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Development of High School Biology Students Worksheets Based on Critical Thinking Skills on the Concept of the Digestive System

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ABSTRACT

One of the problems of life that are happening right now is the problem in education. Three skills need to be improved including 1) the field of cognitive skills, 2) interpersonal skills, and 3) intrapersonal skills. The purpose of this study is to improve the Student Worksheet (LKPD) so that it has effective criteria. The use of LKPD in the learning process is expected to improve students' critical thinking skills. The research method used is the Tessmer design using a small group test. Critical thinking skills refer to Facione 1990 while the structure of LKPD development refers to Daryanto & Dwicahyono. The small group test subjects were six high school class XI students. This research is development research using Tessmer design. The study was conducted for one semester, namely in the 2019-2020 school year. The results showed that the effectiveness of LKPD based on the assessment of students' critical thinking skills in working on LKPD had a category of at least good, interpersonal skills had a very good category, and intrapersonal skills had a very good category.

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A. Introduction

Some problems must be faced in the 21st century, including the problems of survival to the problems of education. This century of education is a digital era education, also known as the industrial revolution era 4.0. Education is demanded to be able to create a generation that is skilled in using technology, able to survive by using life skills, which are hard skills and soft skills which include higher-level thinking skills (Trilling & Fadel, 2009).

In 2011, the National Research Council (NRC) established three skills that needed to be improved, namely: (1) cognitive skills, one of which was critical thinking skills, (2) intrapersonal skills, one of which was self-management, and (3) interpersonal skills, one of which was collaboration.

Critical thinking skills need to be improved, one of the efforts made is to roll out the 2013 curriculum and be carried out in stages since 2014. The learning process in the 2013 curriculum includes three domains of assessment, namely affective, cognitive, and psychomotor owned by students. One of the tools considered to be able to facilitate critical thinking skills possessed by students is LKPD. The problem that often occurs is the use of LKPD is currently not able to maximize the learning process in achieving learning objectives.

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The student worksheets that are currently circulating lack emphasis on the learning process, but most contain a summary of the material. The material presented is not accompanied by structured steps about a concept formation (Iqbal, 2017). Mayasari, et al. (2015) reported that LKPD used in schools currently do not train students to conduct an inquiry process.

This LKPD research development was carried out on the concept of the Digestive System. The main material of the digestive system in humans and animals has special characteristics, that is the physiological processes are abstract, discuss the complicated process mechanisms that are difficult to understand, and involve various other internal organs to carry out their functions. This is thought to cause mastery of biological subject matter not yet optimal, this is following research reported by Lukitaningsih (2015) that the lowest results of the repeat analysis are on the basic competence of the human digestive system which is only 59%, with an average value of 69, thus needed a solution to increase understanding of the material. The results of previous interviews conducted with the teacher of SMAN 6 Banjarmasin stated that the existing LKPD still needed improvement because it had not led students to investigate a problem.

One way that can be done is to produce LKPD that emphasizes KBK through development research aimed at producing LKPD products that are valid, practical, and effective. This LKPD obtained through development research is LKPD that has gone through stages of improvement through microcycles to produce a prototype (Tessmer, 1993). The final product of development has valid, practical, and effective criteria (high-quality intervention) (Plomp & Nieveen, 2007). Therefore, it is necessary to research the development of worksheets for biology students based on critical thinking skills, especially on the concept of the Digestive System.

B. Materials and Methods

The type of research used is the EDR (Educational Design Research) research using the Tessmer design (Tessmer, 1993). The stage used is a small group test. The study focused on the effectiveness of expectations carried out during small group testing. The small group test subjects were 6 students of class XI MIA 2 SMAN 6 Banjarmasin in odd semester 2019/2020 which were chosen based on their academic values, ranging from low, medium, and high classes.

Data on the effectiveness of expectations were collected using students' critical thinking skills assessment sheet instruments, interpersonal skills (collaborating), and intrapersonal skills (rigorous). Data on students' thinking skills are obtained from the assessment of each task done by students while interpersonal and intrapersonal skills are obtained from observers' observations of students' attitudes using the established instruments.

Data analysis techniques for students' critical thinking skills using the formula:

$$P = \frac{\mathrm{f}}{\mathrm{N}} \mathrm{X}\ 100\%$$

The intrapersonal and interpersonal skills data analysis is performed using formulas:

$$X = \frac{\text{Jumlah skor yang diperoleh}}{\text{Jumlah skor maksimal}} x\ 100\%$$

Then the final result uses the categories 75.01-100.00% (very good), 50.01-75.00% (good), 25.01-50.00% (good enough), 00.00-25.00% (not good) (adapted from Akbar & Sriwiyana, 2010).

C. Results and Discussion

The final results of the improvement of LKPD on the concept of the digestive system consist of five topics, namely (1) Tests of Food Substance Content, (2) BMI and BMR, (3) Healthy Menu, (4) Digestion Organs and Their Functions, and (5) Abnormalities or Disorders of the Digestive System Bioprocess. The effectiveness test results obtained from the expectations of critical thinking skills critical, interpersonal skills (cooperation), and intrapersonal (thorough). The average results of critical thinking skills are presented in table 1. The average results of interpersonal (collaborative) and intrapersonal (rigorous) skills are presented in table 2.

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Table 1 Average of Students' Critical Thinking Skills

No	Skills	Score Max	LKPD				Average	Score (%)	Category
			I	II	III	IV			
1	Interpretation	14	-	11,17	10,17	-	-	10,67	Very good
2	Analysis	10	-	8,50	8,83	-	6,00	7,78	Very good
3	Evaluation	20	-	-	18,00	-	-	18,00	Very good
4	Inference	24	-	22,00	22,67	20,58	19,67	21,23	Very good
5	Eksplanation	20	16,71	11,08	18,00	11,00	16,00	14,56	Good
6	Self-regulation	12	8,00	-	-	7,08	11,67	9,33	Very good

Information:
1. Categories 75.01-100.00% is very good, 50.01-75.00% is good, 25.01-50.00% is less good, 00.00-25.00% is not good (adapted from Akbar & Sriwiyana, 2010).
2. LKPD I = Food Test, LKPD II = BMI and BMR, LKPD III = Healthy Menu, LKPD IV = Digestive System Organs and Their Functions, LKPD V = Digestive System Disorders / Disorders.

Table 2 Interpersonal Skills and Intrapersonal Skills of Students

No	Name	Interpersonal Skills (%)	Category	Intrapersonal Skills (%)	Category
1.	Septia Putri N	88	Very good	77	Very good
2.	Nur Huda Fadila	77	Very good	88	Very good
3.	Alisa Amelia	77	Very good	88	Very good
4.	Rahmawati W	88	Very good	88	Very good
5.	Eurika	88	Very good	77	Very good
6.	Siti Muzdalifah	88	Very good	88	Very good
Average		82,5	Very good	82,5	Very good

Information:
Categories 75.01-100.00% is very good, 50.01-75.00% is good, 25.01-50.00% is less good, 00.00-25.00% is not good (adapted from Akbar & Sriwiyana, 2010).

Table 1 explains the skills of critical thinkers and students in the least good category. The next stage is to analyze the results of interpersonal and intrapersonal skills. Table 2 explains students have interpersonal skills (cooperation) and intrapersonal skills (meticulous) very good categories with the same average score of 82.5.

The effectiveness of a development product according to Plomp & Nieveen (2007) can be viewed from the consistency between design and the learning experiences and outcomes of students. The effectiveness of LKPD expectations in this study was measured based on students' critical thinking skills in working on LKPD tasks, interpersonal skills (collaborating), and intrapersonal skills (conscientious). As for the differences with other studies (Hairiani, et al., 2016; Zaini & Jumirah, 2016; Rachman, et al., 2017; Zulyusri, et al., 2017) which explain effectiveness is measured from learning outcomes, activeness of students, analytical skills students, process skills, performance skills, spiritual assessment, critical thinking assessment, social skills assessment, student activity assessment, and teacher activity assessment.

The assessment aspects of critical thinking skills assessed include interpretation, analysis, evaluation, inference, explanation, and self-regulation following the Facione model. The results showed the LKPD had the effectiveness of expectations with a category of at least good based on students' critical thinking skills. This is in line with previous studies (Nuraini, 2017; Susilowati, et al., 2017) which explain that each critical thinking skill has a different score and criteria for each skill.

In the research of Critical Thinking-based LKPD products can improve student learning outcomes and activities (Arafat, et al., 2012; Herdianawati, 2013) reported that the developed LKPD was said to be feasible because it had fulfilled the critical thinking questions. One of how it can be done is to improve the skills of critical thinkers by using LKPD in the learning system because with the

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use of LKPD students can play an active role and take control to solve the problems faced. This statement agrees with Astuti et al. (2017) which explains that so students are actively involved in critical thinking, one alternative that can facilitate is the use of LKPD where students can express their ideas and opinions in criticizing a problem.

In addition to critical thinking skills, there are two other skills in determining the effectiveness of expectations in the development of LKPD products, namely interpersonal (collaborative) and intrapersonal (rigorous) skills. In this study, the students' interpersonal skills assessed were collaboration. There are four criteria for assessment aspects in cooperation, namely the division of labor, unselfishness, ways of solving problems, and tolerance (Stevenson, 2006).

This research is in line with Apriyani (2013) which states that with a good cooperative attitude, the learning outcomes of students are also better. In this study stated that the attitude of effective cooperation is enhanced through peer tutoring learning models. The Peer tutor model has a series of activities such as discussions in working on the activity sheets provided by the teacher. Like this research, students work on LKPD in groups in the hope that the cooperative attitude of each individual will emerge.

Based on observations, it was found that the students 'collaborative attitude had a very good category so that the students' critical thinking skills also obtained results with a category of at least good. This is supported by Trianto (2007) that interactions with parents, especially in arguing that parents and men have discussions can clarify that thinking is more logical. Collaboration activities of students in learning activities according to Isjoni (2009) can provide a variety of experiences. u They are more likely to get the opportunity to speak, initiate, make choices, and generally develop good habits.

Based on the results of the assessment of the observer found that interpersonal skills possessed by students have a very good category with an average score of 82.5%. In previous studies (Hendrik & Elmansyah, 2018) reported that students' interpersonal skills can be improved through peer tutoring activities. Based on the scores obtained students are expected to have the ability to establish and maintain relationships with others and interact effectively.

In this study, the intrapersonal skills to be measured are the attitudes possessed by students. Based on the results of the assessment of the observer obtained a score of 82.5% with a very good category for this attitude. There are three aspects of the assessment in a rigorous attitude, namely doing every stage of LKPD work correctly, doing all stages of activities in LKPD, and doing it on time. Based on the scores obtained, it is expected that individuals have good self-management skills making it easy to develop them and adapt.

D. Conclusion

The effectiveness of LKPD expectations is known through the results of students' critical thinking skills that have at least good categories, interpersonal skills (cooperation), and intrapersonal skills (meticulous) which are stated to have very good categories with a percentage of 82.5%.

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