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**DEVELOPING COMPUTER-BASED INTERACTIVE INTRUCTIONAL
MEDIUM OF MATHEMATICS FOR SENIOR HIGH SCHOOL GRADE 10th
AT THREE DIMENSIONS MATERIAL**

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Abstract

This research aimed at developing a valid, interactive, and computer based media of mathematic instruction accompanied with students worksheet to teach three dimensions to class 10th SMA Students. This research belongs to research and development (RD). The research procedures are as follow: (1) analyzing the available product, (2) developing a preliminary product, (3) expert validation and revision, (4) limited try out of product, and (5) product revision. On analysis phase, and analysis of the design and the development of instructional media was carried out (concept, Design, and Colleting material). On the phase of developing a preliminary product, the materials that had been arranged were put into a frame available in macromedia flash software and for the students worksheet the materials were composed by using Microsoft 2010. On the phase of product try out, the product was validated and tried out, the validation was done by 2 validators. Each of them gave evaluation, correction, comments, and suggestions. Based on those inputs from the validators, the product was revised. The limited field try out of the product was done toward 32 students. The limited field try out revealed students positive response on the interactive and computer based Compact Disk (CD) of instruction which was accompanied by students worksheet.

Keywords : *interactive mathematics instruction media, distance, development research procedure , valid*

INTRODUCTION

Mathematics has an important role in the development of science and technology. This role not only in branches of science but covers all fields of science. Thus mathematics becomes a pretty important subjects and influential in the sciences, so mathematics is studied in every level of education, from primary to higher education.

Since mathematics is so important, it is worth for student to realize that they should learn mathematics seriously, but in fact the learning interest of students in some high school is still low, as well as the learning process is less effective. This is due to several factors, one of them is that in teaching, teachers still use the simple and less varied media, so that the concept presented may not be well understood by students. Learning process is still focused on memorizing concepts. These lead to students that they only know the 'surface' of the concepts given without knowing the benefits and how to apply them in their daily life.

Based on observation and interview on 31st May and 5th June 2012 with high school students in Padang city, and some observation which were done as a teacher

supervising the practice of educational field, it was figured out that the interest of students in learning mathematics on the three dimension objects, particularly on distance concepts was very low. Moreover, teachers were still using media such as book, chalk or eraser. When drawing some objects as examples in the black board, teachers took a long time to do. And not so many variation, it became ineffective. Since Sabri (2007:107) said “ that the media are tools that are used as an intermediary to deliver the message and can stimulate the thoughts, feelings and progress of students so as to encourage the teaching and learning process. In addition, Gerlach and Ely (in Arsyad, 2006) said that when the media generally , could be human, material, or the events to promote conditions that make students be able to get some knowledge, skills, or attitudes.

One the characteristics of media in teaching and learning process is that media contain and carry a message or information to the recipients, i.e.students. The media should be prepared to meet the needs of learning activities, as well as help students to actively participate in the process of teaching and learning. Therefore media need to be designed and developed the learning environment that can respond the needs of individual learning.

To resolve the issue it has been tried to design and to develop an interactive math-based learning media that combined text, sound, animation, and video on a CD, supported by a students worksheet in the learning process. The media are expected to build new interest, desire and the simulation of learning activities as well as to bring positive influences to the students. Using the computer and the programs to develop interactive learning media in the learning process can create a pleasant atmosphere. Image and sound in video hopefully make students interested.

By using interactive learning media, students can also set the speed of learning according to their ability. The media can also be used by student for self- study at home. They can repeat to study material that has not yet been understood. The varied math learning interactive media the student used can optimize and affect the success of the learning process.

Realizing so many benefits from the use of computer technology and programs to develop the interactive math learning media as learning tools, and the lack media is source of learning, particularly on distance concepts in space, the authors want to do research on the development of mathematical learning media about three dimensions which includes the student worksheet. To make a valid of interactive mathematics media of teaching and learning in form computer based for year x student a lesson distance in three dimensional shape and filled in student worksheet. Research goal the result of this study are expected to be useful for teachers as well as students.

INTERACTIVE LEARNING MEDIA

One of the interactive learning is helping by computers. According to Arsyad (2006;100) “Interactive concept in learning is most closely related to the computer-based media”. Interactive means mutually influencing. Interactive learning means between the user (user) and the media (the program) there is a reciprocal relationship, the user gives respond to the request/media display (program), then followed by the presentation of information/next concept presented by the media (program) is.

Interactive learning media is one of media that can stimulate students to do the learning activities actively. By using interactive learning media, students can explore, discover, investigate and build their own mathematical concepts. Therefore math teachers are expected to design interactive learning media so that the learning process can be affectively and learning goals can be achieved. One of the interactive learning media is an interactive learning CD.

According to Sadiman (2003:280) "Compact disk (CD) is an information storage system images and sound on a disc or *disc*". Interactive CD is very closely related to multimedia, because an interactive CD is combinations of several media, they are: text, images, photographs, graphics, sound and animation. Mulyanta (2009:1) states that when we are talking about interactive CD, it is closely related to the topic of multimedia. Interactive math learning CD is an information storage system on a disc or *disc* that contains combinations of three basic elements, namely sound, images, and text that is used as a media of learning process. While the definition of multimedia by Mulyanta (2009:1) a combination of computer and video, so principally multimedia is combinations of three basic elements: sound, images and text.

MACROMEDIA FLASH

According to Stevano(2006), program macromedia flash is the program intended to design an object and make it run or work in the form of animation. This program can be applied in the design plan of webs or display for presentation. This one is the superiority of this program.

STUDENT WORKSHEET

Besides teachers and students, the other important component is instructional materials. The good instructional materials are the materials organize automatically. So that they can be used by teachers and student in the teaching-learning process. Math is the structured science. So by organize the materials automatically can make the students easy to understand the concept of the math. In this opportunity, the instructional materials which will be discussed is student worksheet (LKS), because it is one of the alternatives that can make students active in teaching learning process. As stated by Sumiati (2009:171) that students worksheet is the guidance for students to do the special works that can increase the learning result.

So, the students worksheet is the helping means of teaching used by teachers in under that. The students work sheet consists of the activities than can direct them to comprehend the knowledge they have studied and the questions that they have to do after the class. The questions are designed will by teachers so that the students can find the concepts of the instructional materials.

RESEARCH METHOD

The research method used is development study. According to Soenarto (2006:1), research development is the research to develop and produce the educational products like materials, media, teaching strategy, evaluations means, etc used to solve the education problem and increase the effectiveness of teaching-learning process in the classroom / laboratory. This research will produce the teaching media in the form of interactive learning CD set of math.

The procedures of materials development in this research is what Borg and Gall develop in Soenarto (2006:8) is analyzing develop product, expert validation and revision, small try out and product revision, and large-scaled try out and final product. But in this research the development of learning set is only until the small scaled try out and product revision.

This research development was starting with conducting the analysis was of product that will be developed as follows:

1. Analyzing The Product That Will Be Developed

In this step was conducted analysis was about anything that was needed in developing product, in planning media of learning and in making learning media.

A. Analyzing the need that was needed in planning learning media.

1). Concept

In this step, for conducting the concept, it was necessary to do need analysis in planning learning equipment, starting with studying the material that will be made. It was conducts by chosen the material in curriculum at first year of senior high school and the result of the observation that had conducted. Based on the problem above, the three dimensions were chosen with distance sub material in “bangun ruang” that will be developed into CD interactive that was provided with LKS.

2). Design

The design product was conducted 2 steps. First, makes the general structure of software in form of tutorial (delivering the material step by step). The general structure that will be delivered in this equipment as follows:

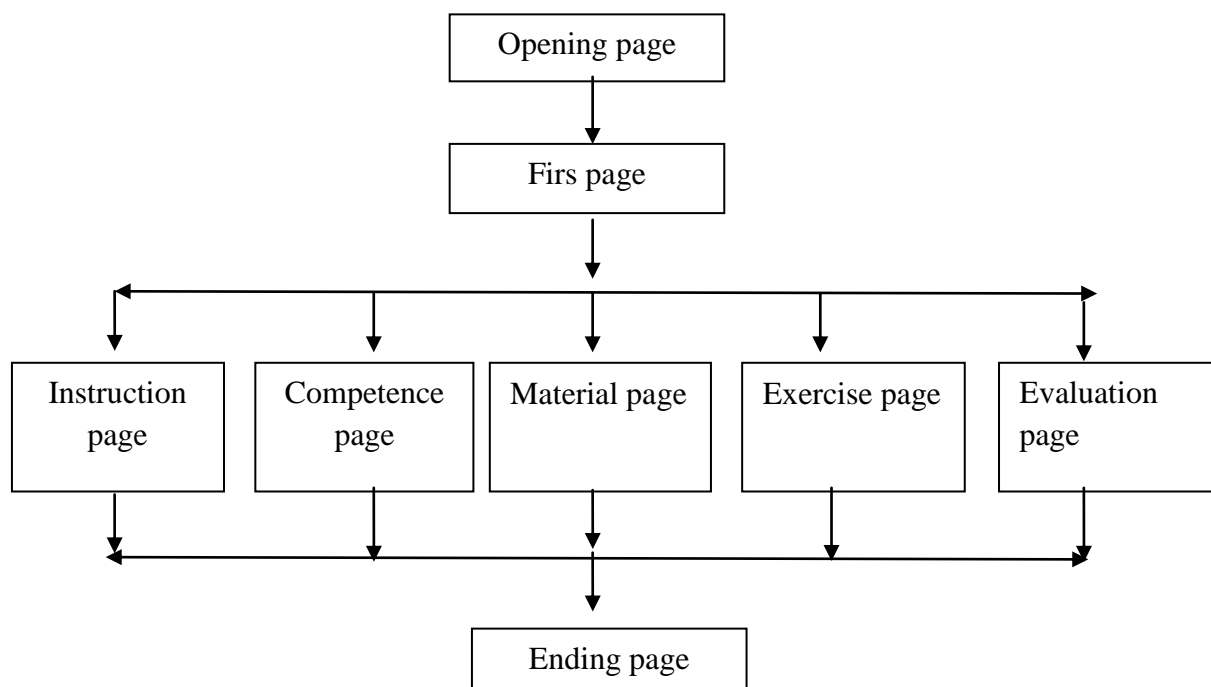


Figure 1.General structure

In delivering the material based on the general structure and also used for arrangement the LKS. After that, made that storyboard of general structure.

3) Collecting material

In this step was conducted collecting the material that was needed in made the product, such as 3 dimensions, beside that it was necessary to collect the another aspect that was needed in making product such as: video, audio and image.

B. Analyzing the need that was needed in making learning equipment.

Beside analyze the planning material, it was necessary to analyze the product making such as hardware and software. Hardware that was used in developing learning math's media interactive like notebook with specification below:

- 1) Prosesor intel^R CoreTM i3-380M
- 2) Operating sistem Windows 7 Fire
- 3) 14.0" HD LED LCD
- 4) Intel^R HD Graphics
- 5) 2 GB DDR3 Memory
- 6) 500 GB HDD
- 7) DVD-Super Multi DL Drive
- 8) Acer NplifyTM802.11b/ g/ n
- 9) 6-cell Li-ion Battery

Mean while software that was used in making learning math's media interactive was Macromedia Flash MX 8, 3D Animation and Microsoft Office Word 2010.

2. Develop The First Product

The next process after conducting the analysis of product was developed the first product. In this step the material that was arranged was input in every frame in softwwere Macromedia Flash MX 8 and for LKS material was arranged with using Microsoft Office Word 2010. CD math's media interactive and LKS was based on RPP. After developing the first product was conducted the editing process about the material was called Daft 1.

3. Test The Product

After the first paragraph was finished, conducting the testing product consist of expert testing and testing small scale. Testing expert and validation was conducted with 2 validator that 2 math's lecturer. Every lecturer gives assessment, correction, comment and suggestion. Based on the assessment, correction, comment and suggestion from the validator was conducted the revision about equipment learning was called Draft II.

After learning math's media interactive and LKS was validated by the validator, product testing has conducted. It will be conducted in small scale. It will be held in at Friday march 1 2013 in computer laboratory at Kartika 1-5 senior high school Padang that was followed by one from math's teacher of Kartika's senior high school and student's of Bung Hatta University as a mechanic and 32 students as participants.

While conducting product testing, students' so excited in following teaching learning process with using CD learning interactive with LKS. During conducting testing small scale, there were many problems that researcher faced: computer that can not be turned on, broken headphone so the students can not hear the audio clearly. While starting teaching learning process there were some students ask about the steps to continue learning process, because they still less comprehend about how to use

learning CD and some students did not work based on the instruction with the lack of time allocated.

During the teaching learning process the researcher was helped by math's teacher and one of college student watching the students activity, when doing learning process every students has different speed and almost nobody students can learn the material in learning CD in the same time. Thus, every student has different ability. Most of the students can use learning CD and comprehend learning material, but there were some students difficult in comprehending the material so they do learning continuously, and many students feel confused to continue to the next step, so they will wait to ask to continue it, beside that there were some students ask about if in exercise there was a part that they can not answer, was the earning process can be continued or must find it until all the questions can be answered?, so do in evaluation part.

The researcher also watch the students' worked when doing evaluation, most of the students were lazy to write the instruction of test in LKS, they choice the available answer in math's interactive CD learning. When doing the testing product, there were some students can not finish learning appropriate with allocated time 2 X 45 minutes and some of the other students can finish the learning that was appropriate in allocated time. In the end of the learning, students was given the learning questioner, to know how the students respond to the learning math's CD interactive and LKS.

4. Validation Result Analysis

Based on the result of the analysis of validation form done by two validators, the researcher can conclude that interactive mathematic learning CD and students' work sheets for the material of dimension three are classified good and useable with a few correction. In the followinf is the result of validation in three times.

No.	Draft I	Validation	Validators' Recommendation & Comments	Draft II (After Correction)
1.	Interactive Mathematic Learning CD	I	<ol style="list-style-type: none"> 1. Mathematic writing is bolded on background 2. The sentence "for SMA class X at the material" for the first presentation is not used since it has been used on the right top 3. The question "Are you ready to study" at the instruction space has been put away 4. The word "introduction" at the 	<ol style="list-style-type: none"> 1. Mathematic writing has been bolded on background 2. The sentence "for SMA class X at the material" for the first presentation has been put away. 3. The question "Are you ready to study" at the instruction space has been put away 4. The word "introduction" at the

			beginning of materials is changed into “read and pay attention to the following case or the other words”	beginning of materials has been changed into “read and pay attention to the following case or the other words”
		II	<p>5. Animation between points is slowed down and so for the other spaces</p> <p>6. Animation is added with animation on the shape space; for example, the first two animation of CD between points and the second animation between points come up at the shape space and so on</p> <p>7. Its right angle sign of animation is flickered, not just in the form cursor</p>	<p>5. Animation between points has been slowed down and so for the other spaces</p> <p>6. Animation has been added with animation on the shape space; for example, the first two animation of CD between points and the second animation between points come up at the shape space and so on</p> <p>7. Its right angle sign of animation has been flickered, not just in the form cursor</p>
		III	8. For the sample, write (one) example for each page	8. Example has been on each page
2	The Students' Work Sheet		The correction on the interactive mathematic learning CD is adapted	The correction on the interactive mathematic learning CD has been adapted

Table 1. Validation Result Analysis

5. Analysis of a Small Group of Try out Results

In the analysis phase of the try out results, to see the response of students towards mathematics learning interactive CD and worksheets are used, researchers distributed questionnaires to the students' responses at the end of the meeting. Analysis of the results of the questionnaire responses can be seen in the following table.

NO	DESCRIPTION	RESPONSE	
		YES	NO
1	I am pleased with the learning CD that I used	94%	6 %
2	This interactive learning CD I can use be easily.	94 %	6 %
3	I can understand the material on this CD Learning.	97 %	3 %
4	I am interested in the appearance (text, illustrations / Figures, and animations) contained in this Learning CD.	88 %	12 %
5	I feel the benefit of the media used in this study.	94 %	6 %
6	Worksheets that used to make me more familiar with this material.	88 %	12 %
7	Worksheets used in this study interesting.	94 %	6 %
8	I am interested in the design / appearance (text, images, font, and color) this LKS.	84 %	16 %
Σ	Average	92 %	8 %

Table 2 . Student responses to the questionnaire on the Learning Media Try out

From Table 2 it can be seen that the average response of students towards mathematics learning interactive CD and worksheets that are used positively. Therefore, the response is more than 80% of students in every aspect, then there is no improvement to be made to the draft II, draft II tested and a final product in the development of the research. Therefore students' response to CD and worksheets interactive math learning in three-dimensional materials is positive

Sheet analysis and validation of student questionnaire responses to interactive math instructional CD and worksheets that can be concluded that the researchers developed mathematical interactive learning media assessment and worksheets based on the validator is quite good and can be used as a medium of learning. Similarly, small-scale test results obtained by the average response of students towards mathematics learning interactive CD and worksheets are positive by 92% is means that more than 80%. So it can be concluded that the medium of computer-based interactive learning mathematics for Three Dimensional material developed is valid, it means learning media can already be used in the learning process.

CONCLUSION

Based on the results gained, it can be concluded that the results of the developing of computer-based instruction media for the high school at grade X in the resulting three-dimensional material is valid, it means instructional CD and student worksheets can be used as instructional media and the student's response to media interactive mathematics learning is positive.

Suggestion

Relate to the study conducted, two suggestion are offered here :

1. Mathematical teachers at high school should use computer – based interactive mathematic teaching media to teach material on three dimensions and can develop the media for other materials because it is very useful for students
2. There should be further study to measure media because what was done is this study is try out in small scale.

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