption test was met, description of data processing of cognitive style, gender, and mathematical ability of elementary school students were analyzed.

A. Mathematical Ability and Cognitive Style in Elementary School Students

The mathematical ability instrument analyzed was multiple choice test. The analysis of mathematical ability scores and cognitive style (FD and FI) of elementary school students in descriptive statistics can be seen in Table I.

TABLE I. DATA OF MATHEMATICAL ABILITY AND COGNITIVE STYLE

Cognitive Style	N	$\bar{X}$	SD	x_{min}	x_{max}
FD	116	15.02	4.390	5	24
FI	25	20.28	3.612	12	25

Based on Table I above, it can be seen that from 141 students, 116 students were with FD cognitive style and students with cognitive style FI were as many as 25 students. This means that most elementary students have a FD cognitive style. Students with FD cognitive style are difficult to process, yet easily interpreted when the information was manipulated according to the context [7]. This is corroborated by Piaget's statement that elementary school students are at the concrete operational stage. At this stage, students are able to understand the existing definition and re-reveal it. However, it has not been able to formulate its own definitions properly, and has not been able to master abstract ideas and verbal symbols [17].

Table I also shows that students with FI cognitive style have higher means of mathematical ability scores than the students with FD cognitive style. This is consistent with the minimum score and maximum score in students with FI cognitive style which were higher than students with FD cognitive styles. The cognitive style differences of FD and FI on students' mathematical abilities are strengthened through inferential statistical analysis. The average difference test was performed with two independent samples T-test obtained Sig value 0.000 < $\alpha = 0.05$. This means that the mean of mathematical ability of students with FI cognitive style is significantly higher than students with FD cognitive style. The facts of this study are corroborated by the assertion that students with FI cognitive style tend to be more analytical in viewing a problem than students with FD cognitive style [6], thus it influences their learning outcomes.

Furthermore, to know the relationship of cognitive style with mathematical ability of elementary school students, correlation and regression test were done. This can be seen in Table II below.

TABLE II. CORRELATION BETWEEN MATHEMATICAL ABILITY AND COGNITIVE STYLE

		Cognitive Style
Mathematical Ability	Pearson Correlation	0.429
	Sig. (2-tailed)	0.000
	N	141

Table II shows the value of Pearson Correlation obtained by 0.429 and the value of Sig. was 0.000 < 0.05, meaning that there is a significant relationship between mathematical ability and cognitive style of elementary school students.

Subsequently, a simple regression analysis of mathematical ability score (Y) and cognitive style (X) was performed which resulted in a constant of 9.754 and regression b of 5.263. This means that the regression equation between mathematical ability and cognitive style is $\hat{Y} = 9.754 + 5.263$ X. Regression test based on ANOVA table obtained the value of F for 31.309 with the value of Sig. 0.000. Because of the significance value of 0.000 <$\alpha = 0.05$, it can be concluded that the coefficient of regression equation is significant. Furthermore, the analysis to see the magnitude of the effect of X on Y was done by looking at the coefficient of determination on regression analysis. R Square value obtained was 0.184 or 18.4%. This value indicates that 18.4% students' mathematical ability is influenced by cognitive style through linear relationship, while 81.6% is influenced by other factors. This means that the higher the student's cognitive style, the higher the mathematical ability is. That is, the more students who have FI cognitive style, the higher the achievement of mathematical ability. This cognitive style is indispensable to students in solving mathematical problems because mathematical characteristic is abstract, as well as problems in mathematics require solutions and solutions in detail to obtain correct results [18].

B. *Mathematical Ability and Gender in Elementary School Students*

The analyzed mathematical ability instrument was multiple choice test. The analysis of mathematical ability scores and gender of elementary school students in descriptive statistics can be seen in Table III below.

TABLE III. DATA OF MATHEMATICAL ABILITY AND GENDER

Gender	N	$\bar{X}$	SD	x_{min}	x_{max}
Boys	60	16.55	4.044	9	25
Girls	81	15.51	5.119	5	24

Based on Table III above, it appears that 141 elementary school students involved in this study consisted of 60 boys and 81 girls. The mean of mathematical ability score of boys was higher than girls. This is consistent with the minimum score and maximum score by boys higher than girls. This fact is reinforced by previous studies which suggest that the mathematical ability of boys is superior to girls [11][10].

This needs to be reinforced by inferential statistical analysis. The mean difference test was performed with two independent samples T-test obtained Sig value. 0.097 > $\alpha = 0.05$. This means that the mathematical ability of boys is not significantly higher than girls. This is reinforced by previous research which states that the difference in mathematical ability is not real at the elementary school level but becomes more apparent at a higher level [12]. Both boys and girls have their own advantages. Boys are superior in reasoning and have better mathematical and mechanical abilities, while girls are superior in accuracy, precision, rigor, and thoughtfulness [12].

Furthermore, to know the relationship of mathematical ability and gender of elementary school students, the correlation test was done. The result can be seen in Table IV below.

TABLE IV. CORRELATION BETWEEN MATHEMATICAL ABILITY AND GENDER

		Gender
Mathematical Ability	Pearson Correlation	-0.110
	Sig. (2-tailed)	0.194
	N	141

Table IV shows that the Pearson Correlation value obtained -0.110 and the Sig value was 0.194 > 0.05, meaning there is no significant relationship between mathematical ability and gender of elementary school students.

Limitations in this study are not measuring other aspects that can affect students' mathematical ability. In addition, in this study the measured mathematical ability is less detailed and general, such as measuring problem solving ability, representation, reasoning, and others.

C. *Mathematical Ability of Elementary School Students*

In the previous discussion, we have analyzed the students' mathematical ability with multiple choice test. In this section, the instrument of mathematical ability was using a short-answer test. The short-answer test consisted of 5 items, which was a matter of algebra and 2 of them were open-ended item. Each problem was analyzed by looking at the number of students who answered correctly on the matter. The following table shows the percentage of students who answered correctly from all subjects (141 students).

TABLE V. PERCENTAGE OF CORRECT ANSWER ON EVERY ITEM

Item	Number of Students Replied Correct	%
1	130	92.2
2	69	48.9
3	118	83.7
4	104	73.8
5	70	49.6
Mean		69.9

Table V above shows that the mean of students to answer correctly on all questions was 69.9%. This percentage indicates that the ability of elementary school students to solve algebraic problems is good enough. Furthermore, students who answered number 1 correctly were as much as 92.2%. In question number 2, students who answered correctly were as much as 48.9%. Students answered correctly about the number 3 as much as 83.7%. Students answered number 4 correctly as much as 73.8% and the number 5 as much as 49.6%. The facts show that item 2 and 5 are difficult. Students' ability to solve algebra problems needs to be improved. In fact, algebra has been widely recognized as one of the most difficult topics which leads to learning difficulties worldwide [19]. This suggests that the algebra problem belongs to a high-order thinking ability.

IV. CONCLUSIONS

Based on the theoretical review and supported by hypothesis test that refers to the purpose of this study, it can be concluded that the mathematical ability of students with FI cognitive style is higher than students with FD cognitive style; there is a significant relationship between mathematical ability and cognitive style in elementary school students. Boys' mathematical ability is not significantly higher than girls although the mean of boys mathematical ability of is higher than girls. Furthermore, there is no relationship between mathematical ability and gender in elementary school students. Judging from the number of students who correctly answered the short-answer test in algebraic form, the means of students correct answer on all items is 69.9%. The percentage indicates that the ability of elementary school students in Banjarmasin in solving algebra problem is good enough.

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The Development of Learning Device to Improve the Quality and Learning Result of Mathematics

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***Abstract*—The aims of this development research were: (1) to produce a learning device in the form of Lesson Plan (LP) and Student Activities Sheet (SAS) at Relation and Function as main subjects which were appropriate to be used in Mathematics learning of class VIII, (2) to describe the appropriateness of the learning device that has been produced, and (3) to describe the quality of learning and learning result after using the learning device that has been arranged. The limited trial involved 16 students and the field trial involved 24 students. The instruments of data collection were observation sheets, interview guides, and test of learning result. The data were analyzed using qualitative descriptive and descriptive statistical analysis. The results of this study were: (1) the learning device has been obtained through seven of ten stages of development from Borg & Gall; (2) the learning device is appropriate to use in class VIII; and (3) the learning device can improve the quality of learning and students' learning result at relation and function subject.**

Keywords- Development; Learning Device; Quality

I. Introduction

The 2013 curriculum for junior high school students in Pekanbaru was applied in academic year 2013/2014 in six schools which consisted of three public schools and three private schools. The implementation was supported by some roles from Ministry of Education and Culture, which were related to competency standards, content standards, process standards, assessment standards, textbook, and teacher's guidebook. Furthermore, syllabus is also applied nationally. With the syllabus and textbook that have been provided in the national level, teachers are demanded to prepare and implement the learning accurately. The textbook spells out the students' minimum effort to achieve the competence expected. The role of the teacher is very important to increase and adjust the students' ability with the availability of activities on the students' book [1].

Teachers can develop the students' ability in the form of the other appropriate and relevant activities which come from the social and natural environment. Therefore, teachers must be able to design a learning device that is appropriate with the basic competencies to be achieved and challenges the process of the students' thinking through the activities to reach the attitude, knowledge and skills [2].

Therefore, schools in Pekanbaru do some ways in implementing the learning. There is a teacher implementing the learning by assigning the students to discuss the problems in the textbook individually and groups. Moreover, there is a teacher using another problem to be discussed by the students but the problem is not provided yet in the form of student activities sheet which challenges the students to think and involve actively in learning.

The information obtained from the teachers of SMP that have applied the 2013 curriculum is as follows: (1) teachers feel overwhelmed in designing lesson plan for each meeting accurately which is appropriate with the curriculum and (2) teachers cannot create student activities sheet which challenge the students to involve actively in constructing their knowledge. Basically, schools have already had learning device such as lesson plan and student activities sheet, but learning device that is designed by the teachers does not yet describe the students' participation actively in learning. Learning device used by the teachers is not yet arranged based on the understanding on each learning component. Therefore, teachers are not ready in developing a learning device individually which is appropriate with the 2013 curriculum. According to [3], in designing a good learning device, a teacher must understand the purposes of the learning that should be achieved by the students, learning materials which are going to be learned, methods, learning techniques and the ways to design the assessment tool.

The application of the 2013 curriculum requires learning media which can make students reach the competence of attitude, skill, and knowledge that has been formulated at graduate competence standard (SKL). As stated in the role from Ministry Education and Culture No. 22 year 2016 that learning process in educational units is organized interactively, in inspiring form, fun, challenging, motivating students to participate actively, as well as providing enough room for initiative, creativity, and self-sufficiency in accordance with talents, interests, physical, and psychological development of students.

Based on the difficulty experienced by teachers in implementing the 2013 curriculum, it is necessary to do a development research related to learning media consisting of lesson plan and student activities sheet in mathematics. Lesson plan can be utilized by teachers as guide in implementing the learning and student activities sheet as one of learning sources for students so that it can enhance quality of process and students' learning achievement. This study is expected to generate learning device which can develop activity, creativity, and productivity of students in learning mathematics. This paper presents the report of the implementation of the development research related to Relations and Functions material in class VIII through the application of cooperative learning approach Think Pair Square (TPS).

Think Pair Square (TPS) is one of approaches that gives opportunity to students to work alone and work together with other students [4]. At first, students are given opportunity to build their own knowledge and think actively in discovering concept of material that is learned (think) so that they can develop their ability in mastering the material. This is in accordance with the learning theory of Constructivism which states that students must find their own knowledge, really understand it and can apply their knowledge. Next, students discuss to solve problems with their pair in one group (pair). Students will exchange opinions on the knowledge that has been acquired at an earlier stage. Students have the opportunity to discuss with students who have high academic ability or with students who have medium and low academic ability. Thus, students can see the other way in solving problem. In this stage, students can develop their knowledge, test the ideas and their own understanding. In the end, students can unify ideas between pair in one group (square). In this stage, students will become easier to reconstruct their knowledge.

II. METHOD

This research and development was done by using seven of ten stages of development from Borg & Gall [5]. The activities undertaken at each stage of development are as follows.

(1) Research and information collecting: (a) Analysis of curriculum to analyze Standard Competency 3.3 and Standard Competency 4.3 mathematics subjects for grade VIII in Indonesian curriculum; (b) Analysis of learning devices made by teacher and compare with the provisions set by the 2013 curriculum; (c). Analysis of student characteristics related to the initial knowledge and level of thinking; (d) Analysis of learning materials by identifying, detailing, and systematically compiling relevant concepts.

(2). Planning. In this stage, lesson plan and student activities sheet were designed based on needs analysis. Lesson plan and student activities sheet are prepared for six meetings, covering learning materials: (a) to understand relation and how to express it; (b) to understand function and how to express it; (c) determine the number of mappings in two sets and one-to-one correspondence; (d) the function formula, function value, and value of the change; (e) express a function form if the value and function are known; (f) application of relation and function in daily life.

(3). Developing preliminary form of product: (a) discussing the design of lesson plan and student activities sheet with three mathematics teacher; (b) validating the design of lesson plan and student activities sheet by validator that are three lecturer of Mathematics Education. The validators assesed the design of lesson plan and student activities sheet by filling the validation sheet. The design of lesson plan and student activities sheet were revised according to validator's suggestion.

(4) Preliminary field testing. The lesson plan and student activities sheet were tested on a small scale (limited trial) involving 16 students grade VIII Babusalam Junior High School. The students were asked to do student activities sheet and fill a student response questionnaire about student activities sheet and completed with interview.

(5) Main product revision. The trial results are used to fix design of lesson plan and student activities sheet so that produce a product called prototype I.

(6) Main field testing. The prototype I was tested on the real subjects of 24 students from grade VIII of Babussalam Junior High School. The teacher was asked to implement learning based on lesson plan that has been arranged. Students are required to learn by using student activities sheet.

(7). Operational product revision. The trial results are used to improve prototype I so that a product called prototype II was produced. Stages 8 to 10 have not been done in this research, which were: operational field testing; final product revision; and dissemination and implementation.

The data of this research were qualitative and quantitative. Qualitative data owere btained from: comments and suggestions from validator on lesson plan and student activities sheet; and observation result of the implementation of lesson plan. Qualitative data were also obtained from discussions with students and teachers. Quantitative data were obtained from questionnaires given to validators to assess lesson plan, student activities sheet and student response questionnaire on student activities sheet.

Validation sheet of lesson plan and student activities sheet using Likert scale consisted of four alternative answers, namely 1, 2, 3, and 4 which were catgeorized as very unsuitable, inappropriate, appropriate, and highly appropriate. The validation sheet of lesson plan was created to assess the aspects of subject identity, indicators and instructional goal, materials selection, learning method selection, learning activity with cooperative learning of TPS, learning source selection, and assessment of learning outcome. The validation sheet of student activities sheet was created to assess the quality of student activities sheet materials content, suitability of student activities sheet with cooperative learning of TPS, suitability of student activities sheet with didactic conditions, suitability of student activities sheet with construction requirements, and suitability of student activities sheet with technical requirements. Student response questionnaire on student activities sheet used Guttman scale consisting of two alternative answers, namely Yes or No. The questionnaire contained some statements consisting of positive and negative statements and viewed from the following aspects: language, display, picture, and content of student activities sheet.

The validation sheet of lesson plan and student activities sheet were analysed using the following mean formula [6].

$$\bar{M}_v = \frac{\sum_{i=1}^{n} \bar{V}_i}{n}$$

Where [redacted] = average total validation; $\bar{V}_i$ =average validation of the i-validator and n : number of validators
The category of validity using criteria from [7] and can be seen in Table 1.

TABLE I. VALIDITY CATEGORY OF LEARNING DEVICE

Interval	Category
$3,25 \leq \bar{x} < 4$	Highly Valid
$2,50 \leq \bar{x} < 3,25$	Valid
$1,75 \leq \bar{x} < 2,50$	Fairly Valid
$1,00 \leq \bar{x} < 1,75$	Invalid

Students' responses on student activities sheet were analysed using Q Cochran test. Moreover, open observation was used to observe the implementation of lesson plan. The observer was the teacher.

III. RESULTS AND DISCUSSION

The purpose of this Research and Development was to produce lesson plan and student activities sheet at the topics of Relation and Function in the eighth class. The development was started from the phase of potential and the problems from need analyses that the researcher did, involving: content and base competences, students' characteristic, and material analysis. Then, the material needed for designing learning device was collected. The learning device which has been arranged was validated. The average validation score of lesson plan was 3.79 and student activities sheet was 3.82. As a whole, learning device was viewed as very valid. The validators stated that the learning device was suitable to be tried out with revision based on the advices given. Validated lesson plan and student activities sheet were analyzed and used as the base to revise design.

The validated learning device was tried out in small group, and students' responses were asked through Student activities sheet. The result of Q Cochran test showed that the students' response was good. Then, the researchers revised the learning device based on the result of trying out to small group. The result was prototype I.

After that, the researchers tried out it in the large group in the classroom at the school regular time. In this phase, the teacher was asked to handle teaching suitable with the lesson plan has been arranged and the students learn how to use student activities sheet that has been developed. The field try out was done in class VIII4 of SMP Babussalam. The material was Relation and Function. The teaching process was done twice a week, three hour period and two hour period.

At the Think phase, students' activities were increased at every meeting. At the first meeting, the students have not got self-confidence to do student activities sheet individually. As a result, the students were lazy to read student activities sheet. Some students discussed with friends and copied other students' answers. However, the researchers always reminded students to do student activities sheet individually and there would be the time for discussing. For the next meeting, the students became more familiar to the phase of Think Pair Square, and the researchers only administered the process of learning.

At the first pair phase, there were still many pairs of students who did not discuss. Some have not seriously discussed in pairs. The students just copied others' work. There were some students who directly discussed with the group. These faults were decreased in the next meeting.

At Square phase in the first meeting, the students have not done discussion well. Some students have not taken part in the activities of group discussion. It was signed by the students who were joking and chatting each other. There were some members of the group working individually and also those who did not participate in the group discussion. The researchers gave explanation in order to have awareness to participate in the discussion activities, and also do good tasks arrangement of group member in writing the result of discussion. At the next meeting, the students started to be active in discussion activities. In this phase, the researchers gave guidance to the group which found difficulties in doing student activities sheet. Students' activities in discussion activities were increased at every meeting.

Students' presentation has been done well. The students became more active and thought critically in giving response and opinion to the group of presenter. Moreover, the students looked active to share the conclusion of material learned. Students' activities have been done well and suitable to the planning. The researchers also have organized the time well. Thus all teachers and students activities run well as the planning.

The result of Q Cochran test of trying out in large group showed that the students' response toward Mathematics lesson set was good. The researchers revised the lesson set to be suitable to the result of large group try out, and it became prototype II.

Based on the result of observation toward teacher and students' activities, it can be stated that by applying cooperative learning, TPS approach increased at every meeting. The students participated actively in learning process through stated phases of learning. The students were asked to optimize responsibility in the phase of individual thinking and group discussion to understand given material. According to [8], cooperative learning model is suitable to make sure individual accountability in group discussion that guarantee involving all students and become excellent effort to increase individual responsibility in group discussion.

Applying learning model with TPS approach in this learning has given a chance to students to comprehend lesson material and increase students' participation in group discussion. TPS is a technique that provides the students opportunity to work individually and cooperate with others [4].

Another superiority of this technique is how to optimize students' participation.

Percentage of the students who reached Minimum Mastery Criteria (MMC) increased from 23.07 to 61.53. The increasing of students' percentage showed that there was the increasing of students' achievement. The increasing of students' achievement occurred because in cooperative learning with TPS approach, the students with groups were given opportunity to actively participate in order to discover the concept of material individually. By discovering, learning becomes meaningful, and the knowledge is stored in long term memory. Constructivism theory from [8] mentions that learning will be more meaningful for students if they construct the concept by their own than only accept the teacher's explanation.

IV. CONCLUSION

This research and development has produced products in form of Lesson Plan and Student Activities Sheet at Relation and Function as main subject through the application of cooperative learning of Think Pair Square for six meetings. The learning device is considered valid after validation process by validator and practical to use by learners for grade VIII after a limited trial and large group trial. The resulting product can improve the quality of learning and students' learning result.

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Students Success in Mathematics and Its Relationship with the Attitude toward Numeracy Learning

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***Abstract*—This research aims to determine students' success in mathematics and its relationship with the attitude toward numeracy learning. This research was held at the SDN Cindai Alus 1 Banjar district Academic year 2015-2016. The research lasts for three months from January until March 2016. The method used in this study was a survey correlation technique. The target population of this research was all students of SDN Cindai Alus 1 Banjar. The population was the fourth grade students who are taking math lesson. The total sample as a whole was 60 students. The instruments to retrieve the data were in the form of questionnaires and documentary. The aspects of students attitudes toward math lessons that were observed in this study includes cognition, affection and conation. The results showed that: (1) the value significance of students' attitudes toward math was greater than a 0.05 which was 0.56 and normally distributed; (2) the variance of the relationship between students' attitudes toward math lesson with students success in mathematics expressed linearly with F count < F table (2,626 <4:00); (3) there is a significant relationship between students' attitudes toward math lesson with students success in learning math in elementary school where R count > R table (0423> 0254); and (4) the more positive students attitudes toward math lesson, the higher the students' success in learning math.**

***Keywords*—Attitudes, Learning Math, Learning Outcomes**

I. INTRODUCTION

Improving the quality of human resources can not be separated from how education can produce skilled manpower in their respective fields, or in other words, graduates of the high quality educational process. Education begins from elementary school to university/college. In this process, basic education is one of the main determinants of the success of national education. This is because basic education is a prominent foundation which is decisive in the formation of students attitudes and intelligence. On this basis, the effort to improve the quality of basic education is a determining factor for the success of efforts to improve the quality of national education. It is arranged in the Government Regulation No. 19 of 2005, 3 stating that "The purpose of primary education is laying the foundation of intelligence, knowledge, personality, character, and skills to live independently and to follow further education. To achieve the objectives referred, Kemendikbud (Ministry of Education and Culture) enacts 2006 curriculum where coverage among other groups of subjects in science and technology including elementary math lesson.

Mathematics is important in everyday life when it is seen by the things related to science, both in the field of exact and in other knowledge fields that require math. On the other hand, a lot of students have difficulties in learning mathematics compared to other subjects. Various efforts have been initiated and developed continuously by the government, private sector, or group of teachers' professional organizations, ranging from the improvement of the curriculum, providing workshop associated with the implementation of curriculum, provision of textbooks, learning and CAR (Classroom Action Research) training strategies, complementary means of infrastructures, and other mathematics props.

In fact, the students ability in the learning mathematics is still weak. In addition, there is still less impact of students mastery in mathematics learning outcomes. Their learning outcomes are still low as has been seen from observations and interviews with the teachers where this research was carried. The daily tests score, the task of training given to students both at school as well as home and mathematics test results obtained the average score of 50.5. It has not reached a score of 65 according to the standardized set KKM (Minimum Graduation Criteria).

The results of mathematics learning is supported by the research conducted by Susanto, showing that the results of school exams (UN and UASBN) average learning score outcomes of primary school students was between 5 and 6, and even smaller than that. These results indicated that the students ability in math is still low [1]. The results of the evaluation of low quality of education in mathematics, conducted by "The Third International Mathematics and Science Study-Repeat" [2] reported that students' mastery in basic education (2nd grade junior high scool) in mathematics surveyed internationally put Indonesia on 36th ranks out of 49 countries. The score obtained by the average 397 points from the average standard international score of 500 [2].

Based on these data, it can be inferred that the mastery of math concepts of elementary school students learning process is still not implemented optimally, whereas the students' mastery in mathematics would be a means to help a variety of subjects both at the same education level or at a higher level. The efforts and activities that have been implemented in order to improve the learning process, especially in improving the learning results still do not meet the expectations of the government, the public, as well as parents and teachers, who teach in schools, not just math skills, and learning results are still lack even the students who behave negatively on their math lessons assuming that math is such a desperate lesson, this view shows the students' attitudes toward math.

A positive attitude in mathematics is very important and needs to be shared by all students so they can feel pleased to accept the lesson attentively and actively involved in the study and the individual task or in groups and finally getting better learning. It is supported by the research results by Lin Shu-Hui which showed students' attitudes toward math plays an important role in the learning process for students with a positive attitude in mathematics correlated with higher student achievement [3].

In connection with the above description, fundamental repairs are needed in terms of both internal and external in the implementation of learning mathematics. One of the internal factors that can be carried out to see increased students success in mathematics is to investigate the relationship between students' attitudes toward arithmetic learning with outcomes of mathematics.

This study aims to determine the students success in mathematics and its relationship with the attitude toward arithmetic learning in the fourth grade students of SDN Cindai Alus 1 Kab. Banjar.

A. The Nature of Learning Outcomes

Russell [4] gives the sense that "Mathematics is the queen of the sciences" mathematics acts as both queen and servants to another science. Higgens stated math is the science of learning concepts, symbols and the relationship between the two [5].

Similar opinion was expressed by Daen that mathematics is influenced by the development and advancement of technology and the development and progress of science. Math is a mental activity to understand the meaning of relationships and symbols which contain in mathematics systematically, carefully and rightfully, and then applying the resulting concepts to solve problems in different ways, circumstances or real situations. To assess the success or failure of students in learning, it should be measured through achievement test.

Groundlund gives the sense that the learning outcomes are a number of abilities of the students as a result of learning activities [6]. Then Suprijono [7] stated that learning outcomes are patterns of action values, understanding the attitudes of appreciation and skills.

Five basic ability as result of learning are intelectual skills, cognitive strategies, verbal information, motor skills, and attitudes that have become private property and allow it to do something [8]. The lhe learning outcomes can be measured in two dimensions: (1) the level of performance with the indicator to remember, to understand, to use, and to find (2) the type of field of study with the indicator is facts, concepts, procedures, and principles [9].

The amount of time spent on reading theory, writing or answering questions, following by the math lesson, studying materials of mathematics both from teachers and other sources will have a very positive relationship with the results of students' mathematics learning.

Based on the description of the theory that has been stated above, we conclude that mathematics is the study of a collection of ideas that are abstract, with the structures and relationships are arranged according to a logical sequence and utilizing the method of deductive reasoning. It is also a tool that helps to solve problems of other sciences, both fields of exact and non-exact (especially problems relating to the calculation). In addition, based on the opinions and thinking of the experts that have been uncovered above, it can be concluded that the results of learning mathematics is students' mastery of subject matter previously gaining learning experience shown by students through teacher's test scores.

B. The Nature of Students Attitudes toward Numeracy Lesson

Attitude is one element of personality that must be held to determine the actions and behave to an object is accompanied by positive and negative feelings. Attitude is a system that is settled inside the individual in the form of positive and negative assessment in which there is a tendency to accept or reject [10]. The same opinion is expressed by Sanjaya that attitude is a person's tendency to accept or reject an object based on the value he/she thinks is right [11].

Students' attitudes toward the math subject cannot be separated from his perception, his way of thinking, attention, interest, memory, etc. Mathematics is one of the objects of psychology that can be connected with positive and negative feelings. Thus, the students' attitudes toward mathematics courses can be seen from the way he responded to the subjects of mathematics in the classroom and outside the classroom. Students need to have a positive attitude toward the subject, students' positive attitude will grow and develop interest, motivation to learn and easy to absorb the subject matter provided. Anwar reiterated in more details that a person's attitude toward an object always plays a role as an intermediary between its responses to the relevant object. The respond includes cognitive, affective and conative [12].

Similarly, students' attitude toward math is shown through feelings and assessment of the benefits of lessons given. Students who have a sense of interest in this learning can foster the interest in learning and feel pleasure in doing the teachers assignment. If the students have grown the interest, it will be followed by willingness of the students to receive lessons given. Similarly, the assessment of the benefits associated with a math lesson. When students know and realize that math is useful to support in learning other sciences as well as for a judgment, it will affect the study results.

Feeling, willingness and assessment of arithmetic given benefit is the positive attitude of students toward these subjects. Students who were positive about math would classify math as a fun and interesting lessons to be learned with his own consciousness not merely because of the demands of the curriculum and teacher. On the contrary, students who feel negative on math classify math as a boring, unattractive and consider mathematics a waste of time to learn, and work on a job involuntarily.

So the meaning of students' attitudes toward arithmetic in this paper are internal factors that influence the students and are a manifestation of feelings, a willingness and assessment of arithmetic presented and developed by teachers including interest, curiosity, enthusiasm, accuuracy, independence, and the benefits and uses of arithmetic accompanied by positive and negative feelings.

II. METHOD

The research was conducted in the fourth grade of SDN Cindai Alus 1 Banjar district from January to March 2016. The method used in this study was a survey correlation technique. The target population of this study was all students of the Elementary Schools in Banjar District Region academic year 2015/2016, while the sample was the fourth grade students at SDN Cindai Alus I in a number of 60 students.

The data collection techniques used questionnaires, tests, and documentaries. Questionnaire techniques used to collect students data of the attitudes toward arithmetic (X1), while the data on students learning outcomes in math (Y) used documentary techniques namely by taking the score of the test that has been given by mathematics teacher in the first half of semester.

The collected data were were analyzed using descriptive statistics and inferential statistic. The inferential analysis was used in accordance with the required tests, including tests of normality, linearity, and hypothesis testing research on each variable.

III. RESULTS AND DISCUSSIONS

The research instrument used in this study consisted of two types, namely the students learning outcomes and the attitudes toward mathematics and arithmetic. The instruments were not tested because the test has been created by the teachers and have already tested to students. Instruments of students attitudes toward math subjects were tested with 50 point statement, and after tested, 10 points were invalid and only 40 points that were used for research. The results of the test instrument turned out that students attitudes toward arithmetic has a very high reliability. This is shown by the price of R = 0.95.

TABLE I CORRELATIONS

		Attitudes	Results
attitudes	Pearson Correlation	1	,423**
	Sig. (2-tailed)		,001
	N	60	60
results	Pearson Correlation	,423**	1
	Sig. (2-tailed)	,001	
	N	60	60

a. **. Correlation is significant at the 0.01 level (2-tailed).

Based on the calculation results showed that the students' attitudes toward math lessons obtained the maximum score 113 and minimum score of 60, an average of 91.25, and a standard deviation of 10.83.

Normality test data used Kolmogorov-Smirnov test. To determine the normality of the data, it used the Asymp value comparison. Sig.2-tailed at the alpha level of 0.05 (Syarifudin, 2010: 143). The test results are presented in Table II.

TABLE II NORMALITY TEST DATA BY ONE-SAMPLE KOLMOGOROV-SMIRNOV TEST

		Students Attitudes	Learning Results
N		60	60
Normal Parameters[a,b]	Mean	91.25	63.50
	Std. Deviation	10.833	8.991
Most Extreme Differences	Absolute	.115	.068
	Positive	.096	.068
	Negative	-.115	-.056
Test Statistic		.115	.068
Asymp. Sig. (2-tailed)		.056[c]	.200[c,d]

From Table II above, it can be seen Asymp value. Variable Sig.2-tailed students attitudes toward math lessons are 0:56, and the variable learning outcomes were 0.200. Both grades Asymp. Sig.2-tailed for each of the variable value was greater than alpha level of 0.05, it can be concluded that the data were normally distributed.

TABLE III NORMALITY TEST DATA BY ONE-SAMPLE KOLMOGOROV-SMIRNOV TEST

		Students Attitudes	Learning Results
N		60	60
Normal Parameters[a,b]	Mean	91.25	63.50
	Std. Deviation	10.833	8.991
Most Extreme Differences	Absolute	.115	.068
	Positive	.096	.068
	Negative	-.115	-.056
Test Statistic		.115	.068
Asymp. Sig. (2-tailed)		.056[c]	.200[c,d]

Based on the above table, the normality test results showed that for the calculation of Kolmogorov-Smirnov test for each variable had a value Asymp. Sig.2-tailed respectively each variable. Variable Attitude 0.056 and 0.200 variable results. Third Asymp value. Sig.2-tailed for each of the variable value was greater than alpha level of 0.05, it can be concluded that the data were normally distributed.

Linearity test according to Nisfiannor (2009: 92) is performed to determine whether the relationship between the dependent and independent variables is linear (straight line). Linearity test conducted by F test, if the value of F count is smaller than the F table at significance level of 5% as well as the significance value greater than 5%, then the data will have a linear relationship [12].

Based on Table III above, it can be concluded that the relationship between students attitudes and math lesson where F count < F table (2,626 <4,00) then the variance of the relationship between students' attitudes toward arithmetic and mathematics learning outcomes is linear.

The hypothesis testing of this study used Pearson Product Moment correlation techniques on students' attitudes toward count learning variable. The hypotheses are as follows: H_o: There is no relationship between students' attitudes and math learning outcomes in mathematics at SDN Cindai Alus 1 Kab. Banjar.

H_a: There is a relationship between students' attitudes and learning numeracy to math learning outcomes in SDN Cindai Alus 1 Kab. Banjar.

TABLE IV RESULTS OF THE CORRELATION BETWEEN STUDENTS' ATTITUDES AND NUMERACY LEARNING IN MATHEMATICS OUTCOMES AT SDN CINDAI ALUS 1 KAB. BANJAR

			Sum of Squares	df	Mean Square	F	Sig.
Learning results students attitudes *	Between Groups	(Combined)	3742.333	31	120.720	3.292	.001
		Linearity	853.260	1	853.260	23.271	.000
		Deviation from Linearity	2889.074	30	96.302	2.626	.006
	Within Groups		1026.667	28	36.667		
	Total		4769.000	59			

Based on Table IV, it was obtained the Sig. 0.001 <0.05, it can be concluded that there was a relationship between the students' attitudes and mathematics learning outcomes or in other words, H_0 was rejected and Ha was accepted.

Meanwhile, to see the level of relations between the two variables, it was obtained by comparing the value of r tables that can be gained through r Product Moment table with the number of df = 60 (df = n-1) at the 5% significance level that is equal to 0.254. The value of r count> r table (0, 423> 0.254), then the level of the relationship of variable students attitudes to learning outcomes was significant.

This indicates that the higher the students' attitudes toward math, the higher the obtained students learning results are. Conversely, the lower the students' attitudes toward math the lower the obtained results learning are. The result of this study showed that math learning outcomes scores of the fourth grade students of SDN Cindai Alus 1 is quite satisfactory with a percentage of 70% and the range of scores (54.509 -71.991). This is partly due to the different students' ability to understand the material given, learning strategies applied by teachers in the classroom, and students' readiness to accept a given subject matter.

According to the table of the results of correlation between students' attitudes and learning outcomes in mathematics at SDN 1 Banjar Cindai Alus obtained r count at 0.423 and Sig. 0,001. This result showed that students' attitudes were significantly related to the results of studying mathematics at SDN Cindai Alus 1 Banjar, meaning that the higher the students' attitudes toward math, the higher the students math learning outcomes. Conversely, the lower the students' attitudes toward math, the lower the students math learning outcomes.

Meanwhile, in terms of the degree of closeness between variables, the correlation criterion was 0.423 showing that there is a relationship between students attitudes and mathematics learning outcomes. It is under low category. Low positive attitude category toward math impacting the students learning outcomes they gained. Therefore, in the context of the classroom, every teacher is responsible for developing a positive attitude toward mathematics material on all students that will be useful to solve problems in their future life.

This is in accordance with the opinion of Huang and Lin [3] that the students 'attitudes toward math plays an important role in the learning process, students' positive attitude toward math is correlated with high achievement as well. In addition, in developing a positive attitude, evaluation position in learning is very important and cannot be separated from the learning activities.

IV. CONCLUSIONS AND SUGGESTIONS

Based on the research that has been done, it can be concluded that there is a relationship between the students attitudes to solve counting problems and the students math learning outcomes at SDN Cindai Alus 1 Banjar. These findings suggest that the higher the students' attitude to solve counting problems, the higher their math learning outcomes.

Some insight on this research is namely: first, students should be positive on math and realize the duties and responsibilities of studying and practice, as well as the willingness to accept arithmetic without coercion to gain knowledge and mastery in math. In mathematics there are prerequisites material that must be controlled by the students before the next material is given. Therefore, it is necessary to study, practice, in order, thorough, and organized more in the effort on answering the questions. Students should not feel satisfied with the score they obtained now to get more optimal learning results.

Second, teachers should foster and enhance a positive attitude and a sense of responsibility in students both in the aspects of academic and non-academic by taking into account the personality and characteristics of each student individually to prepare a plan and present the lessons with good and attractive not only to master the material, but mastering a lesson counting as a knowledge base for the next steps. Giving routine testing should be given by teachers to determine students mastery of the lessons given both advantages and weaknesses as a basis of learning improvement.

Third, the Institute of Education Workforce Education (LPTK) in this case PGSD as an educational institution that produces prospective elementary school teachers should be a model and provide adequate opportunities and provide intensive training to begin designing the learning activities and doing it with the learning practice through simulation activities with their friends in class. A positive attitude of students in mathematics learning can be enhanced by including as much material as other science coverage in discussing mathematics through a thematic approach in which the material is taught integrated with other subjects according to the KTSP curriculum and the 2013 curriculum.

This research still needs to have further comprehensive research, by examining psychological factors other than those examined in this study to investigate wider with other variables associated with an increase in other learning outcomes with more samples.

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5th South East Asia Development Research (SEA-DR) International Conference

Mobile Learning: Visualization Tools of Data Structures Course to Support Learning Students

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***Abstract*— Mobile learning course of data structure, it cannot only be used as auxiliaries of learning, but also an independent learning mode. The various approaches theory of research and development, software design, and methods we use into built of media. The main objective is the construction of educational software adapted to learning. First and foremost, it is essential to have in mind that our application is designed for two very specific public; on the one side the lectures, who will use it as a teaching tool, and another side the students, for learning purposes. This research has created a mobile learning application for courses of data structures, the learning material is presented visually according curriculum-syllabus and learning outcomes of data structures. This application as one a learning media to support students who can be used all the time (long life learning).**

Keywords—Mobile Learning, Data-Structures, Course, Students, Visualization.

I. Introduction

In Computing Curricula, the curriculum guidelines for undergraduate Degree Programs in Computer Science [1] and Computer Engineering [2] study of fundamental concepts, terms of data structures and the skills, necessary for their use in modeling real-world tasks, are a part of the subject matter of the Fundamental Data Structures and Algorithms (knowledge area Software Development Fundamentals and Algorithms and Complexity) courses [3]. The study of data structures and algorithms provides insight into the intrinsic nature of the problem as well as possible solution techniques independent from programming language, programming paradigm, computer hardware, or any other implementative aspect [1].

Reference [1], explains that data structure is knowledge area defining the central concepts and skills required to design, implement, and analyze algorithms for solving problems. Algorithms are essential in all the advanced areas of computer science: artificial intelligence, databases, distributed computing, graphics, networking, operating systems, programming languages, security, and so on. Algorithms that have specific utilities in each of these are listed in the relevant knowledge areas. However, many students find those difficult, less interest, passive, lazy to learn them. This is because this material requires abstract thinking [4], and learning of data structures is complex issue for many students [5-8], and complexity is defined as a problem that can have several solutions. Data structure is an important subject for 2nd year students at University of Mulawarman (UNMUL), but it is difficult to work with them due to their abstract nature [9].

Failure into learning [10] and understand the courses leads to significantly lower student learning outcomes at the final semester [11]. Solution to understand complex data structures or algorithm is to see them in action [12]. The present work a new tool for develop, and implement mobile learning of data structures for supporting on students' learning. This is especially useful for students and lecturers in computer science in UNMUL.

Mobile learning tools developed to make a learning of data structures course is easy and interesting. While using these tools, the tool would allow students to see the workings of common operations in form of changes that take place to the corresponding data structure. Moreover, this tool would provide a simple language, they understand how to the material course work, and how the operations are executed. It would be very helpful if there were a visualization tool of data structures for students to experiment.

This study is intended to create such an exploration environment, in which students can learn through experimentation. The tool can be used as an effective supplement to the traditional classroom education and textbooks for data structures courses. The application package presented in this paper has the following functionality: (1) Provides a visual learning materials based on the curriculum syllabus and learning outcomes of data structures course, (2) The materials of teaching include of theory and basic concepts, the complexity of the algorithm, an online reference list, the simple code of material, running the program output is presented in a visualization and animation, and (3) Provides simple animation for user-defined algorithms and common operations, such as inserting an element and deleting an element from the specified data structures.

II. Related Work

A. A Review of Research on Mobile Learning

Mobile technologies, such as smartphones, tablets, and laptops, as well as online applications, networking, internet and tools [13-15], became an integral part of the lives of most teachers and students in East Borneo. These devices have transformed the way that people communicate, search for information and work. The challenge for the educators and researchers was to explore how mobile technologies might be used to support learning [16-17]. In 2015, Indonesian mobile cellular users, especially in major urban centers, had firmly adopted mobile cellular services in all walks of life including e-education [18]. Mobile devices have become an attractive learning tools for education. Existing research has mainly focused on the value of mobile learning for students [19] and teachers [20].

Mobile learning research on the subject has been done by the data structures in [8] with study reports on various papers on how researchers - computer scientists have gone about to tackle the problems faced by students in learning data structures and various approaches that are taken to make data structures learning more fun and effective. This literature review includes various tools, technologies, advantages of using these technologies and suggestions on the techniques that can be combined for effective learning of data structures.

III. Research Design and Methodology

This study requiring to design and development of mobile learning tool for data structure courses intended for an Undergraduate Degree of informatics engineering class, the tool was designed with the initial objective of creating an instructional assist for the students of the Informatics Engineering course at UNMUL. The ultimate goal is to develop and implement of the mobile learning based on android as a learning resource to support in an effort to increase student interest and creativity in learning of data structure courses.

A. Research Methodology

Research methodology in this paper uses of approaches educational Research and Development (R&D), to develop and validate of mobile learning. The steps of this process are referred to as the R & D cycle, which consists of studying research findings pertinent to the product to be developed, developing the product based on the finding, field testing it in the setting where it will be used eventually, and revising it to correct the deficiencies found in the field testing stage. indicate that product meets its behaviorally defined objectives [21].

B. Design Software for Mobile Learning

The Software Development Life Cycle (SDLC) is a domain of competency used in systems engineering, information systems and software engineering to describe a process for planning, creating, testing, and deploying an information system [22]. The software development models used in building mobile learning of data structures courses is V-Shaped Model [23]. The V-Shaped SDLC Model is an extension of the waterfall model that introduces the added responsibility of defining the criteria for system testing-evaluation during each stage of the system design.

C. Architecture System for Mobile Learning

There are 3 key elements that must be provided in the development of mobile learning system, in "Fig. 2" is the availability of network infrastructures, smartphone devices, and application software.

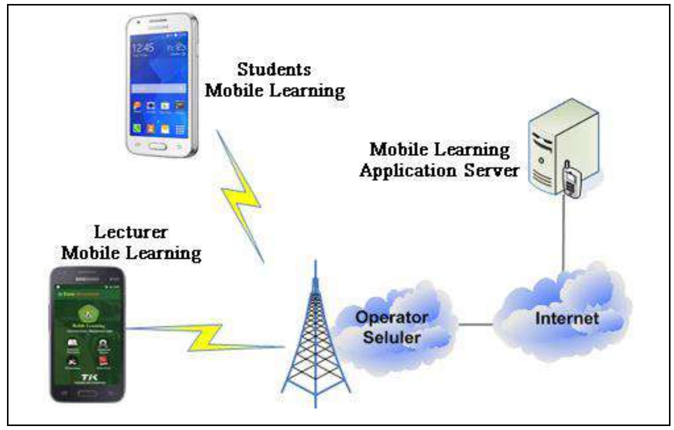

Fig. 1. Structure of mobile learning system

1) Network infrastructures: in Samarinda city, the availability of mobile networks has researchers did a study of quality of service mobile network in Samarinda [14], [24].

2) Devices smartphone: Generally, every student has a smartphone that can to support mobile learning applications,

3) Application software: for the availability of software applications, we design and develop of mobile learning course for the data structure that can support learning 2nd year students for undergraduate Degree Programs at UNMUL.

Framework adaptation mobile learning environment, the system architecture is designed based on the 5R adaptation from framework [25], [26]. The adaptation mechanism and process shown in "Fig. 2". The platform is based on the 5R input ontology that ensures all the learning contents developed to be used by the 5R adaptation mechanism.

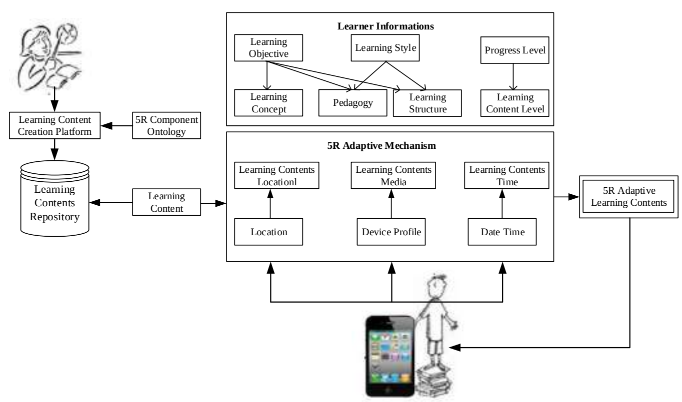

Fig. 2. The 5R adaptation mobile learning system architecture

D. Software Analysis and Design

The design and development of mobile application determined as hard procedure regarding to technical phases such as software programming, interface designing and familiarity with smart phone hardware. The analysis and design software used in the development of this system using object-oriented modeling Unified Modeling Language (UML) for object visualization [27]

IV. Results

Implementation is the realization of an application, In the implementation phase, the application of mobile learning course data structure is run to see how the system was built and worked in practice.

A. Implementation: Role assignments of user

In "Fig. 3", who explained the role assignment mobile learning, for student, presented the menu option include information learning outcomes for a course and syllabus, the student can do a searching the material topic include references.

The main activities student in the mobile learning is the access to the material, in this menu, students can do learning materials of data structures course, learning materials that contains; basic theory, weaknesses and strengths of materials, complexity, steps to resolve the algorithms, examples source code program, and visualization of running a program that can set its value by the user. For the lecturer, perform activities of material management, reference, information that will be presented to students.

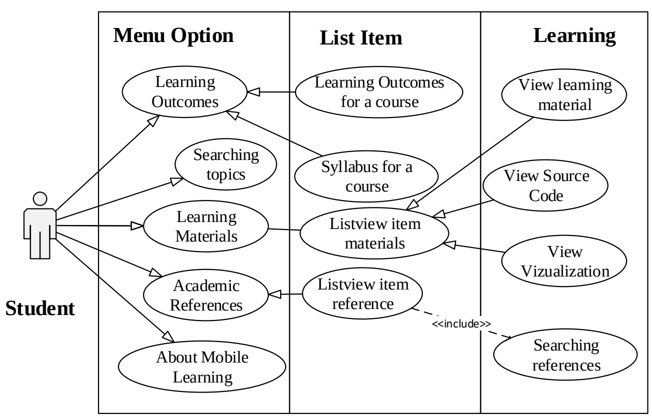

Fig. 3. Use case diagram for students

In general, hierarchical information about the content of the learning material on the mobile learning can be seen in the mind map diagram, see in "Fig. 4".

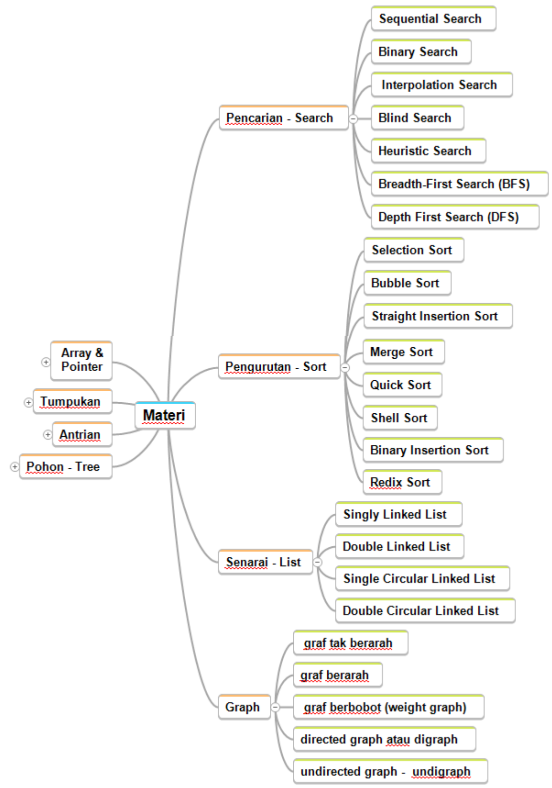

Fig. 4. Mind-map diagram material learning of data structures course

B. Implementation: User interface module

The real mobile application which can be installed on Android system was one of the ultimate production of this study. It is conceived as a learning system with a base on mobile android, utilizing smartphone a student's for learning, and organizing the students' learning process anytime and anywhere. The main user interface can be seen in "Fig. 5(a)", showing a menu of options provided, such as;

1) Learning outcomes: data structures in accordance with curricula-syllabus, and learning outcomes of the course see in "Fig. 5(b)".

(a) (b)

Fig. 5. User interface main module and learning outcomes

2) Searching material: can do a quick search keyword order by name or title in the database system, the references, contains reference materials used in teaching this course. can be accessed online at the website address link source and the reference list of books related material. See in “Fig. 6”.

Fig. 6. User interface module references

3) M-Learning, contain instructional material taught during the semester, which includes material arrays, pointers, list, stack, queue, tree, sort, search, and graph the kinds and types of each packaged in the form of learning theory, source code, and animations interactive visualizations. See “Fig. 7”.

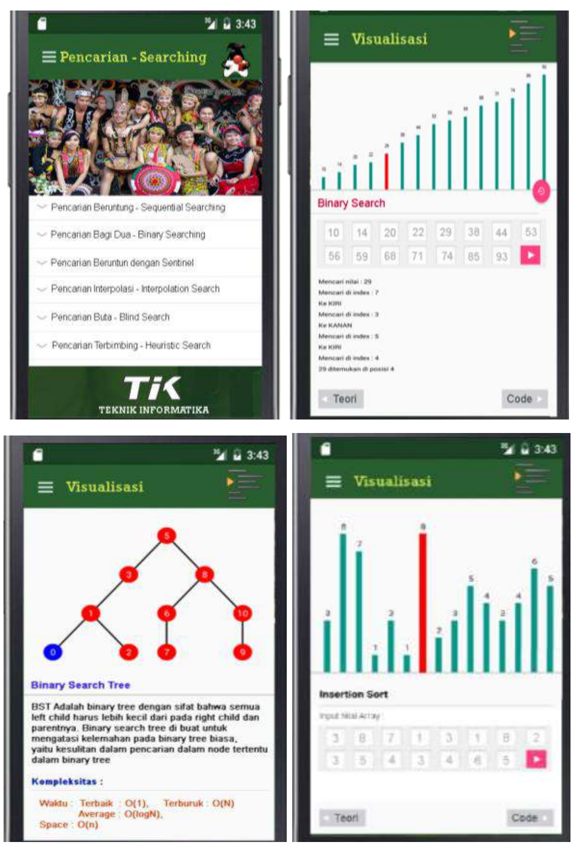

Fig. 7. User interface module m-learning

V. Discussion and Conclusion

From the teaching work in these years, we deeply feel that the data structures course is so important for students in the study of computer science and technology. How to turn this course from a difficult and boring course into an interesting course is becoming an urgent issues. Student teaching experience from previous years into our evaluation that this year is much better.

The student difficulties in learning this course encourages teams to develop learning tools that utilize the smartphone device that students have for learning media. A mobile learning media to subject the data structure with the theoretical material in accordance with the course syllabus. To be easily understood by the students, presenting the material is accompanied by examples of the application in a simple case study, with source code and running code in the form of animated visualizations that move output and attractive. Development and implementation of mobile learning data structures course, it can not only be used as auxiliaries of learning, but also an independent learning mode.

The media has been used by 2nd-year students for undergraduate Degree Programs informatics UNMUL in this semester and is still used as a supporting media lecturer's in teaching. The final evaluation of the use of mobile learning media in lectures this semester, we will do with analyzing the media's impact on student learning outcomes are achieved, and in the next academic year we will continue to develop these tools, additional material, and examples of exercises for each material. otherwise it is not only limited in platform android but also for other mobile platform.

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