Development of Android Based Learning Media for Students in the Course of Machinery Electricity

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Abstract. The lack of internet usage in the present learning materials contributes to Indonesia's low internet usage for education. This course covers a wide range of concepts, from simple to difficult or abstract, and from easy to learn to those that require more time to comprehend. Every idea is related to every other idea. One of the topics that most students find most challenging to comprehend is DC electrical machinery. According to the findings of the study on the characteristics of students in Medan State University's Electrical Engineering Education Study Program, the majority of them own smartphones and utilize the internet daily to obtain references or information for their coursework. The objective of this research is to provide learning materials on DC electrical devices that are based on Android and can be updated via an internet connection. The Design and Development approach, which comprises three stages planning, design, and development is used for implementation development. The resulting educational materials can be used as a substitute for traditional teaching methods in DC electrical machine lectures.

Keywords: Multimedia Learning, Higher Order Thinking Skill, Effective, Practical.

1 Introduction

The development of technology today makes it easy for us to make breakthroughs based on science and technology along with innovation, one of the developing technologies is smartphones. Smartphones are devices that have computer and mobile device features, unlike ordinary mobile devices, smartphones have a large amount of local storage and memory. Smartphones are mobile devices whose user growth is very rapid and their existence has mushroomed in recent years [1,2]. The growing popularity of mobile devices, including smartphones, tablets, iPads, PDAs, and cell phones, is spreading around the world. This phenomena should be used by educational institutions to enhance their teaching and learning methods. Utilizing cellphones as learning tools based on Mobile Learning (M-Leaning) gives students the chance to learn at any time and from any location [3, 4].

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A novel learning experience may be offered via the use of mobile learning. Mobile technology has the potential to offer more learning opportunities and novel learning experiences, according to research by Kim, Rueckert, Kim, and Seo (2013). Students' learning outcomes can also be impacted by mobile learning. This supports the findings of Elfeky and Masadeh's (2016) study, which found that mobile learning significantly affects academic performance. [5, 6].

The results of identifying the characteristics of students in the Electrical Engineering Education Study Programme at Medan State University show that the majority have smartphone devices and use the internet every day to get information or references for their needs in doing coursework. One of the Electrical Engineering Education Study Programme courses where students need mobile-based learning media is DC electrical machines. This course is full of understanding concepts, from concepts that are easy to understand to concepts that need longer to understand, from simple concepts to complex or abstract concepts. Each concept has a relationship with one another. DC electrical machines are one of the subjects that are quite difficult for most students to understand [7]. So alternative learning media is needed to support student learning that can be used anytime and anywhere to understand the material so that these difficulties and complexities can be overcome [8].

2 Development Model

To form students' understanding abilities in learning, learning media are designed using a scientific approach, practising evaluation questions that demand skills and making meaningful learning in the learning media developed. The media design that will be developed can be seen as shown below :

Fig. 1. Learning Materials

This page provides various learning materials in text form. Users can learn important concepts presented in a structured manner. Displays a list of available materials, which can be selected and read by the user. After selecting the material, users can view the content of the material that explains a particular concept, such as types of electrical machinery.

Fig. 2. Learning Video

This page provides learning videos that support the material that has been learnt. These videos provide a more in-depth and visual explanation. Users can select an available video from the list. Videos are played within the app with playback controls such as play, pause and seek. Provides a brief summary or explanation of the content of the video being played.

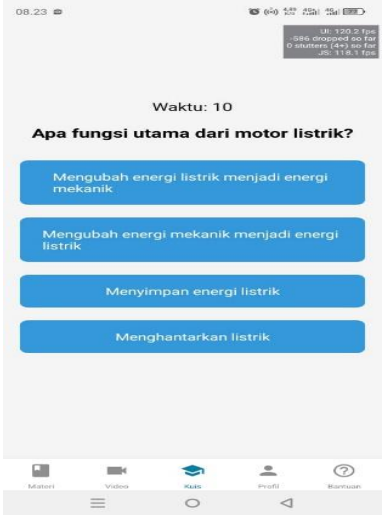

Fig. 3. Study Quiz

This page is used to test the user's understanding of the material that has been learnt. The quiz consists of several questions that must be answered within a certain time limit. Displays questions related to the material learnt with several answer options. The user must select the answer that is considered correct from several options provided. Displays the remaining time available to answer the question.

3 Results and Discussion

a. Alpha Test

The alpha test was conducted by experts consisting of two material experts and one media expert. The experts were asked to assess the media that had been produced. The media assessment was carried out by filling out a material assessment questionnaire sheet for material experts, and a media questionnaire for media experts. This test was carried out several times until the test resulted in 100%. Based on the conclusion of the assessment from the material experts and media experts, the developed media can be said to be 'very good' and 'usable'. The development results of the alpha test can be seen in the table below:

Table 1. Alpha Test Development

Validator	Alpa test I	Alpa test II	Alpa test III
Material Expert I	74.33%	100%	
Material Expert II	72.33%	46.66%	100%
Material Expert	94.11%	100%	
Average Percentage	80.25%	82.22%	100%

b. Beta Test

The beta test was conducted after the alpha test. The beta test was carried out by testing the learning application on respondents. The intended respondents at this stage were electrical engineering education students of Universitas Negeri Medan semester 4 as many as 31 respondents. Before testing, the researcher briefly explained the testing procedure and how to use the application. Then each respondent uses android-based learning media on electrical machinery material on their respective smartphone devices. After that, respondents were asked to fill out a questionnaire to provide assessments, suggestions, and comments on the learning media tested. To obtain empirical evidence regarding product feasibility, identify errors, and obtain suggestions and improvements to the products developed. The following is the data obtained from the Beta test:

Table 2. Results of Student Response Questionnaire in Beta test

Aspects	**Indicators**	**Percentage (%)**		**Average percentage**		**Criteria**	
		Beta test I	***Beta test II***	***Beta test I***	***Beta test II***	***Beta test I***	***Beta test II***
Quality of content and purpose	Accuracy	83.87	78.9	78.9%	83.4%	Good	Very good
	Importance	79.35	81.94				
	Completeness	76.13	83.23				
	Interest and attention	70.32	85.16				
Quality of Learning	Providing learning opportunities	81.94	78.4%	78.4%	85.9%	Good	Very good
	Providing help to learn	80.00	84.52				
	Motivating quality	76.77	84.52				
	Flexibility of learning	84.52	91.61				
	Relationship to other learning programmes	82.58	85.81				
	Social quality of learning interaction	70.32	80.00				
	Quality of tests and assessments	80.65	85.81				
	Can have an impact on students	78.06	83.87				
		74.19	89.03				
	Providing learning opportunities	76.77	83.87				
Technical Quality	Readability	81.94	88.39	77.9%	86.2%	Good	Very good
	Easy to use	80.65	89.68				
	Quality display or impressions	73.55	84.52				

Quality handling of answers	75.48	83.87				
Quality of documentation	78.06	84.52				
Average development results			78,4%	85,2%	Good	Very good

From Table 2, it can be seen that there is an increase in the percentage value from the previous test results on each indicator assessed except for the accuracy indicator. The accuracy indicator decreased from 83.87% to 78.9%. In addition, of the 3 aspects of the components assessed in the beta test II by students regarding the android-based learning media chemistry lecture developed obtained excellent average criteria with an average percentage of 85.1%. The component aspect that gets the largest average percentage is in technical quality, namely with an average percentage of 86.2%. Then in the aspect of learning quality with an average percentage of 85.9%. while in the aspect of the quality of content and objectives on learning media get an average percentage of 83.4%.

4 Conclusion

It is determined that Android-based learning materials for students studying electrochemical topics are created based on the outcomes of the previously mentioned conversation. The educational materials created as applications run in three stages on smartphones using the Android operating system. The three phases are design (design), development (development), and planning (planning). It is well known that the validator's evaluation of Android-based learning materials for students studying electrochemical topics yielded an average percentage of 80.25% in alpha test I, 82.22% in alpha test II, and 100% in alpha test III. These findings suggest that the educational materials are excellent and practical. It is known that in beta test I, students' answers to learning materials on electrochemistry that are based on Android receive an average percentage of 78.40% with an excellent category. The very good category then received an average percentage of 85.20% in beta test II.

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