Development of Android-Based E-Module Learning Media in an Effort to Improve Grade X Mathematics Learning Outcomes at SMA Pramadina Bogor

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Abstract

This research aims to develop learning media in the form of android-based e-modules in class X mathematics learning at SMA Pramadina. The research was conducted for five months using a 4-D development model consisting of 4 stages, namely Define, Design, Develop, and Disseminate or adapted into a 4-P model, namely defining, designing, developing, and deploying. This study used the validation of 3 experts, namely design, media and material experts and conducted an effectiveness test using the t test. The findings in this study show that the development of android-based e-modules is feasible and effective for use in mathematics learning at the high school grade X level.

Keywords: e-module, Android, mathematics, learning

I. Introduction

Education is one of the means to form a quality next generation of the nation in the future. The rapid development of science and technology today requires education to participate in the use of technology as a form of innovation in learning (1). Technology that plays a role in the learning process is able to influence curriculum development in three ways, namely: (1) the use of new technology becomes the social goal of the curriculum, (2) technology provides resources for curriculum development, because it can make educators find and collect teaching materials and also guide students in learning. Technology can provide tools to assess various fields of practice, such as simulation, namely making models or visualization tools in the field of science and tools for analyzing manuscripts in literature (3).

The development of science and technology in the era of globalization is unstoppable. This requires us to be able to adapt to various existing advances. One of the easiest examples to find today is the use of the internet that allows people from various parts of the world to communicate, therefore mastery of technology is important considering that currently the world community has entered the era of 4.0 which is technology that cannot be separated from human life. Every human being must change because if it stays in place then creativity will die and not develop.

Today's technology, known as technology that uses a systematic approach, is the development and application of methodological processes based on laws or rules in an effort to facilitate learning. Systematic means following a sequence or rule. This means that the second revolution is focused on efforts to design, develop and implement and assess media learning into a learning system designed to be able to teach and learn without the presence of teachers so that it requires systematic steps.

The development of education today is very rapid in line with the use of technology that is increasingly advanced now. The independent curriculum is designed to be more relevant to the needs of today's society and prepare students to face future challenges. It emphasizes the importance of digital literacy and the use of technology in education, as well as the development of social and emotional skills. The aim of this curriculum is to provide a more flexible and learner-centered approach to education. with a focus on developing learners' thinking, critical, creativity, and problem-solving skills.

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Learning Media is etymologically divided into two words, namely media and learning. The word media comes from the Latin medius which literally means middle, intermediary or introduction. In Arabic, a medium is an intermediary or conveyor conveyor of a message from the sender to the recipient of the message. Media in general are people, materials, and events that build conditions for learners to be able to acquire knowledge, skills, or attitudes. Media as a tool makes it easier for educators to convey messages from learning materials to students.

Learning media is a tool for the learning process. Learning media is a container that contains learning messages from various sources that want to be passed on to students and have goals to be achieved in the form of a learning process (4). Learning media has special benefits that we can consider as research subjects, including: (1) The delivery of material can be uniformized, (2) The learning process becomes more interesting, (3) The learning process of students, students are more interactive. The amount of teaching and learning time can be reduced, (5) The quality of student learning can be improved, (6)The learning process can occur anywhere and anytime, The

role of the teacher can change towards a more positive and productive direction. Development of a learning media that can support the learning process and improve the quality of learning in the form of student learning outcomes (7).

The use of media in learning can help educators in conveying information and limited class hours. The media serves as a source of information on learning materials and a source of practice questions. The quality of learning is also influenced by individual differences in participants, both differences in learning styles, differences in cognitive abilities, differences in learning speed, and differences in background. The application of media in learning will make it easier for teachers to deliver material to students. Students will also be more interactive with more interesting learning media. Learning media can be grouped into three categories, namely (1) presenting media; (2) object media; (3) interactive media (8) analyzed learning media by classifying into seven groups, namely 1) graphics, printed materials, and still images; 2) stationary projection media; 3) audio media; 4) silent audio-visual media; 5) live/film audio-visual media; 6) television media; and 7) multimedia. Various types of learning media can be applied by teachers in learning by adjusting the needs of the material to be delivered.

Maths is often considered an unpleasant and scary subject by some students. They avoid learning to count, even though in real life humans cannot be separated from the term counting. The wrong way of delivering and learning from the beginning can be the cause of Mathematics is less desirable by students at school. Problems regarding learning arise at Paramadina High School, where in mathematics subjects, especially in Trigonometry material, the KKM that has been determined by the school for mathematics courses in grade 10 is 75 but there are still many students' scores still below KKM. Based on the results of the midterm test that has been carried out in semester 1, the average score of 70.76 out of 25 students is only 9 people or 36% of students who meet the KKM and 16 students or 64% still do not meet the specified KKM. With the lack of interest of students in learning mathematics, it affects their learning outcomes. For this reason, there is a need for learning media that can facilitate mathematics learning to make it more fun and easier for students.

Android is a Linux-based mobile operating system that includes an operating system, middleware, and applications for mobile devices. ANDROID is one of the mobile operating systems that grew amid other operating systems that are developing today. Android is a comprehensive, open source platform designed for mobile devices. Android is a Linux-based operating system intended for mobile devices. Android is the most popular operating system in the community because it has advantages such as the open source nature that gives developers freedom to create applications (9). In general, Android is widely used by the community, especially students. The use of smartphones itself is popular in the world and is not left behind with Indonesia. With the existence of smartphones can have a very big impact on human life and provide a lot of ease of use. However, the use of smartphones is only used for social media use and only a small number use it to help learning activities (10).

The use of Android-based learning media is one of the applications of 21st century learning styles (11). The use of this type of learning media has the potential to help improve students' academic performance in the form of learning outcomes in the cognitive realm. In addition, learning with a model like this This type of learning media allows learners to learn not limited by time and place with interesting applications

With this android E-module, where later the learning process will be skilled audio-visual, sound, movie and related to teaching materials whose use is designed to be easily understood so that it can be used as a good learning aid. E-modules can be implemented as independent learning resources that can help students improve their cognitive competence or understanding and no longer rely on the only source of information. E-modules can also be used anywhere, making it more practical to carry anywhere, because it is a combination of print media and computers and can be accessed wherever students are.

II. Research Method

The development model used in this study is a 4D development jouent model (12). This research step is Define, Design, Develop, and Disseminate or adapted into a 4-P model, namely defining, designing, developing, and deploying. This study involved three experts to test the feasibility of android-based e-modules. Where the three experts are media experts, instructional design experts and learning material experts. After the Android-based e-module product is carried out expert validation, then if the e-module product developed is said to be feasible, then a small group trial involving 5 students will be carried out, a large group trial involving 25 students and then a product effectiveness test will be carried out.

The instrument developed refers to the importance of development in terms of learning design, learning materials, peer views on the material developed, and student responses in using this e-module product in the learning process. For instruments used for students, instrument validity and reliability tests will be carried out to see the validity and mockery of instruments carried out using infrencial statistics. Data assessment and analysis are carried out using percentages with predetermined conditions.

After the product analysis can be declared feasible and get a positive response, the e-module product can be disseminated and socialized which will be produced to be used in teaching materials for the learning process.

III. Results and Discussion

A. Data Description

Research aimed at developing E-module Mathematics in Improving Learning Outcomes of grade X students at SMA PRAMADINA. To find out that this device can be used as a reference in the learning process, the design product will be tested on students with a total of 30 students. The desired data in the questionnaire to the use of the product will ask how the content or material is presented, the ease, and attractiveness of the product by students. To find out student responses to the design product with 2 stages, namely small group trials categorized as initial validation of 5 students and large group trials involving students with a total of 25 students.

1. Material Expert Test

The validation results from material experts from the 3 aspects measured were obtained for the learning objectives aspect obtained a percentage of 96%, for the practice aspect of the question obtained a percentage of 94%, for the

evaluation aspect obtained a percentage of 92%. The total assessment of the developed product obtained a percentage of 94.28%, this indicates that the developed product is worthy of being tested, as shown in Figure 1.

Figure 1. Material Expert Test Results
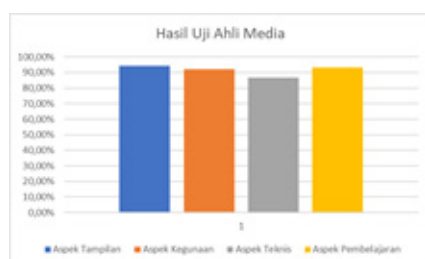
2. Media Expert Test

Figure 2. Media Expert Test Results

The validation results from media experts from 4 aspects measured were obtained for the display aspect obtained a percentage of 92%, for the usability aspect obtained a percentage of 91%, for the technical aspect obtained a percentage of 86% and the learning aspect obtained a percentage of 92%. The total assessment of the developed product obtained a percentage of 92.38%, this indicates that the developed product is worthy of being tested, as shown in Figure 2.

3. Test Design Expert

The validation results from design experts from 2 aspects measured were obtained for the usability aspect obtained a percentage of 90% and the learning aspect obtained a percentage of 98%. The total assessment of the developed product obtained a percentage of 95.38%, this indicates that the developed product is worthy of being tested, as shown in Figure 3.

Figure 3. Design Expert Test Results
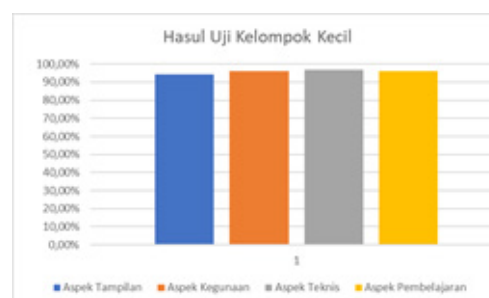
4. Small Group Test

Figure 4. Small Group Test Results

The results of the trial in a small group with a total of 5 respondents from 4 aspects measured obtained for the display aspect obtained a percentage of 92%, the usability aspect obtained a percentage of 93%, the technical aspect obtained a percentage of 94% and for the learning aspect obtained a percentage of 92%. The total assessment of the developed product obtained a percentage of 95.77%, this indicates that the developed product is feasible to be tested in large groups, as shown in Figure 4.

5. Large Group Test

The results of the trial in a large group with a total of 25 respondents from 4 aspects measured obtained for the display aspect obtained a percentage of 98.5%, for the usability aspect obtained a percentage of 97%, the technical aspect obtained a percentage of 99.50% and the learning aspect obtained a percentage of 98.50%. The total assessment of the developed product obtained a percentage of 98.5%, this indicates that the developed product is feasible to be mass-produced to be known and used as a guideline in developing e-module teaching materials. This

e-module teaching material can be socialized and disseminated to all educators to be able to develop e-module-oriented teaching materials as a guideline in the learning process in grade X of Senior High School, as shown in Figure 5.

Figure 5. Large Group Test Results

B. Discussion

Modules are teaching materials that are specially prepared and systematically designed based on a curriculum that is packaged into the smallest learning unit (modular) that learners can use independently to achieve certain learning objectives that have been set. An electronic module is an electronic version of a printed module that can be read on a computer and designed with the necessary software. E-module is a learning tool or means that contains material, methods, limitations and ways of evaluating which are designed systematically and interestingly to achieve the expected competencies according to the level of complexity electronically.

According to (13) states that electronic media that can be accessed by students have different benefits and characteristics. If viewed from the benefits of electronic media itself can make the learning process more interesting, interactive, can be done anytime and anywhere and can improve the quality of learning. Understanding of e-module media requires an initial understanding of the definition of two things, namely about media and e-Module. Association of Education and Commmunication Technology (AECT) places restrictions on media as any form and channel used to convey messages or information (14). In different expert definitions, media are various types of components in the student environment that can stimulate students to learn.

The characteristics of e-modules in general actually have similar characteristics with modules,

namely five basic characteristics such as self instructional, self contained, stand alone, adaptive, dan user friendly (15). E-modules are systematically arranged into specific learning units, which are presented in electronic format where each learning in it is linked with a link, complemented by the presentation of video tutorials, animations and audio to enrich the learning experience. E-module writing is carried out according to the 2013 curriculum RPP with the following steps: (a) Core Competencies (IC); (b) Basic Competencies (KD); (c) Learning Indicators and Objectives; (d) Learning Methods and Models; (e) Teaching Materials; (f) Summary; (g) Steps of learning activities; (h) Sample Questions and Competency Tests; (i) Assessment.

From the results of the data description that has been presented indicates that the development of android-based e-modules in high school mathematics subjects in grade X obtained validation results and from small group trials, large group trials and effectiveness tests show that android-based e-modules are feasible and effective for use in mathematics learning. This fact has been supported by several previous studies that have been conducted that show improved learning outcomes, increased achievement, motivation as well as improved critical thinking of students in learning. The research conducted had different results in terms of its usefulness in the learning process, including:

1. The development of E-Modules in Android-Based High School Mathematics learning was obtained based on the results of validation tests of media experts, material experts, and practitioner experts, it was concluded that 74.70% E-Modules were declared "very good" and 25.93% were declared good. Based on the results of student responses, learning using E-modules as many as 90% of students stated that they strongly agreed and E-modules can increase motivation to learn mathematics, respondents answered 96.67% strongly agreed. Based on the results of student responses, learning using e-modules instills digital literacy skills for students through an overview of student and teacher activities. Learning using E-Modules makes interest in participating in classroom learning by 93.33% (almost all) and 83.33% (almost

all) students are not lazy to participate in learning activities using E-Modules and most (63.33%) students are active and enthusiastic about participating in learning using E-Modules.

2. Development of E-Modules (Digital Modules) in Thematic Learning in Elementary Schools This research and development produces final products in the form of electronic module teaching materials (e-modules) on thematic learning themes always save energy. This digital module (e-module) product was tested in grade IV SD Muhammadiyah 9 Malang City. The purpose of this trial is to determine the practicality (e-module) of user responses in thematic learning. In addition to producing products (e-modules), this research also produces usage manuals (e-modules) that can be used by teachers and students. The manual contains instructions on how to use e-modules in thematic learning.

3. Android-based Tajweed learning media for elementary level students. This research aims to produce an interactive android-based application of tajweed science, which contains basic tajweed material accompanied by examples of correct pronunciation of tajweed law equipped with examples of writing, narration / reading. This interactive mobile application allows users to see examples and hear from the application used, making it easier for children to understand the tajweed material and can repeat it at home at any time. The application is designed using UML as well as jQuery Mobile programming language with blackbox testing. Research is carried out by collecting data through literature studies and interviews. This research produced a tajweed learning medium for elementary school-age children. Applications can display the science of tajweed along with images and sounds.

4. Developing the Flipbook Maker-based SETS e-module refers to the development of the EDDIE model The feasibility test or product validation of the flipbook maker-based SETS e-module was obtained through validation by two language validators, and media validators, and two materi-

al validators obtained results of 94.57% for material, 97.5% for language, and 96.53% for media with the acquisition of all three criteria very feasible. The practicality and attractiveness test was obtained through the educator response test and also students obtained 92.16% results by students with very attractive criteria, and 97.6% by educators with very good criteria.

5. The development of Android-based Interactive E-Modules in the Teaching and Learning Strategy Course has been validated and meets the criteria for good learning media and is suitable for use in learning history teaching and learning strategies courses in the history education department, where 93% of validation is by material experts, 82% of validation is by learning design experts, and 86% of validation is by media experts. While the feasibility of each trial ranged from 63%, for small trials, 66% for medium trials, and 63% for large trials. The android-based interactive e-module developed has been effectively used to improve student learning outcomes in the learning process. This can be seen from the analysis of student learning outcomes using more android-based learning media efficient, where nilia is obtained posttest larger in use pretest.

From these results, it has been proven how the consequences and benefits in developing e-modules in the learning process. Of course, e-modules in the future can be developed vareatively and innovatively by using android-based module content models as expected competencies expected in the 21st century.

IV. CONCLUSION

From the results of the description of the data that has been described with discussions carried out in accordance with the theory and previous research that has been carried out, it can be concluded that the development of products in the form of e-modules for mathematics learning grade X Senior High School which in this study was carried out at Pramadina High School can be significantly said to be feasible and effective to be used in the implementation of the mathematics learning process. Therefore, this learning e-mod-

ule can be mass-produced to be distributed to teachers who teach mathematics subjects both in the school environment as a place of research and in other high schools in mathematics subjects.

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