Development of Android-Based Mathematics Learning Media

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Abstract

The purpose of this research is to develop an Android-based math learning media that can be accessed using smartphones. This research is research development and using ADDIE model development with 5 stages of development, namely analysis, design, develop, implement, and evaluation. This research has successfully developed an Android-based math learning media with basic principles 1) the product is developed for one school year, 2) the formula is available or a quick way of calculation, 3) The practice questions with scores, 4) the Discussion is available for each question exercise, 5 there is an evaluation every chapter, 6) There are preparations for midterm and final exam, and 7) available help and about functions. The resulting product has also been through revision and expert tests, with satisfactory results, so that the media product of mathematics learning is feasible to be used as an alternative learning media for students.

Keywords: Mathematics, Learning Media, Android-Based, Development

1. Introduction

Education is an important element of the progress of a nation. A good education is expected to change individuals toward maturity and maturity, as well as make changes in human life towards a better, right, useful, and planned [1]. The most important part of education is the learning process. The learning process must be able to combine various things, be more adaptive, interactive, and so on to produce meaningful learning [2].

The subject that demands great attention to the quality of learning in mathematics. Why mathematics? Mathematics is one of the lessons that have an important role in life ([4]; [3]) and becomes the basis for the development of other sciences [5]. However, mathematics has so far been considered a difficult subject for most students ([6]; [7]; [3]; [8]).

Many factors make mathematics considered difficult by students, both in terms of students' perceptions or also in the ability of teachers to create interesting learning. The use of instructional media is very limited [10] and methods of delivery that are not precise and minimal variation [12] make mathematics increasingly difficult. Instructional media can change abstract mathematical perceptions [13] and make the learning process interesting, and increase student interest in learning ([11]; [14]).

The learning media used so far are still limited to media in the form of books, modules, the use of PowerPoints, or other learning devices that are rarely changed or modified to suit the needs of the times. The use of technology in media development is necessary because today technology is increasingly needed in all aspects of life. The number of Indonesian people who use the internet has reached 132 million people or more than half of Indonesia's population is

accustomed to using the internet. Even if that number, the majority have also used smartphones to access the internet. This fact is an opportunity to develop an Android-based online learning media that can be accessed by all internet users in Indonesia, especially students who need quality mathematics subject matter.

2. Research Methods

In product design, this research uses the ADDIE development model which is theoretically considered quite effective and efficient in developing learning tools. The development step using the ADDIE model is preceded by a needs analysis that aims to obtain information related to product development goals. The needs analysis is done by conducting interviews with relevant experts, namely material experts (especially for mathematics material in schools and media experts (especially experts on Android applications).

The next step after the needs analysis is designed, i.e. preparing a product design to be developed. This section is in the form of storyboard preparation, application design, material plans and questions to be developed. The designs that have been prepared are then realized in the development stage, namely writing lines of application code to produce applications that can be accessed interactively by users.

The application design is then tested with material experts and media experts, to get feedback on improvements. Input from experts is then used as a guide to improving applications that have been developed.

3. Results and Discussion

Following the results of the needs analysis, the purpose of this research development is to produce learning application products that can be used by students easily and fun. The important things that are of concern to the development process are: 1) the product is developed for one school year, 2) the formula is available or a quick way of calculation, 3) the practice questions with scores, 4) the discussion is available for each question exercise, 5 there is an evaluation every chapter, 6) there are preparations for midterm and final exam, and 7) available help and about functions.

Based on the results of the needs analysis, a learning application product was developed which can be seen from Figure 1 to Figure 10.
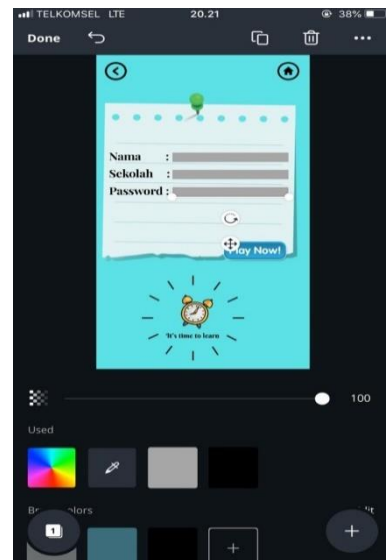

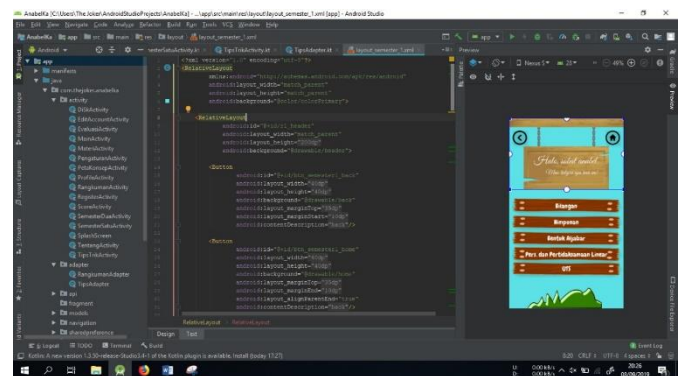
Figure 1. Design Phase with Canva
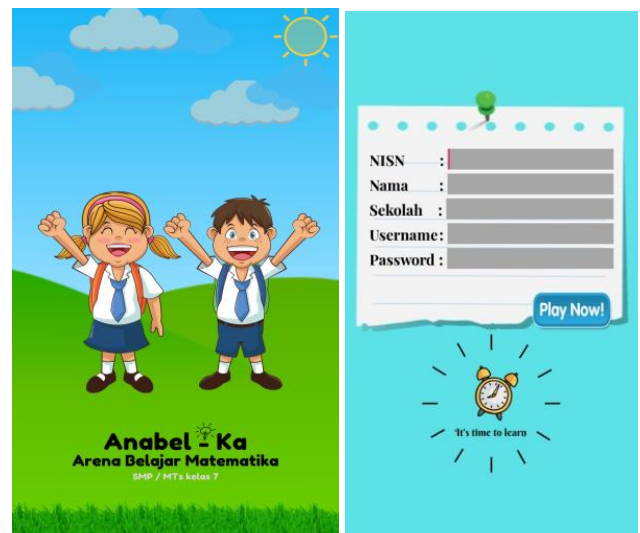

Figure 2. Coding Phase with Android Studio

Figure 3. Main Screen Display & Register Menu

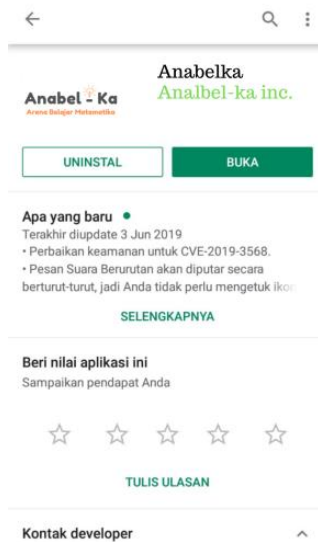Figure 4. Display in Playstore

Figure 5. Semester Selection Display
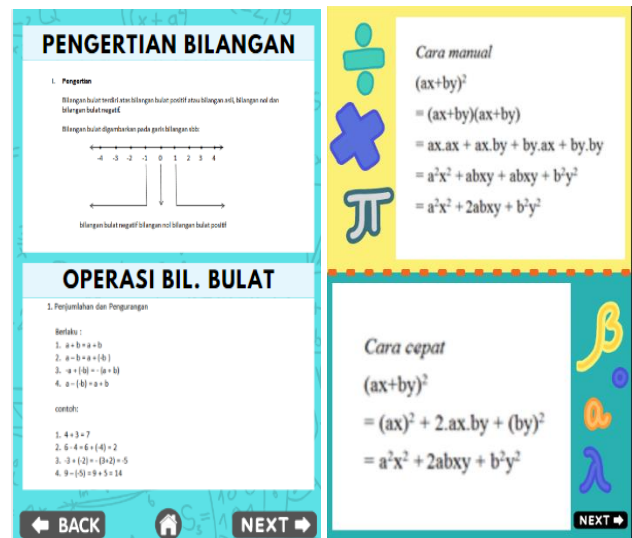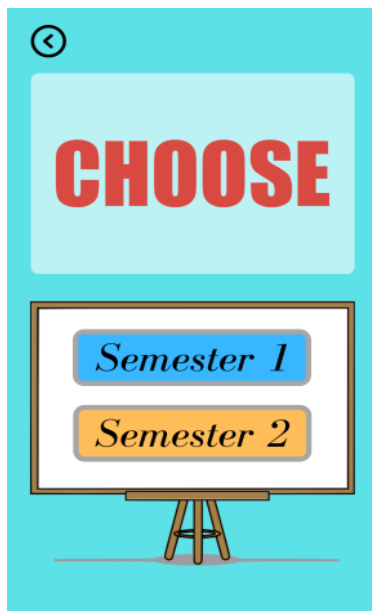

Figure 6. Display Material & Instructional Objectives

Figure 7. Display Material

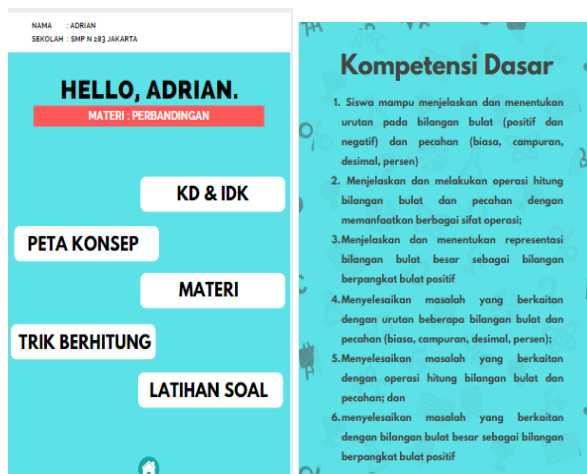Figure 8. Display Exercise Questions

Figure 9. Display Evaluation

Figure 10. Display Key Answer & Discussion

Applications that have been developed are then evaluated by experts, namely material experts, media experts, and also development design experts. The results of the evaluation given to media experts concluded that the application developed was included in the good category, which received a score of 4 out of 5. Material experts also assessed the very good category, which received a score of 4.5 out of 5, mainly viewed from the material aspects and learning that is very appropriate to the needs of students. Finally, the development design expert also assessed the good category, which received a score of 4 out of 5, mainly from the suitability of the development process carried out as well as the resulting application products. However, all assessments are also accompanied by suggestions for improvements that must be made, which aim to improve the quality of the product produced. Input provided by experts and follow-up improvements can be seen in table 1.

Table 1. Expert Advice and Follow Up Corrections

Expert Advice	Follow Up
Posts are still not aligned, the typeface and size are still not consistent	The typeface and size are aligned
The student registration process should not be complicated, just name, school, and password	Improvements to the registration and login fields, along with backing up the programming data
Exercise questions should use daily problems	Improvements to the practice questions
The number of evaluation questions is lacking and it is better to add more HOTS questions. The time duration was also added to 40 minutes for 20 items	Added HOTS-based question exercises and changed the number of questions and the duration of the workmanship to 40 minutes

Expert Advice	Follow Up
The text on the button is made neater	The improvement according to expert input
Questions that arise in practice and evaluation should be random	This part is rather difficult to do, so it is not done, it's just that the number of questions is made more varied

The results of some improvements made related to input from experts can be seen in Figure 11 through Figure 13.
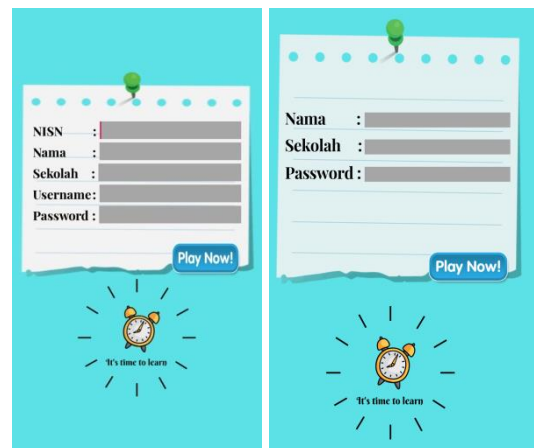

Figure 11. Simplification of the Registration Menu

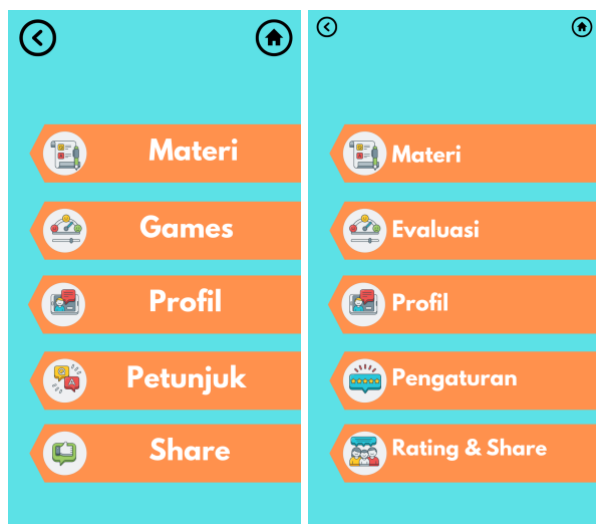Figure 12. Improvements in Processing Time Duration

Figure 13. Improved Display Text Button

This research has succeeded in developing an Android-based learning application product that has proven its quality, especially in terms of experts. Smartphone-based application development has been shown to show many benefits for students and teachers [17], because it is easier to use and easy to repeat as needed [16].

The use of Android-based applications that can be accessed easily by students will certainly make students interested and want to use it further [18]. This shows that the use of technology is necessary as a tool in learning in the classroom.

Interesting learning media will also make mathematics learning more directed [19], more effective [20], motivating and attracting learning interest [15], increasing student enthusiasm in learning [9], and ultimately will improve student learning outcomes in school [6]] In fact, Astuti et al [21] states that the use of applications in learning can be applied in everyday life and makes it easy for students to understand the subject matter, especially mathematics.

Strengths in this application, among others: 1) this application was developed very focused on the needs and knowledge used in schools in the year of making the application, 2) data collected is in accordance with the theory, because researchers take based on findings in the field such as the analysis stage, namely interviews with several teachers and tested on the teacher, 3) the practice questions and evaluations that appear in the application help students to memorize the types of questions that appear and have an accustomed impact on doing it if it is raised continuously or even in class during the lesson, 4) The practice and evaluation questions are developed based on expert input, making the types of questions more varied or varied, ranging from the types of questions and the level of difficulty of the questions, 5) This application presents material that is packaged briefly and clearly by displaying summaries and numeracy tricks, thus making students more muddy ah doing the exercises and are more eager to follow the learning and make it easy for

students to quickly understand the contents of the material, 6) given a "timer or time to work" on the evaluation questions that aim for students to measure the ability based on the time to calculate by applying a short way or tricks given before working on the problems, and 7) a discussion is given on each practice question in sub-material, which aims to make students directly (at that moment) understand how to work on the problem.

4. Conclusion

This research has successfully developed an Android-based learning application that has procedurally fulfilled all development research requirements. The product developed has also undergone a series of evaluations and the results show that the quality of the developed application falls into the good category, so that it can be used in the process of learning mathematics. However, further research to develop this application can still be done, so that better applications can be generated and meet the needs of students in learning mathematics.

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