

The Development of Interactive Multimedia Learning Pyramid and Prism for Junior High School Using Macromedia Authorware

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ABSTRACT

Limited access to information due to the unavailability of internet connection in remote areas of Indonesia, especially in South Kalimantan, causes low mathematics achievement of students in junior high school, so still, require offline packages of learning such as interactive multimedia learning, therefore this study aims to develop interactive multimedia learning of pyramid and prism. The research was applied Luther (1994) method that consists of six steps: concept, design, collecting material, assembly, testing, and distribution, and for the development was using Macromedia Authorware. The result is an interactive multimedia learning pyramid and prism with following the description of the steps of developments.

Keywords: interactive multimedia pyramid and prism, mathematics achievement.

INTRODUCTION

The current globalization era, the development of science and technology is growing rapidly which effects of the progress or the decline of a nation. The progress can be realized in life if human resources having the ability of science and technology in any various fields. Therefore, various ways related to the improvement of the quality of human resources, especially through education. Education can be interpreted as a process of training and teaching for individuals to achieve knowledge, understanding, skills development and behavioral ways that suit their needs. Moreover, education also is a very important factor in improving human quality.

Various efforts have been made by education managers to develop education in order to improve student learning achievement by optimizing the available educational resources. One of the goals of today's education is to provide stock so that we can function effectively in this era of technology.

Mathematics as the science underlying the development of modern technology has an important role in various disciplines and advances the human mind.

In fact, mathematics is indeed considered the most difficult lesson for both children and adults (Reynolds, 2008). In Indonesia, this can be seen from the survey that conducted by Trends in International Mathematics and Science Study and by Organization for Economic Co-operation and Development by using PISA instrument, showed that the achievement of Indonesian student on mathematics are still low with ranking 45 and 69 from 55 and 65 countries (Mullis et al., 2015; OECD, 2017).

The successful of mathematics learning process during this time is still experiencing many obstacles because of the dominance of teachers in learning is still high, the lack of use of media and props (Fitriah, 2011). In the delivery of learning, teachers pay less attention to the use of learning media to help students understand the concept of mathematics (Anggraeni, 2012).

Mathematics consists of four aspects: algebra, arithmetic, geometry, and analysis. Geometry has been taught since elementary school, but it turns out students' ability in solving three-dimensional problems are still low (Fitriana, 2010). In fact, this material is very important to learn the next material on a higher level of education.

In the three-dimensional learning process, teachers typically use three-dimensional learning media that has been provided in schools such as props pyramid and prism made of wood or other concrete objects. However, not many teachers utilize existing technology in delivering learning materials whereas today's technology has contributed greatly to providing educational media in education.

Information and Communication Technology (ICT) has spread to almost every aspect including the world of education (Neo & Neo, 2014). One technology that developed in the world of education is multimedia technology which has a very important role in the learning process (Mumpuni, 2013). It is expected that multimedia can bring a positive impact on classroom learning that can bring learning into an active, fun and effective and can overcome the problems that we have often encountered in the world of education, especially mathematics subjects.

Multimedia is a way to produce and deliver learning materials by combining several types of computer-controlled media where the interactive multimedia program is one of computer-based learning media that combines and synergizes all media consisting of text, graphics, photos, videos, animations, music, narration and interactivity programmed by theory and principles of learning (Warsita, 2008).

One of the computer programs that support for making interactive multimedia learning is Macromedia Authorware. Macromedia Authorware is a multimedia software that integrates with global network internet with graphical display sound, digital movie, video and interaction buttons that can generate its own attraction (Adjarriawan, 2011).

Limited access to information due to the unavailability of internet connection in remote areas of Indonesia, especially in South Kalimantan and regarding to the background, it is important for researchers to contribute in providing an interactive multimedia learning, especially for the pyramid and prism material which created by using Macromedia Authorware.

LITERATURE REVIEW

Multimedia Learning

Multimedia learning is a multimedia application used in the learning process, in other words, to channel the message (knowledge, skills, and attitudes) and can stimulate thoughts, feelings, attention and willingness to learn so intentionally the learning process occurs, aimed and controlled (Ariani & Haryanto, 2010). While the interactive multimedia is a multimedia display designed by the designer so that it can meet the function of informing the message and has interactivity to its users (Munir, 2012).

Multimedia interactive learning has its own characteristics such as having more than one convergent media (can combine audio and visual elements), interactive, has the ability to accommodate user responses, is self-contained, provides convenience and completeness of the content so that users can use without the guidance of others.

In addition, interactive multimedia learning should meet the following functions: be able to strengthen user response as quickly and often as possible; able to provide opportunities for learners to control their own pace of learning; notice that learners follow a coherent and controlled sequence; and able to provide opportunities for participation of users in the form of responses, either in the form of answers, selection, decisions, experiments, and others. The interactive multimedia learning capabilities of interactive multimedia have several capabilities not shared by other media; multimedia provides an interactive process and provides ease of feedback, giving multimedia freedom to learners in determining the topic of the learning process, giving multimedia ease of systematic control in the learning process (Lee, 1999).

The benefits that can be gained from the interactive multimedia learning is the learning process is clearly more interesting, more interactive, the amount of teaching time (lectures) can be reduced, the quality of student learning can be more motivated and boosted and learning can be done anywhere and anytime (very flexible), as well as student attitudes and attention can be improved and centered (Ariani & Haryanto, 2010).

Text Design and Multimedia Learning Layout

The text is a learning multimedia component that is very important in delivering a learning message. For that the use of text in the development of multimedia applications need to pay attention to the way or technique that is the use of concise but solid text, use the appropriate typeface and font, make sure the text can be read, the selection of writing style and text color and the selection of fonts and concepts consistently (Munir, 2012).

Some considerations of text design in multimedia view, among others (Marzuki, 2009):

- a. Consider formatting, a text designed for easy reading.
- b. Text design is a visual hierarchy; people tend to read the largest element, then the smallest.
- c. The text arrangement should improve readability.
- d. All factors of letter spacing, word spacing, and line spacing are easy to read, communicative and expressive.
- e. Consider using letters, use original characters, and think about positive/negative spaces.
- f. When mixing the text surface, it must be ethnically adapted to the message, contrast, weight, scale and visual hierarchy.
- g. Avoid anything new or decorative typeface.

Munir (2012) explains that to create text in the development of multimedia products there are several ways that can be used include:

- a. Be careful in choosing the appropriate font type so that the display on the computer screen is not hard to read.
- b. Use of large number faces of font type on one screen should be minimized.
- c. Spacing the characters, lines, and spacing between text and text with other objects such as images.
- d. Use text of any size, type, thickness, and so on to deliver messages to attract more users and should use larger text and bold fonts.
- e. Use white text if the background is black or dark and avoid using the same color or color mix that resembles the background color.

In addition to text, another thing to note is the layout (layout) multimedia. Layout (layout) is the placement of text, images, audio, video, and animation as a multimedia display of learning (Marzuki, 2009). The placement of multimedia elements greatly affects messages or information visualized because of improper placements the impression is unattractive; otherwise, the perfect placement will give the impression that multimedia display is interesting (Marzuki, 2009).

Implementation of all layers visualized with the same concept (not exactly execution), in the design of visual communication this is called unity, which uses the audio and visual language harmonious, intact and matching so that the teaching materials are perceived as intact (Marzuki, 2009).

To help the execution of layout can be made grid system, that is division of field according to ergonomic element functions, for example laying of navigation adjusted with mean of command of navigation, navigation 'next' placed on the right and 'back' placed on the left and so forth (Marzuki, 2009).

Preparation of the text is consistently left, right, or symmetrical depending on the desired concept, but the left flat layout tends to give the impression of informal and flowing, left-right average more formal and rigid impression, and symmetrical memorable very formal and the layout is made more for the purpose of adding value to the communicative aspects of multimedia learning, not for beauty alone (Marzuki, 2009).

As a first step, you should create a simple layout, so that visualization is not complicated to reduce noise on the clarity of the content of teaching materials and also intended for the subject matter easy to remember and the layout is expected to meet the aesthetic rules, among others: the composition is maintained and produces rhythm, balance, and controlled harmony. Keeping the simplicity can be done by choosing the right graphics layout, minimal and matching according to the character of information and pay attention to the closeness of the layout to the characters/habits of the target or the tastes of students who are in most of the young dynamic spirited and in preparing the layout of the multimedia display of learning need to consider the principles of balance, contrast, harmony, proximity, and repetition (Marzuki, 2009).

Macromedia Authorware

Authorware is multimedia software that integrates with global internet network with graphical display of sound, digital movie, video and interaction buttons that can generate its own attraction (Adjarriawan, 2011). Authorware is used to create interactive programs that integrate various multimedia content (Wikipedia, 2012). Currently, Authorware 7.0 has two choices of programming languages namely Authorware programming languages and JavaScript language version 1.5. The use of icons and the flow line under which Authorware is operated makes it easy to create interesting tutorial applications. The use of a flow line differentiates Authorware from other authoring programs, such as Adobe Flash and Adobe Director that rely on visual timelines and action scripts

RESEARCH METHODOLOGY

This research was applying Luther (1994) method which then modified by Sutopo (2009) into six stages: concept, design, collecting material, assembly, testing, and distribution as explained below:

1) *Concept*

Stage of concept making is the initial stage in making multimedia-based learning media. What is done in this concept stage is the determination of the purpose of the use of instructional media, determining who can use this learning media and analyze the extent to which the material will be applied in this multimedia learning.

2) *Design*

In the design stage, is to specify in detail about the structure of media, style, and material needed. In this design phase begins by arranging the order of presentation and arranging the flow of learning flowchart. This is done in order to make multimedia learning more focused.

The steps of design include: writing the script material that will be made as a multimedia learning, composing the contents of the outline in the media learning, storyboard making, arranging the flow of learning in the form of a flowchart, and the design of learning media layout. The design of media layout done with the help of some image editor such as Adobe Photoshop 7.0 and Paint.

3) *Material collecting*

This stage is the stage of collecting materials and also the advanced stage of the design stage.

The sequence in the process of collecting materials includes the collection of materials needed for multimedia learning such as animation, music, video, and images. For animation and video creation, researchers use some supporting software such as Macromedia Flash MX, Macromedia Flash 8, Swish Max 4.0, Adobe Flash CS4, and Anim FX and development of test questions (Competency Test) which further compilation of test instruments pay attention to several things, referring to education unit level curriculum, assessments viewed from the cognitive aspect, the items are multiple choice items.

4) *Assembly*

Assembly is the stage where all multimedia objects are created or inserted into each frame called screen mapping. The steps taken in the manufacture of the media begin by integrating all the material that has been made into the layout according to the storyboard and transfer all the components that have been made into the screen mapping by using flow line on the Macromedia Authorware program.

5) *Testing*

Stage testing is done by running the application for errors tracer for application improvement (Sutopo, 2009). In this study, testing is done by using black box testing for testing some functions that were wrong or missing, interface design, or other performance errors.

Black box testing is to see whether all the device functions are running properly according to the defined functional requirements (Pressman & Maxim, 2014). Black box testing is done to 2 teachers of mathematics subjects and 72 students of grade VIII of Madrasah Tsanawiyah Hidayatullah Banjarmasin South Kalimantan Indonesia. Black box testing focuses on Interactive Learning Multimedia error searching. Black box testing performed on testing system functionality including buttons, interface design, animation and material that is displayed is in accordance with the standard GUI (Graphical User Interface) that allows users to interact with the computer. If all the buttons on the Interactive Learning Multimedia being tested can run as expected then this interactive multimedia learning can be said to fulfill the GUI.

6) *Distribution*

In the Luther method, this stage is the stage of distribution or stage of program sales. However, in the Luther-Sutopo method (Sutopo, 2009), this stage is modified into a multimedia distribution or packing stage into a storage medium. In this research, storage media is CD.

Multimedia packaging is done after this interactive multimedia learning is published in the form of .exe for subsequent burning into CD.

RESULTS AND DISCUSSION

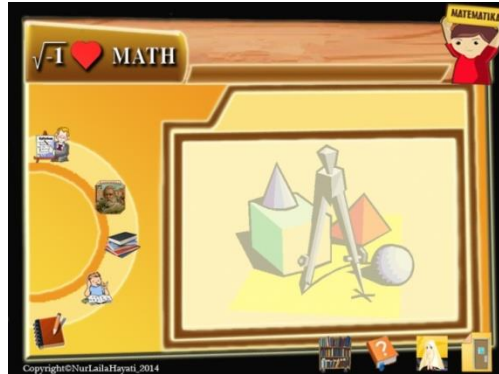
Developing interactive multimedia learning of pyramid and prism material for VIII grade the 2nd grade of Junior high school is done with multimedia development procedure. The design of this research is done through six stages: the concept of concept, design, collecting material, assembly, testing, and distribution (Luther, 1994).

The researcher's concepts include determining the purpose of using instructional media, determining the objectives in making instructional media, analyzing the extent to which the material will be applied, and determining the competence standard, basic competence and the material indicator that will be applied in this learning multimedia. From the results of material analysis obtained two sub-materials that will be delivered in this interactive learning multimedia that is pyramid and prism. Each sub-material is divided into 4 parts namely understanding, painting, surface area, and volume.

The results of research on the design of interactive multimedia learning include narrative script, storyboard, flowchart and layout of learning media. Based on the script written then this interactive learning CD is divided into three parts, namely:

- 1) The initial (preliminary) section consists of intros and preliminary menus.
- 2) The core consists of several parts of the menu are figures, menu materials, competency test menu, glossary menu, and menu list of libraries, and profiles of researchers.

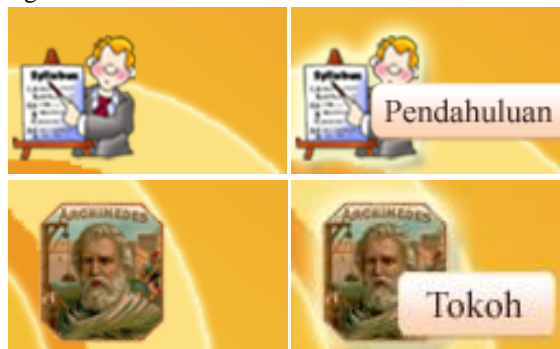
- 3) The cover contains an exit menu. As for designing layout of this interactive learning CD, the researcher uses adobe Photoshop 7.0 software. This application is used for processing images that will be imported into Macromedia Authorware to be used as background, buttons, and text that will be used in this learning CD also made using adobe Photoshop. Here are the layout design results:



Capture 1. Background Main Page



Capture 2. Design of information on interactive multimedia learning CD package



Capture 3. Samples of buttons and their response

At the collecting material stage, the collection of video, animation, instrumental music and the results of the development of test instruments that have been tested and then will be applied to interactive multimedia learning.

A testing instrument that tested there is two packages questions that are a package of questions A and a packages questions B, each package consisting of 30 multiple choice questions which then analyzed the validity, reliability, difficulty level, and discrimination.

At the assembly stage, media creation is done gradually. Making learning media applications based on the storyboard, flowchart view, navigation structure or object diagram comes from the design stage. These interactive learning multimedia is created using Macromedia Authorware 7.0 as the main software.

Making interactive multimedia learning in Macromedia Authorware 7.0 using a flow line system that can facilitate the process of importing animations, music, videos, exercise questions, navigation systems and so forth into the work area Macromedia Authorware 7.0.

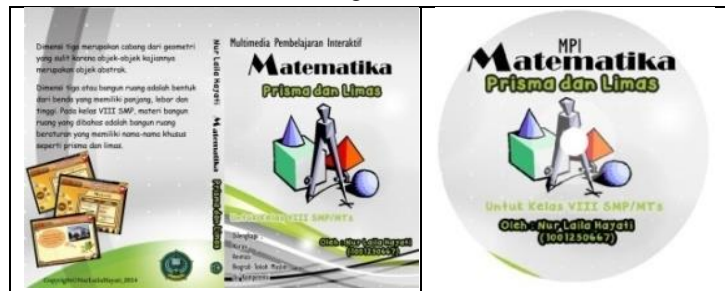
Macromedia Authorware 7.0 also cannot be separated from the programming language used to run program commands. The existing programming languages in Macromedia Authorware 7.0 are Authorware and JavaScript. In this case, researchers use an Authorware language that can facilitate the creation of programming commands. A programming language is used when making the contents of the menu "competency test" in which there is a process of giving time to do problems and the process of scoring and used on the menu "out" to give commands to the program to end the interactive multimedia learning applications.

Each page in this interactive multimedia learning consists of title text animation, text animation and provided a navigation button that links one page to other pages like next to next page, back to page previous and buttons to the main page.

Black box testing results performed on testing system functionality including interface design, animation, and material that is displayed is in accordance with the standard graphical user interface (GUI) so as to facilitate the user in interacting with the computer.

Based on the results of black box testing, it can be concluded that the standard GUI all the buttons can function in accordance with the order that has been designed.

After testing, the next process is to save the file in the form *.exe then packaged in the form of CD learning that is run by using CD-ROM. Here is the label design and cover CD-ROM.



Capture 4. Label and cover design of interactive multimedia learning CD package

In general, developed multimedia focuses on the activities of students in using it; therefore this learning media contains problems related to pyramid and prism material. For that, interactive multimedia learning is ready for use by teachers and students.

Before students or teachers using this interactive multimedia learning CD, at the first they have to know the computer specifications that support to run this program and how to use it. This application has a capacity of 98.3 MB and the minimum requirement to run this interactive CD is Intel Pentium II or more computers with 32 MB memory, 120 MB free hard drive capacity, Windows operating system, 800x600 resolution (SVGA) and a CD ROM drive.

This interactive multimedia learning CD is very easy to use because the program comes with a help menu and instructions that appear each time the cursor is directed to a button that is either icon or text. To enter into this interactive learning multimedia program, simply select this program insert the CD ROM folder, then press enter or double-click.

Conclusion and Recommendation

Making interactive multimedia learning using Macromedia Authorware on pyramid and prism material is done in six stages: concept, design, collecting material, assembly, testing, and distribution. In the concept stage, the objective is determined that this research produces an interactive multimedia learning product in the form of learning CD prism and pyramid of class VIII which can be used by teachers and students as learning media of pyramid and prism.

In the design stage, the results obtained are manuscript produced in the form of analysis of pyramid and prism material, storyboard produced in the form of detailed explanation for each interactive multimedia learning view, the flowchart in the form of the whole learning path in instructional media, and interactive multimedia learning layout design. In the material collecting stage, the results obtained are collecting materials of pyramid and prism which will be displayed in the media in the form of animation, image, video, and music. While at the stage of assembly, all the materials that have been collected processed using Macromedia Authorware program and media results include nine main menus that are The preliminary menu, character, material, competency test, glossary, bibliography, help, profile, and exit.

At the testing, the stage is done by black box method stating that all the buttons can function in accordance with the order that has been designed. The distribution stage is done by packaging process of interactive multimedia learning of pyramid and prism into the form of learning CD.

In the next research is expected to develop an integrated interactive multimedia learning with the model and equipped with games that match the material being taught. Multimedia interactive learning is basically an early development, to furthermore is expected to be tested to the user (student or teacher) to obtain an input to improve the interactive multimedia learning.

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