Development of mobile-learning media on Basic Electricity and Electronics Subject

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Abstract — In the learning process of basic electricity and electronics subject, students face problems in understanding the material because it is considered as difficult without supported of adequate media. Then, the time allocation for basic electricity and electronics learning in the classroom is only four hours in a week, thus the material delivering is considered as not optimally to students. Therefore, teaching learning process needs to be supported by suitable and adequate media. The purpose of this research is mobile based learning media that is valid, practical and effective for Basic Electricity and Electronics subjects. The method of this research is Research and Development (R&D). This research and development used the Borg and Gall model that consists of several stages. The instrument used in this research is validation questionnaire that was given to material experts and media experts. The results obtained from this development research are a learning media based on mobile learning in the Basic Electricity and Electronics subjects. Based on research developed media are valid media, with the results of media validation of 0.84 and material validation of 0.74. The practical value of the results of the teacher's response of 94% and student responses of 84.24% were categorized very practical. From the posttest scores students get effective results that is 0.00 which is smaller than 0.005 which means that it is significant from the value of the experimental class and the control class.

Keywords: *Media Learning, Mobile Learning, Basic Electricity and Electronics*

I. INTRODUCTION

Education is a process of influencing the students to foster their basic potential skills of intellectual and emotional in order to be beneficial to society [1-3]. A formal education stage is divided into three levels; elementary, middle or junior and senior high school. The senior high school is divided into general senior high school and vocational high school. The high school is divided into senior high school (SMA), Madrasah Aliyah/ Islamic high school (MA), Vocational High School (SMK) and Islamic vocational high school (MAK) and other types of schools at the same level.

A vocational school is a specific education that is aimed at preparing the workers with specific skills to enter the workforce [4-6]. In the learning concept of the 2013 curriculum, it is developed that the learning should be student-centred and the teacher is a facilitator. Teaching and learning activity in the classroom needs to enhance with several methods or learning model that supported by learning media. Rusman states that the use of learning media will be helpful in delivering the learning message and content and also to give more value of learning process that will motivate the students to improve their learning process [7].

According to Gary B Smartphone is a set of handphone that can be used to do the basic communication (sending a message and making a call) with PDA (Personal Digital Assistant) in it and works like a mini-computer [8]. In order to make a smartphone operating as what needed software that is called android should be used. An android is a software that is used at the mobile device that consists of the operating system, middleware and core application that can be illustrated as a bridge between the device and it is' so that the users can interact with their devices and run the application provided in the device [9-10]. This operation system of android is open source so the programmer can both create the application or modification of this system. Therefore a mobile-based learning media is developed.

Based on the observation analysis of student's need, at 19 to 23 august 2019 at SMKN 4 Pariaman, it can be concluded that the subject of basic electricity and electronics is an interesting subject for the students to learn. However, 74,07% of students revealed that the time allocation for basic electricity and electronics learning in the classroom is only four hours in a week, thus the theory delivering is considered as not maximal yet. 81,48% of students face problems in understanding the theory of basic electricity and electronics subject because the theory is considered as difficult without supported media that motivate the students and help them to understand easily. Based on the results of interviews with DLE, subject teachers

the use of media in the form of a module, job sheet and PowerPoint media. PowerPoint has been implemented in previous learning activities. But the problems are still remaining the same. This is because of the media used is not interesting, thus the students are not motivated to learn.

Learning media is everything like the environment, everything that is conditioned to increase knowledge, change attitudes or instil skills in everyone who uses it [11]. Learning media are all tools or forms that work on messages to increase knowledge, change attitudes or instil benefits; the message conveyed here is the subject matter delivered to students. Mobile learning is one of the supporting elements in the process of education and training, using mobile media, such as PDAs, Smartphones and Mobile Phones [12]. In mobile learning, there is convenience in the use of functions and the ease of media or tools used (functionality and mobility). One of the characteristics of mobile learning is the ease with which tools can be carried and used anywhere, easy to use.

Revealed that with the concept of mobile learning, learning will not be limited by space and time because of the flexibility and portability of the devices used so that students are more enthusiastic and have the opportunity to learn with new, easy, useful, and fun learning spaces [13]. This mobile learning can be used as a learning tool that contains learning material, such as summary material, questions, and other features that are more interesting. Learning media applications using smartphones are proven to be feasible, practical, and efficient for use in learning.

Several studies have revealed that m-learning-based learning can improve quality and learning outcomes. The development products in the form of learning media that can be accessed via smartphones can attract students with a complete application content and attractive appearance so that it becomes a new innovation that can be utilized for use in the learning process [14]. Mobile learning model can focus

on students (student-centred learning) by means of the teacher as a facilitator [15].

Based on the results of the study can be drawn conclusions from the mobile learning media effectively applied anywhere and anytime, so as to overcome the limitations of time in learning [16]. The development of android based smartphone technology from various sides, the complete and fast features allows us to be active and creative in supporting the learning process [17]. By using this learning media, it is hoped that the teaching and learning process conducted by the teachers becomes active, innovative, creative, and fun. Mobile learning media is designed to teach the students the specific theory by challenging the students in order to make them more motivated in learning. The implementation of android based learning media will produce positivizes in learning, allow students to have full participation and improve the learning process.

II. METHODS

The method of this research was Research and Development. This research and development used the Borg and Gall model that consists of several stages. It consisted of ten stages research and information collecting, planning, develops preliminary for of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, dissemination and distribution. This research was conducted at SMKN 4 Pariaman.

The subject of this research was the grade ten students of industrial electrical engineering (TEI$_A$). The number of students in the experimental class was 32, and the control class was the grade ten students of industrial electrical engineering (TEI$_B$) which the number of students was 29. The design of this research was a quasi-experimental research with posttest only. Therefore, this research was conducted in two classes; the experimental class that was taught by using smartphone-based learning media, and the control class that learn as common teaching and learning process.

Table 1. Type of class

Class	Total Student	Type class	Treatment	Data Source
X TEI$_A$	32 students	Experiment	With treatment	Posttest
X TEI$_B$	29 students	Control	Without treatment	Posttest

The instrument used in this research to collect the data on the effectiveness was the posttest questions, then comparing the result of students score in the experimental and control class. The result of the assessment was achieved from the test given to students after the use of smartphone-based learning media was valid. The questions of test given should be tried out first. In the tryout process, the test was tried out to class XI TEI which has studied this theory in the previous class. The purpose is to get the more effective tryout test.

III. RESULTS AND DISCUSSION

The results of media validation are obtained from the assessment of each aspect of the indicators given by the validator, for dictate validation of 0.82 with valid categories, for construction validation of 0.85 with valid categories, and for technical validation of 0.85 with valid categories.

Table 2. Learning Media Validation of Results

No	Aspect	Validator Rating Score			∑s	Aiken's V	Explanation
		V1	V2	V3			
1	Purpose and content	22	28	27	59	0.82	Valid
2	Instruction	32	39	35	82	0.85	Valid
3	Technic	24	28	27	61	0.85	Valid
	Total	78	95	89	202	0.84	Valid

The average validation of learning media from three validators is 0.84 so that it can be concluded that included in the "Valid" category. Then, the results of the theory validation were obtained from three validators; the theory validation consists of two aspects, namely the

theory aspect of 0.70 with a valid category and the learning aspect of 0.78 with a valid category. The overall average of theory validation is 0.74 so that it can be concluded that the theory falls into the "Valid" category.

Table 3. Results validation of theory

No	Aspect	Validator Rating Score			∑s	Aiken's V	Expla-nation
		V1	V2	V3			
1	Theory	14	34	32	59	0.70	Valid
2	Learning	21	27	26	56	0.78	Valid
	Total	35	61	58	115	0.74	Valid

Based on teacher assessment, it has results, 92% product aspects with a very practical category, the presentation of theory 96.67% with a very practical category, and the benefit aspect 93.33% with a very practical category. The average teacher response is 94% with a very practical category. The results of student assessment, product aspects 89.38% with a very practical category, the presentation of theory 82.29% with a very practical category, and aspects of the benefits 81.04% with a very practical category. The average student response was 84.24% with a very practical category. So it can be concluded that the Android-based learning media developed are categorized as Practical.

Tabel 4. Questionnaire Student Response Result

No	Aspect	%	Category
1	Product quality	89.38	Very practice
2	Presentation of theory	82.29	Very practice
3	The benefits	81.04	Very practice
	Average Student Response	84.24	
	Aspect Categories	Very practice	

This smartphone-based media presents the theory in the form of simple and interesting theory in order to make them become easy to understand and to increase the students' motivation in learning, so they can understand

and remember the learning theory easily. The smartphone-based media is more flexible, can be used everywhere, thus it can be a solution to problems in time allocation for learning in the classroom and the learning theory can be delivered maximally. Mobile learning instructional media design as follows:

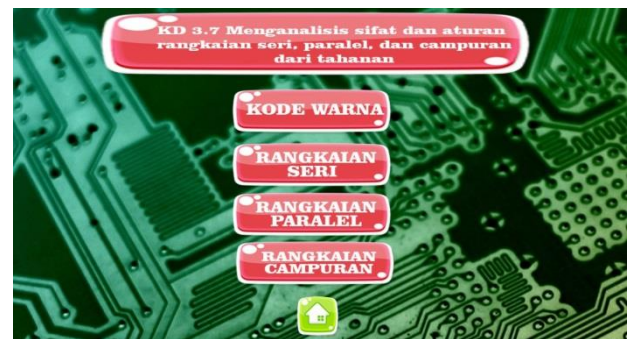Figure 1. Initial display of learning media

Figure 2. Initial Display of theory

Figure 3. Question display

Based on the Edgar Dale cone of experience, someone will be able to remember or to understand a theory 70% totally if she or he is involved in an experiment that uses an artificial object. In this research, that artificial object is presented in the form of smartphone learning

media. Based on the results of posttest it can be concluded that the students are able to understand the learning theory 78,1%, so it can be concluded that the smartphone-based learning media achieves the purpose of this research; to help the students remember and understand the learning theory easily.

Students learning outcomes are also used to see the effectiveness level of mobile learning media. To see the level of effectiveness, the researcher used the Mann Whitney U test and the results are as follows:

Table 5. The result of Mann Whitney (U test)

Test Statistics

	Result
Mann-Whitney U	214.500
Wilcoxon W	649.500
Z	-3.627
Asymp. Sig. (2-tailed)	.000

From the result of SPSS, it can be seen that the Asymp value is Sig (2-tailed) = 0,000 which is lower than 0,05, so it can be concluded that there are significant differences between the learning outcomes of students in the experimental and control class.

IV. CONCLUSION

A mobile learning media that developed is valid, Practice, and effective way to increase student learning outcomes. It can be seen from the learning outcomes of students who are taught by using mobile learning media are higher than the students who are taught without mobile learning media. The result of data analysis shows that the significant differences between the learning outcomes of students who taught with mobile learning media and the students who are taught without mobile learning media.

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