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Development of Module and Augmented Reality Based Android Aplication Computer Assembly For Vocational High School Student

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ABSTRACT

Based on observation in class X TKJ SMK Negeri 1 Sawit. Students had some problem when learning computer assembly. That happens because lack of equipment and learning media. They need a learning media that can be used to study computer assembly not only inside a school but outside as well. We propose to solve that problem with developing a new learning media that can help students learn independently. We develop a module and android based augmented reality application called ARRAKOM . when ARRAKOM detect a marker in the module. It can display a 3-dimensional model in real time. Learning media is created using ADDIE consist of Analysis, Design, Development, Implementation, and Evaluation. In the development stage, we are using an incremental model and created 2 prototypes of ARRAKOM. In result of the feasibility test, Arrakom gets measured with a Likert scale from expert media get percentage 75% very good, 25% good, 0% bad, 0% very bad. for expert material get percentage 57% very good, 43% good, 0% bad, 0% very bad. And from user get percentage 47% very good, 43% good, 3% bad and 0% very bad.

Keywords: Interactive Learning Media, Computer Assembly, Augmented Reality

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1. INTRODUCTION

The rapid development of technology has influenced many areas of human life, one of those are education. There are many products using technology in the education sector, for example learning media. Learning media is created to help student learn something Learning is anything that can bring information and knowledge to the interaction that takes place between teachers and students (Asyhar, 2012). From those studies, it can be concluded that a learning media is a tool used to convey information and knowledge in teaching and learning activities that can help to achieve learning goals.

In vocational high school, computer assembly subject is one of the most important basic which is taught in class X TKJ. The student has to learn how to recognize a computer component name, how to install them together to make a computer etc.

Based on observation in SMK Negeri 1 Sawit, there is a problem when students are learning computer assembly subject. Lack of component and tool in school to practice computer assembly, besides that there is a lack of learning media. If there are no practice, the teacher is only explaining the process of computer assembly. The students are less motivated because in class they only hearing an explanation from the teacher and became passive.

Using interactive learning media will make student easier to learn subjects by themselves. Rijal Bait Syaiful(2014) created an electronic module for computer assembly. It have a good respond from the student. However, it can only run on a personal computer, so the use is limited. Hardiyanto (2014) create learning media that using augmented reality technology. It can show a 3-dimensional model to learn hydrolic cycle.

Using augmented reality technology can increase student motivation to study. Andria Kusuma Wahyudi (2013) created an augmented reality application for studying Prambanan temple. The application that they call ARca is created to attract the attention of learners to learn about Prambanan temple. its an innovation for a history

book. Maria Blanca(2014) do study about the usage of augmented reality technology in lea rning electromagnetic. The result is augmented reality can increase student understanding about electromagnetic.
Based on the literature study above can be seen that using interactive media can help students to learn. We propose to solve the problem of learning computer assembly by creating interactive learning media that can help student learning independently. ARRAKOM Interactive learning that will use augmented reality technology to learn computer assembly. With augmented reality, student can visualize material with a 3-dimensional object in real time.

2. RESEARCH METHOD (10 PT)

Research methods used in this research is research and development. Research and development are performed to generate new products or development of existing products. The products developed in this research was a module and android application for learning computer assembly. The development model used in this research is the development model ADDIE developed by Reiser and Mollenda in 1996. This development model consists of five phases of development include (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation
In the analysis phase, an instructional problem is clarified, and objectives are established. The next is the design phase. In this phase, there are planning for learning media, how its look, what material for learning, how system work, etc. In the development phase, an application is developed. The developer creates and assembles the content assets from the previous phase. When learning media is completed there is a feasibility test from expert media and expert material, In the Implementation phase, the learning media is tested on users in a real environment for study which is a classroom. In this study, its end in the implementation phase and the last phase is not done.
For the feasibility test in this study is based on criteria from Walker and Heiss (1984). The result is displayed on frequency distribution table and pie chart diagram. The feasibility of learning media that has been developed is assessed using a Likert scale. Data analysis is done by converting the data into a percentage with the following calculation:

$$\text{Percentage (\%)} = \frac{f}{n} \times 100$$

Explanation :
f: Value obtained
n: Total Value

3. RESULT AND DISCUSSION

3.1. RESULT

3.1.1 ANALYSIS

Based on the problem that has been found, The learning media is created based on the Android smartphone. It will make the student easier to access the learning media because 90% student in SMK Negeri 1 Sawit already has an Android smartphone. Learning media should be able to present the material clearly and can show the forms of computer assembly components and how to assemble the computer. Therefore, the author decided to create interactive learning media that utilizes augmented reality technology and Android smartphone.

3.1.2 DESIGN

1. Designing Structure Navigation
   The design of navigation structure used in this research is the hierarchical navigation. The design of the navigation structure is used to show how a page is linked to other pages on learning media. Navigation design can be seen in Figure 1.

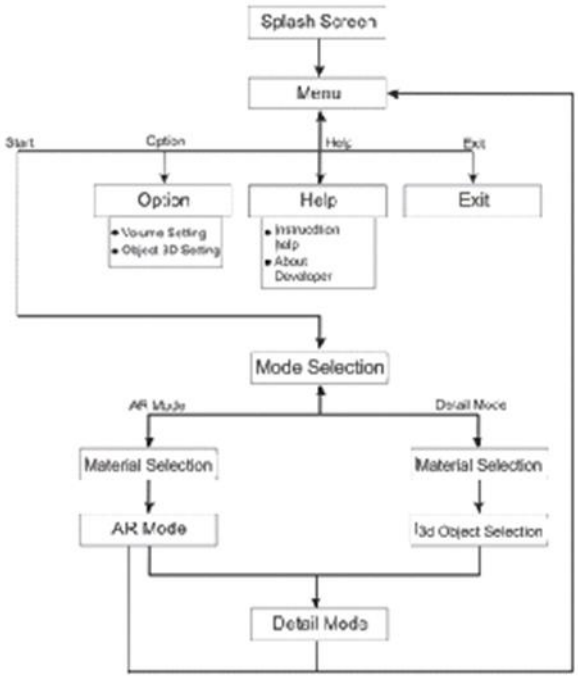

Figure 1. Navigation Structure Design

The main page consists of "Start" menu, "Option" menu, "Help" menu, and "Exit" menu. The "Start" menu is used to display computer assembly material in augmented reality mode or detailed mode. The "Option" menu is used to access volume setting and 3-dimensional object behavior in the application. "Help" menu is used to display instruction on how to use application and display developer profile. . "Exit" menu is used to exit the application.

2. Designing Interface

Designing interfaces are a very important step. Sketch of how the application will look, the interface is based on the design of navigation in the previous stage. For example, there is a sketch for the main menu page shown in Figure 2.

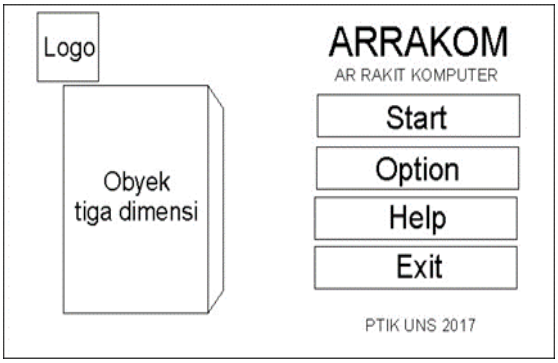

Figure 2. Main menu

3. Designing material

In this stage is selecting material for learning media. The material is based on school 2013 national curriculum electronic book about computer assembly. The material that will be included is about recognizing computer assembly component and installing computer assembly component.

3.1.3 Development

For application development model will be used an incremental model. There will be two prototypes for this application. In prototype one that is called the core product, the main function of the application is developed, and prototype two is a refinement of the core product. There are several stages of developing each prototype that is analysis, design, coding, and testing. In the development phase, there are several tests for the application. The first test is the Product Functional test, product non-functional test and expert feasibility test.

3.1.4 Implementation

In this phase, learning media is tested by users, Users in this test is students from class X TKJ 2 SMK Negeri 1 Sawit.In this class there is 35 student who took the test of learning media. After testing learning media, the user is given a questionnaire about learning media, there is 25 question and four choices of answer, very good, good, bad, and very bad. the question is based on criteria from Walker and Heiss.

3.1.5 Testing

1. Product Functional Test

Product functional test is done using the black box. Product functional test is done by testing each navigation button, material, evaluation and educational game that exist on ARRAKOM. The test results will be declared valid if the test results from the expected results.

2. Product Non-Functional Test

Product Non-functional test is performed to find out if the learning media applications that have been made can run on other devices with different specifications. The device specification that used as an indicator in this test is the processor, RAM, GPU, device resolution, and Android version. Several devices with different specification being tested. The result can be determined by the minimum specification to run ARRAKOM.

3. Expert feasibility test

The product developed in this research is learning media, so it is necessary to test the quality of media and material aspects. Material aspects are tested by material experts and media aspects tested by media experts. The media and the material's feasibility result test for experts can be seen in Table 1 and Table 2.

Table 1. Media Expert Testing Result

Category	Value Obtained	Percentae(%)
Very Good	24	75%
Good	8	25%
Bad	0	0%
Very Bad	0	0%
Total	32	100%

Table 2. Material Testing Result for Experts

Category	Value Obtained	Percentae(%)
Very Good	12	47%
Good	9	43%
Bad	0	0%
Very Bad	0	0%
Total	21	100%

Result also can be shown with pie chart. Pie chart for expert testing can be seen in figure 3 and figure 4.

Figure 3. Main menu

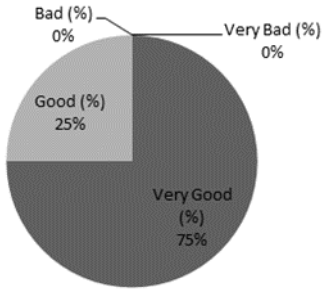

Figure 4. Main menu

4. User Test

User testing is done by pointing students class X that follows a computer assembly subjects. Respondents consisted of 35 students. The purpose of this test is to find out the feasibility of the media learning that has been developed. User testing results are shown in table 3.

Table 3. User Testing Result

Category	Value Obtained	Percentae(%)
Very Good	410	75%
Good	8	25%
Bad	0	0%
Very Bad	0	0%
Total	32	100%

It can be visualize by using a pie chart shown in Figure 5.

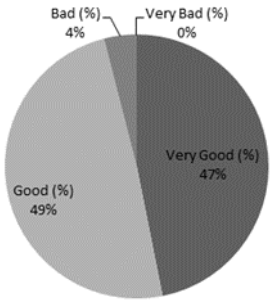

Figure 5. Main menu

3.2 DISCUSSION

Product functional test results show that the expected results from the functions of each of the elements as well as the conclusion of the testing shows that the whole of the test results was valid. Based on the test result of nonfunctional products obtained a minimum specification for running ARRAKOM, The minimum specification is processor 1 GHz, RAM 1 GB, Camera 5 MP with autofocus, multi-touch, resolution minimum 480x845, and Android version minimum jelly bean..The feasibility is tested based on criteria from Walker and Heiss. The result from expert media get percentage 75% very good, 25% good, 0% bad, 0% very bad. for expert material get percentage 57% very good, 43% good, 0% bad, 0% very bad. And from user get percentage 47% very good, 43% good, 3% bad and 0% very bad. It concludes that learning media is good because the result from the test is very good.

The advantages of these learning media are easy to use, the design is simple and easy to understand. Learning media is practical can be used by the student when practice of assembling a computer, The module and application ARRAKOM can be used independently but if both are used at the same time, it can be very interesting learning media had a feature that was learning computer assembly. The application size is fairly small and can run smoothly in the mostly android device because it only needs low hardware. The disadvantage

of this learning media is there is still no version for iOS only available for Android; there is no game about computer assembly. Learning media can be expanded again by iOS version and adding other basic competencies and game. Another disadvantage of this learning media is there is still limited 3-dimensional object. Currently, the is only one 3-dimensional object to represent a component.

4. CONCLUSION

The creation of module and augmented reality based android application for computer assembly as a learning media on computer assembly subjects. The feasibility test of learning media application is done by media experts, material experts, and users. Based on the Result, it can be concluded that this learning media applications included in the feasible category to be used as a learning media on the computer assembly subjects.

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