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Development of Computer-Based Interactive Learning Media on Data Presentation Subject

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Abstract

21st century learning students is required to be more active in learning than teachers, therefore this study aims to develop computer-based interactive learning media tutorials. This research used Research and Development (R & D) models and adapted from Borg and Gall. The learning media was validated by three validators using a validation sheet and obtained an average score is 3.55 (very valid) from the maximum scale of 4. Furthermore, revisions are made according to the suggestions and input of the validator. The revised learning media was tested with a questionnaire technique using a student response questionnaire sheet. The trial was carried out in two stages, namely product trials and usage trials. The first stage was product testing on six students and the percentage of practicality was 96.03%. The second stage was trial use on 28 students and the percentage was 97.62 (very practical). Then the product was revised according to the students' suggestions in the usage trial). Based on the analysis, it can be concluded that this computer-based mathematics learning media is valid and practical and can be used for students' learning.

1. Introduction

The development of Information and Communication Technology (ICT) is increasingly encouraging efforts to update and utilize technology results in the learning process. In the 2013 curriculum, the learning process demands that learning be studentcentered, the teacher only as a facilitator to guide students, and teachers are required to be able to create innovative and interesting learning in order to foster curiosity and students do not feel bored in learning (Sukiman, 2012). Teachers are required to be able to use the tools provided by the school and develop skills in making learning media that will be used if the media is not yet available (Kustandi & Darmawan, 2020). One of the means to make this happen is the existence of computer-based learning media (Rahman, 2008). Along with technological developments, computer-based learning media are needed in order to help students and teachers in learning, especially mathematics. Hick and Hyde (Sinurat, 2015) say that, with computer-based learning students will interact and deal directly with computers individually. So what is experienced by a student will be different from what is experienced by other students. One of the most interesting characteristics of computer-based learning is the ability to interact directly with students. In line with this, (Susilana & Riyana, 2007) stated that a computer program that can be used in designing learning media is the PowerPoint program. Microsoft PowerPoint is a software specially designed to be able to display interactive media programs in an attractive manner, easy to manufacture, easy to use and relatively inexpensive. One model to attract attention and increase interaction between students and computer-based learning media is an interactive tutorial model.

The interactive tutorial model is a model designed for learning media to act as tutors for students (Hunt, 2016). The subject matter in the form of a concept is presented on a computer screen with text, images or graphics. Computers are able to continue the concept of the next subject when students have mastered certain subject, and are able to repeat subject that has not been mastered by students (Arsyad, 2016). The

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main purpose of tutorial programs is to provide support for learning with textbooks or lectures(Asyhar, 2013). Students are given the opportunity to interact with these concepts, as well as doing learning with the teacher. The development of computer-based learning media with interactive tutorial models is based on facts in several junior high schools in the city of Pekanbaru. Researchers made observations to see the potential in the use of interactive learning media in schools, when researchers carried out at Junior High School in Pekanbaru. Based on the observations,The potential found is that the facilities provided at the school are quite complete, such as computers, projectors, and computer labor. However, projector facilities are not evenly distributed for each class. Only special guided classes have been facilitated by projectors, while regular classes can only borrow projectors in the vice principal's room.if you want to use learning using a projector. Then the researcher also saw that most of the teachers in schools did not use the media in the mathematics learning process.

As a comparison subject to see the potential facts that support learning in other schools in Pekanbaru. Based on observations, researchers see that schools already have very adequate facilities such as computer laboratories and learning aids such as projectors available in classrooms, which can be used for the use of computer-based learning media. Each class has been facilitated by a projector equally. In some classes there are also speakers as a supporting facility in the learning process. One of the subject that becomes an obstacle in understanding it and in the learning process that requires media is data presentation subject. This can be seen when the teacher draws bar charts and pie charts, the teacher can only draw them on the blackboard using markers that only have a few colors. So that the level of accuracy and understanding obtained is still not optimal (Djalal, 2017). The teacher also said that learning media for data presentation subjects, both printed and electronic-based, were not yet available in schools.

Other difficulties in data presentation subject were also felt by students. Most students still do not understand how to read the data presented in tables and diagrams. Data presentation subject requires students to be able to read, understand and calculate the data presented in the form of tables or diagrams. This resulted in students bored to calculate the data presented. When presented on the blackboard, the teacher is only able to present a very small and limited amount of data. In contrast to the data presented on computer-based learning media. Computers can present unlimited data.The presentation in tables and diagrams depicted by the computer will be more visible and can be given different colors, so that students can read and understand each data. One of the software used to help present the data is Microsoft Office Excel. With the help of this software, students can present large amounts of data. From the problems in the learning process such as the conditions described above,the research wants to develop computer-based learning media interactive tutorial models using Microsoft Power Point software,Microsoft Office Excel and, Adobe Photoshop for class VII data presentation subject. In this computer-based media, each topic is made in slides with pictures and animations accompanied by appropriate descriptions (Damayanti & Qohar, 2019). Thus, this study aims to develop computer-based learning media with interactive tutorial models for valid data presentation subject and meet the practical requirements for use by class VII student.

2. Methods

Section describes when the research has been performed. The researchers explain experimental design, equipment, data collection methods, and control types. Authors describe the research area, location, and also explain the work done. The general rule to keep in mind is that this section should describe in detail and clearly so that the reader has the basic knowledge and techniques to be duplicated.

The implementation of development research refers to the development model (Borg & Gall, 1983) which has been modified by (Sugiyono, 2016) which is arranged in several stages of research as follows: 1) potential and problems; 2) data collection; 3) product design; 4) design validation; (5) design revision; 6) product trial; 7) product revision; 8) trial use; 9) final product revision; and 10) mass production. However, in this study, the procedure carried out only reached the final product revision stage. The instrument in this study was a media validation sheet consisting of aspects of the program, curriculum, learning, and display as well as a student response questionnaire consisting of aspects of display, material, and program. The data in this study were collected using a questionnaire collection technique through two sources, namely validators and class VII students as test subjects. The data analysis technique uses the average value of validation and the percentage of user practicality which is adapted from Khabibah ((Yamasari, 2010) and (Akbar, 2016)) with the following formula.

1. Find the average value of each criterion/indicator with the formula:
$$K_i = \frac{\sum_{h=1}^{n} V_{hi}}{N}$$

2. Looking for the percentage of practicality of student response questionnaires with the formula:
$$V_a = \frac{TSe}{TSh} \times 100\%$$

Where:
K_i : Score of validity
N : amount of validators
V_{hi} : score of validator-h towards criteria-i
V_a : Percentage of score
TSe : Total of empiric score
TSh : Total of maximum score

3. Results & Discussions

Here the researchers present concise data with reviews using narrative text, tables, or drawings. Remember only the results presented, there is no interpretation of data or conclusions from the data in this section. The data collected in the table / picture should be accompanied by a narrative text and presented in an easily understandable form. Do not repeat at length the data presented in tables and drawings.

In this section, researchers interpret data with observed patterns. Any relationships between experimental variables are important and any correlation between variables can be seen clearly. The researcher should include a different explanation of the hypothesis or results that are different or similar to any related experiments performed by other researchers. Remember that every experiment does not necessarily have to show a big difference or a tendency to be important. Negative results also need to be explained and may be important to change in your research.

Computer-based learning media is needed by teachers as a tool to convey material and can make learning more innovative, can motivate and attract students to be able to learn optimally, both studying in class and learning independently (Choirotul & Faizah, 2021). Based on the results of interviews by researchers with mathematics teachers, information was obtained that most of the teachers already have and can operate computers/laptops. However, in classroom learning, the material presented by the teacher comes from textbooks. Obstacles occur when drawing bar, line and circle charts, the teacher is only able to use a blackboard and markers with limited colors. So that this has an impact on the lack of accuracy and accuracy of students in drawing and understanding the concept of presenting data (Widyoko, 2011). With the interactive tutorial model computer-based learning media, the presentation of tables and diagrams will look clearer and can be given different colors, so that they can help students read and understand the contents of tables and diagrams (Sumiharsono & Hasanah, 2017). The teacher's difficulty in explaining how to present tables and diagrams will be easier if they are presented in computer-based learning media.

The use of computer-based learning media makes learning fun for students, including in studying data presentation material in mathematics learning. With the existence of computer-based learning media that can be used independently by students, students will have additional learning resources that can be used outside the classroom independently to repeat learning in parts that are not understood (Rezky, 2019) . The need for available facilities and infrastructure is one of the supporting factors for the use of computer-based learning media in the learning process (Nurfadillah et al., 2021). The facilities provided at school are quite complete, such as computers, projectors, andteachers also already have personal laptops, so supporting facilities for teachers are available to learn to use or develop computer-based learning media(Suryanti & Putra, 2021).

At the data collection stage, researchers collect data and study literature that is used as material for designing computer-based learning media interactive tutorial models for data presentation materials and animations and navigation buttons. After the materials were collected, the researcher began to make

learning media. At this stage, the researcher makes an initial program design using a paper-based design. Product design is in the form of layout and media systematics. After the paper based design is completed, the product design that has been designed is then created using the Microsoft Power Point program. The results of the paper based design and product can be seen in the figure below.

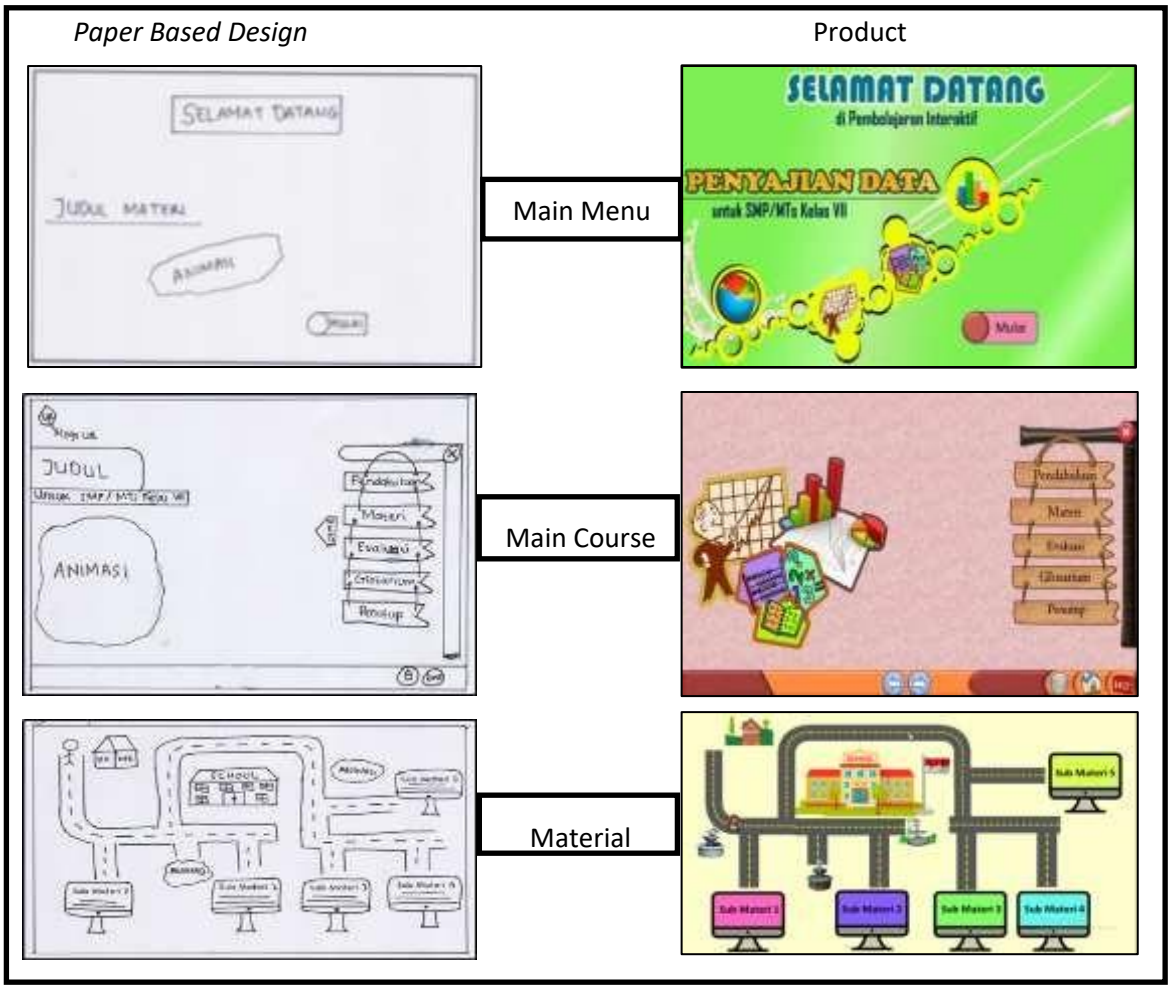

Figure 1. Paper Based Design and Product Design

After the learning media has been created, then validation is carried out by three validators, namely two mathematics education lecturers at Mathematics Department in University of Riau and one mathematics teacher at junior high school in1 Pekanbaru. The researcher gave the media program and validation sheet to each validator. The validation of learning media is assessed from four aspects, namely program aspects, curriculum aspects, learning aspects and display aspects. The results of the validation of computer-based learning media interactive tutorial models on the subject matter of presenting class VII data from three validators can be seen in Table 1.

Table 1. Validation Results of Learning Media

No.	Aspects	Sub material					Average	Category of Validation
		1	2	3	4	5		
1	Program	3.6	3.47	3.73	3.67	3.93	3.68	Very Valid
2	Curriculum	3.5	3.5	3.67	3.33	3.5	3.5	Very Valid
3	Learning	3.29	3.52	3.55	3.55	3.6	3.5	Very Valid
4	Appearance	3.53	3.63	3.59	3.56	3.67	3.6	Very Valid

Based on the assessment of the validation questionnaire as well as comments and suggestions from the validator, the researcher revised the four aspects. Revisions made by researchers for each aspect can be seen in Table 2.

Table 2. Revision of Learning Media on Program Aspects

No.	Media Component	Validator's Suggestions	Revised Results
1	Hyperlink on media	There are some hyperlink did not run as it should.	The hyperlink has been fixed and has been running as it should.
2	Some exit buttons appear blocked in the material description	Fix layout of multiple exit buttons (see Figure 2.)	Exit button has been fixed and run properly (see Figure 3)
3	No introductory music	Add introductory music to the animation at the beginning of the lesson	Introductory music has been added at the beginning of the media.
4	Animation duration is too slow	Speed up the duration of the animation	The duration of the animation is too slow on media has been fixed

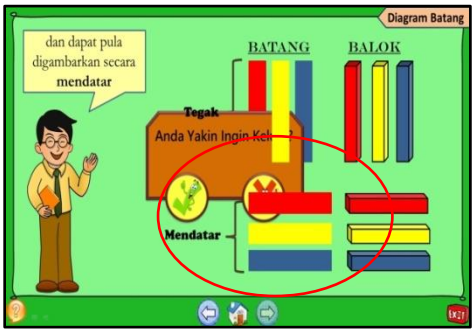

Figure 2. Before Revision on Program Aspect Aspect

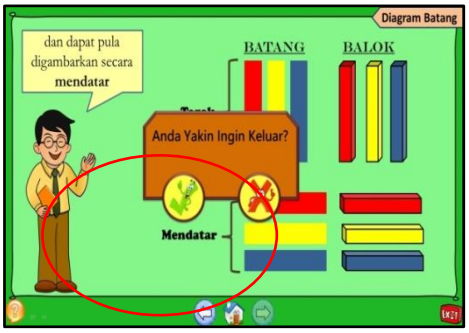

Figure 3. After Revision on Program

Researchers revised the learning media on aspect of the curriculum can be seen in Table 3 below.

Table 3. Revision of Learning Media on Curriculum Aspects

No.	Media Component	Validator's Suggestions	Revised Results
1	The 5M scientific approach instructions on several sentences in the material description have not been seen. (see Figure 4)	Adjust a few sentences in the material description with the 5M scientific approach instructions	Several sentences in the material description have been replaced according to the 5M scientific approach instructions (see Figure 5)
2	Some terms in the material description	There are some inconsistent use of terms in the description of the material (see Figure 6)	Some inconsistent terms in the material description have been checked and corrected (see Figure 7)
3	The KI (Core Competencies) and KD (Basic Competencies) sub menus are made on the learning media slide, and the motivation sub menu is moved to the introduction menu (see Figure 8)	The KI and KD sub menus do not need to be made on the learning media slide, and the motivational sub menu is moved to the introduction menu	KI and KD sub menus have been removed. The motivation menu has been moved to the introduction menu (see Figure 9)

Figure 4. Before Revision on point 1

Figure 5. After Revision on point 1

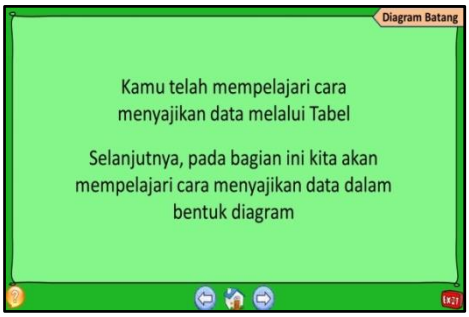

Figure 6. Before Revision on point 2

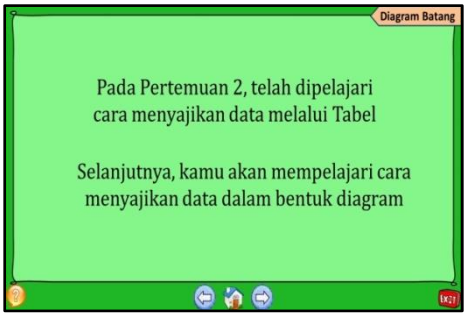

Figure 7. After Revision on point 2

Figure 8. Before Revision on point 3

Figure 9. After Revision on point 3

After revision of the learning media based on the assessment as well as suggestions and comments from the validator, the researchers then conducted a trial. The trial of computer-based learning media with interactive tutorial models on the subject matter of presenting class VII data was carried out twice, namely product trials in small groups and use trials in large groups.

At the product trial stage, computer-based learning media with interactive tutorial models on the subject matter of presenting data were carried out to six students of junior high school in Pekanbaru with heterogeneous academic abilities. As long as students learn to use learning media, the researcher acts as a companion. If at any time students have difficulty or need help, the researcher will provide assistance or direction. After the students finished using the learning media, the researcher gave a student response questionnaire that students had to fill out. The results of the practicality of learning media in product trials can be seen in Table 4 below.

Table 4. Practicality Results of Learning Media on Six Students

Aspects	Percentage of Practicality	Category
Appearance	97.62	Very Practical
Material	94.45	Very Practical
Program	95.83	Very Practical
Total Percentage	96.03	Very Practical

After the revision of the computer-based learning media interactive tutorial model on the subject matter of presenting class VII data in accordance with the results of product trials, the researchers then conducted a usage trial. The trial was conducted in class VII.6 juniior high school in Pekanbaru with a total of 28 students. Students who have been included in the product trial are no longer included in the usage trial. The results of the practicality of learning media in product trials can be seen in Table 5 below.

Table 5. Practicality Results of Learning Media on Six Students

Aspects	Percentage of Practicality	Category
Appearance	97,96	Very Practical
Material	97.02	Very Practical
Program	97.78	Very Practical
Total Percentage	97.62	Very Practical

Researchers checked all components of the learning media to the last sub-material. After the researchers finished revising the media, the interactive tutorial model computer-based learning media on the subject matter of presenting class VII data was packaged in a Compact Disc (CD).

Based on the data analysis, the results of the validity of the learning media reached an average of 3.55 which means it is very valid. The validator stated that the learning media was feasible to be tested in accordance with the suggestions for improvement given. This is in accordance with the opinion of Sugiyono (2012) which states that the criteria in making product validation decisions are ready to be used if the validator's average assessment is categorized as valid and very valid. After the improvements were made, then the learning media was tested twice, namely product trials and usage trials.

The trial was conducted to determine the student's response to the learning media by using a student response questionnaire. In the product trial for six students, the percentage result was 96.03% which indicates that computer-based learning media is very practical to use, although there are still some errors in the media. This is in accordance with the questionnaire category of student responses to the practicality of learning media according to Akbar (2016) which states that if the percentage result is 85.01% - 100%, the learning media is categorized as very practical.

Next, the researcher revised the errors in the media. After being repaired, the learning media was tested in large groups consisting of 28 students in class VII.6. The results of the trial use obtained are very good than the previous one. The results obtained from the trial use are 97.62%, which means that the learning media is very practical to use. From the results of student response questionnaires and discussions that have been carried out on product trials and usage trials, it can be concluded that this learning media gets a very good response. Students stated that they could operate the learning media well. The media display really attracts students' attention to learn mathematics and the explanation of the material presented is easy to understand. Students also stated that learning to use this learning media really helped them in understanding the material. This is in accordance with Slavin's opinion (Wena, 2014) which suggests that learning presented through computer media is one of the learning media that can make the learning process more interesting and challenging and add experience to students.

From the description of the results of the validation and the results of the student response questionnaire to the interactive tutorial model computer-based learning media on the subject matter of presenting class VII data, it can be concluded that the learning media is valid and meets the practical requirements for use by class VII students.

4. Conclusion

Through this development research, products have been produced in the form of computer-based learning media with interactive tutorial models on the subject matter of presenting class VII data. This media is considered valid after going through a validation process using the opinion of experts (judgment expert) and meets the practical requirements for use by class VII students after going through two trial stages. Students have been able to operate computer-based interactive learning media as well. Learning media is practical and effective used in learning mathematics to improve student learning outcomes.It can be concluded that the learning media is valid and meets the practical requirements for use by class VII students.

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