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Improving mathematical understanding ability student through study of mobile learning mathematics base on the Android

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Abstract: Research and Development Research aims to describe (1) the development of Android-based mathematical learning matters on sine rules material and cosine rules for high school students, (2) measure the effectiveness of students' mathematical understanding through learning of mobile mathematics based on Android, and (3) mobile eligibility learning mathematics based on Android developed. Based on the results obtained: (1) The development of mobile learning is adapted from the development model of ADDIE (Analysis, Design, Development, Implementation, and Evaluation). (2) The students' understanding of mathematical comprehension is improved (3) Mobile learning is effective in three trials with appropriate criteria in every aspect. (4) Mobile learning research results worthy of use.

1. Introduction

Learning media are influenced by technological development, teachers are required to make innovative technology-based learning media, learning technologies have a role to facilitate learning and improve performance by creating, using, or utilizing and managing appropriate processes and technology resources [1]. The use of interesting media learning will increase the motivation and interest of students to learn that will ultimately make students successfully understand the material given, another study conducted [2]. The Development of Model Learning Media of Sorting Algorithm. The use of learning tools allows students to understand the material in a shorter and more enjoyable time. In the context of learning mathematics the use of learning media technology can use mobile learning. Development of media in the form of mobile learning able to meet the criteria of support to the objectives and content of learning, conformity with student characteristics, efficiency of learning time, and easy to use by learners. Mobile learning has practical characteristics and can be taken anywhere. There are three main functions of mobile learning in the learning process, namely as supplement (addition), as complement (complement), and as substitution (substitution) [3]. Mobile learning can serve as a supplement if learners have the freedom to use or not. Mobile learning can serve as a complement if used as a complementary program of instructional materials taught to students in the classroom. In this case, mobile learning acts as a reinforcement or remedial for learners who cannot meet the standards. Mobile learning in learning mathematics can be developed based on Android, one of them is ADDIE (Analysis, Design, Development, Implementation, Evaluation). The research objectives are: 1) Developing mobile mathematics based on Android on discussion of Limit Function for high school students; 2) Knowing the students' mathematical understanding before and after using Android-based mathematical learning;



3) Knowing the effectiveness of mobile learning based on mathematics android; 4) Knowing the eligibility and success of mobile learning mathematics is produced.

Media comes from the Latin *medius* which literally means 'middle', 'intermediary' or 'introduction'. In the process of teaching and learning, the media can be interpreted as graphic, photographic, or electronic tools to capture, process and rearrange visual or verbal information [4]. The use of learning media in the teaching and learning process has several benefits [4]. In general, the benefits of media use are: 1) clarify the presentation of messages and information 2) improve student learning motivation, and 3) overcome the limitations of the senses, space, and time. Mobile learning can be defined as a facility that provides general electronic information to learners and educational content that helps achieve knowledge without blaming location and time [5]. Mobile learning is part of e-Learning is more inclined to the utilization sophistication of mobile phones. Mobile learning provides learning materials that can be accessed anywhere and anytime with an attractive look [6]. The use of mobile learning will improve students 'learning motivation and students' attention in learning math. In addition, compared to conventional learning, mobile learning enabled more opportunities for direct collaboration and interacted informally among students [6]. Mobile learning mathematics by using suitable Android app applied in learning mathematics because it has function: a. Supplement (additional) The application of mobile learning mathematics is very useful if used by learners to be used as another source as an exercise to do the problem or understand the related material presented. Math is not an easy lesson if students do not practice often. Mobile Learning can be improved as needed, so the material developed in the application can be added as needed by the learners. Therefore, mobile learning is important applied to the learning of mathematics. b. Complement (complementary) Mobile Learning serves as complement (complementary), the material is programmed to complement the learning materials in the classroom. With Mobile Learning students can work on exercise questions as well as for remedial programs if students have difficulty. c. Substitution the Mobile Learning application can serve as a substitute for module books. This means that it can be used in the classroom as a substitute learning medium for module math. Divides the aspects of understanding into 4 levels [7]: 1) Mechanical understanding: recall and apply formulas routinely and calculate simply; 2) Inductive understanding: applying formulas or concepts in simple cases or in similar cases; 3) Rational understanding: to prove a formula by theorem; and 4) Intuitive understanding: estimate the truth with certainty (without hesitation) before analyzing further. The aspect of mathematical understanding studied in this study focuses on the understanding expressed by Skemp [7] namely instrumental understanding and relational understanding. The instrumental understanding of a number of concepts is defined as an understanding of the concepts that are mutually exclusive and only memorize the formula in simple calculations. On the contrary a relational understanding contains a scheme or structure that can be used to solve broader problems.

2. Research method

This Research represent the type of research R & D (Research and Development). This Research aim to to yield the mobile learning base on the effective and competent android for competitor of student Senior High School for the items of limit function. Model the development used in this research that is model the development of Alessi and Trollip..

At planning phase, stages; steps conducted cover (1) making definition of items scope conducted through observation, and interview, (2) identifying competitor characteristic educated, that is by using sheet analyse the requirement, (3) determining and collecting source that is source which correlate with the items and also other; dissimilar reference, and (4) conducting brainstorming with the teacher learn the mathematics in making concept of design study media developed at phase design, stages; steps conducted cover (1) developing concept of early media including layout, knob navigation, colour type, size measure text, and graphical resolution weared in mobile learning. (2) analysis conception and related/relevant duty with the study content (3) making flowcharts to present the structure program from early final till and storyboards to present the device of appearance of mobile learning to be operated by consumer, and (4) determining used software development phase, stages; steps conducted cover (1) drawing up items text processed use the software Microsoft Office Word (2) preparing content text,

video, and draw, (3) uniting component made into software, then diexport so that yield the file by extension is apk, (4) preparing material supporting to cover the addition of forum online, (5) conducting test alpha at two people of media expert and two people of substance expert teach the Mathematics, and conduct the test-drive to student cover the test alpha conducted by two people of media expert and two people of items expert and test the beta. Test-Drive conducted to test the developed product eligibility. Test-Drive in this research. Test the alpha. Assessment by media expert cover the visual audio appearance aspect and software engineering. Assessment by items expert cover the study aspect, and fill the items. Test the beta conducted in two phase that is test the big and small group. This research use the technique analyse the data qualitative, analyse the data descriptive qualitative to result of product developed, while quantitative analysed by altering mean score become the quantitative value with the assessment criterion to assess the eligibility of product of mobile learning. This research is a type of R & D research (Research and Development). This study aims to produce a viable and effective mobile learning based on android for high school students for material limit function. The development model used in this research is the development model of Alessi and Trollip. At the planning stage, the steps taken include (1) defining the scope of the material through observation, and interviewing, (2) identifying the characteristics of learners, ie by using the needs analysis sheet, (3) determining and collecting resources sources that relate to other materials and references, and (4) brainstorming with teachers of mathematics teachers in developing learning media design concepts developed. In the design phase, steps include (1) developing early media concepts including layouts, navigation buttons, color types, text size, and graphic resolution used in mobile learning. (2) analysis of concepts and tasks related to learning content; (3) create flowcharts to display program structure from beginning to end and storyboards to show the mobile learning view design to be operated by the user; and (4) determine the software used. At the development stage, the steps include (1) preparing the text of the material processed using Microsoft Office Word software (2) preparing text, video, and image content, (3) uniting the components that have been made into the software, exported so as to produce files with apk extensions, (4) prepare supporting materials including additional online forums, (5) perform alpha tests on two media experts and two mathematics teaching experts, and conduct trials to students including alpha tests conducted by two media experts and two material experts and a beta test Trial Design Trials are conducted to test the feasibility of developed products. The trial in this study. The alpha test. Assessment by the media expert includes aspects of audio visual display and software engineering. Assessment by the material expert includes the aspects of learning, and the content of the material. The beta test is done in two stages: small and large group test. Data analysis techniques used in obtaining data in this study using qualitative data analysis techniques, qualitative data descriptive analysis for product results developed, while quantitative analysis by changing the average score into a quantitative value with assessment criteria to assess the feasibility of mobile learning products. Improved learning outcomes can be determined by calculating the gain (normalized gain or N-gain).

3. Result of research and solution

The results of the development in this study, namely learning-based mobile learning media android math lessons for high school students using Helios Eclips software packed in the android package format (apk) contains: the splash screen, curriculum page, material page, discussion page, practice page, usage page, discussion forum page, and developer page. This android-based mobile learning instructional product is accompanied by a user manual that contains: 1) a brief description of the application, 2) product specifications, 3) installation instructions, 4) about the operating instructions containing menu descriptions/features and instructions for opening mobile learning products and 5) learning that contains instructional instructions before operating a mobile learning product. The process of developing learning media based on android mobile learning is in accordance with the theory of multimedia development according to [8], with validated by material experts and media experts. The results of the study describe the data: 1) Android-based mathematical mobile learning included into the qualities highly appropriate according to the material expert, limited test results and extensive test for aspects: a) Material Relevance Aspect; b) Material Handling Aspect; c) Aspects of Problem Exercise;

d) Language Aspects; e) Securities Aspects for Learning Strategies with a mean score of 97%. Furthermore 2) Android-based math-based mobile learning is included into highly qualified qualities according to the media expert, limited test results and extensive testing for aspects of: a) Ease of navigation; b) Artistic and aesthetic; c) media integration with an average of 90.5%. The effectiveness of mobile learning based on Android mathematics obtained data 1) Android-based mathematical mobile learning included into the quality is very reasonable according to material experts, test results are limited and extensive test for aspects: a) Material Relevance Aspects; b) Material Handling Aspect; c) Aspects of Problem Exercise; d) Language Aspects; e) Securities Aspects for Learning Strategies with a mean score of 97%. Furthermore 2) Android-based math-based mobile learning is included into highly qualified qualities according to the media expert, limited test results and extensive testing for aspects of: a) Ease of navigation; b) Artistic and aesthetic; c) media integration with an average of 90.5%. Pretest and posttest were conducted in the research class as subjects of mobile learning users. Data of pretest and posttest result in research class can be seen in table 1

Table 1. Result pretest, posttest and gain.

No	Variable	Pretest	Posttest
1	high score	84	94
2	low score	56	75
3	Mean	66.45	80.54
	Gain	13,97	

Table 1 explaining is informing of ability is understanding of student mathematics passing mobile learning happened with the score gain of equal to 13,97

4. Conclusion

Research can improve students' mathematical understanding through android-based mobile learning products so teachers are required to be able to use mobile learning model based on android for mathematics learning

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