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Development and Feasibility Test on Android-Based Interactive Multimedia Applications for Mathematics Learning

Ganda Yoga Swara[1], Giatman[2], Ambiyar[3], Wakhinuddin[4], Nizwarni Jalinus[5], Rizal Abdullah[6]
[1]Universitas Negeri Padang, Indonesia
[23456]Faculty of Engineering, Universitas Negeri Padang, Indonesia
**Corresponding Author*: gandayogaswara@gmail.com

INTISARI

Permasalahan dalam penelitian ini adalah melihat sejauh mana multimedia interaktif dapat dipergunakan untuk menciptakan proses belajar online yang efektif dan terintegrasi antara guru dengan siswa. Penelitian ini dilaksanakan di SD Negeri 07 Kota Padang dengan menggunakan metode Research and Development model pengembangan APPED. Dalam prosesnya, model pengembangan APPED terdiri dari 5 langkah yaitu tahap analisis dan penelitian awal, Perancangan, Produksi, Evaluasi dan Diseminasi. Hasil penelitian ini menunjukkan bahwa produk aplikasi multimedia interaktif yang dihasilkan layak digunakan untuk siswa SD. Aplikasi multimedia interaktif ini dapat menciptakan proses pembelajaran online yang efektif dan terintegrasi antara guru dengan siswa. Mempermudah siswa SD dalam belajar matematika dimana saja dan kapan saja. Produk multimedia interaktif ini layak sebagai media pembelajaran berdasarkan hasil ujicoba dan evaluasi ahli media dengan skor 3.9 dan guru dengan skor 3.8 atau dengan skor rata-rata 3.85 (tinggi).

Kata kunci: *multimedia, interaktif, matematika, android*

ABSTRACT

The problem in this research is to see how far interactive multimedia can be used to create an effective and integrated online learning process between teachers and students. This research was conducted at SD Negeri 07 Padang City using the Research and Development method of APPED development model. In the process, the APPED development model consists of 5 steps, namely the analysis and initial research stages, Design, Production, Evaluation and Dissemination. The results of this study indicate that the resulting interactive multimedia application product is suitable for use by elementary school students. This interactive multimedia application can create an effective and integrated online learning process between teachers and students. Make it easier for elementary students to learn mathematics anywhere and anytime. This interactive multimedia product is feasible as a learning medium based on the results of trials and evaluations of media experts with a score of 3.9 and teachers with a score of 3.8 or with an average score of 3.85 (high).

Keywords: *multimedia, interactive, math, android*

INTRODUCTION

The times that are increasingly rapid coupled with advances in information technology make it easy for someone to package and present information. The same thing is also felt in the world of education, various methods and learning models have been created and developed by experts to maximize learning outcomes. The use of technology and the use of media in the teaching and learning process can arouse students' desire to learn, increase learning motivation, stimulate learning activities, and even affect students psychologically [3]. Technology has become part of the classroom activity process and life aids. Skilled in using technology can help humans communicate, practice life skills and can better understand concepts [3]. One of the results of using technology products that can be used as an innovation in learning is multimedia learning [5].

The world of education at this time is required to develop a learning approach. This is in line with the development of student psychology,

social dynamics, and the dynamics of the education system in each country which is constantly changing. Elementary school or abbreviated as SD is the initial stage to instill the basic concepts of education for children, it is hoped that the basic concepts received by children can be used as an opening to the mindset to the next level [7].

Mathematics is one of the most important and difficult subjects and is a basic and used subject until college. The low understanding of students towards this subject is indicated by the finding of several students with unsatisfactory grades [7]. The purpose of learning mathematics in schools according to Permendiknas No. 22 of 2006 are as follows: 1) Understand mathematical concepts, explain the relationship between concepts and apply concepts or algorithms in a broad, accurate, efficient, and precise manner in problem solving; 2) Using an understanding of patterns and characteristics, performing mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements; 3) solving problems which include the ability to understand problems, design mathematical models, solve models and interpret the solutions obtained; 4) Communicating ideas with symbols, tables, diagrams, or other media to clarify the situation or problem; 5) Having an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, attention and interest in studying mathematics, as well as being resilient and confident in problem solving [19]. In addition, mathematics is also a difficult subject to understand. Understanding the concept is the most important part of learning mathematics [25]. This means that in studying mathematics, students must first understand mathematical concepts so that they can solve problems and apply this learning in life. Apart from understanding mathematical concepts, independent learning is also an important factor to be improved. Learning independence is a factor that determines the success of students in learning and shows a positive influence on learning and the achievement of learning outcomes [11].

In learning activities, the media has a very important role in the process of delivering lessons to students. Learning media, namely information media for teaching and learning activities in order to provide more effective and interactive learning outcomes. The existence of media in the teaching and learning process is expected to help teachers and students in learning that is more visual, interactive, interesting, easy and quick to understand [10]. Learning media are tools that can convey or deliver messages and learning outcomes. The use of attractive learning media will be able to increase student motivation and interest in learning which in turn will enable students to understand the material provided [1]. Learning media is a component of delivery strategies that can contain messages to be conveyed to students [9]. Learning media have contributions including: the delivery of learning messages can be more standardized, learning can be more interesting, learning becomes more interactive by applying learning theory, learning implementation time can be shortened, the quality of learning can be improved, the learning process can take place whenever and wherever needed, The positive attitude of students towards learning materials and the learning process can be improved, the role of the teacher changes in a positive direction [6].

Seeing this potential, the development of learning media by utilizing cellular phones with the Android operating system becomes interesting to research. The emergence of cell phones and Android aims to make it easy to get all the information needed [19]. It is strengthened by Wibisono through the results of research conducted by the Indonesian Internet Service Providers Association in 2014 which found that internet users in Indonesia still have not fully utilized the power of technology for productive activities. Android is a Linux-based operating system intended for mobile devices. Android is the operating system that is most in demand by application service providers because it has the advantage of being open source so that it provides freedom for developers to create applications [25].

The development of mobile learning teaching materials is deemed necessary as a way to help students understand concepts and increase learning independence. The role of the media is very important in the learning process so that the topics conveyed by the teacher can arrive more quickly and are maximally accepted by students [3]. Several previous studies and developments that were considered feasible and effective to be used as learning media, including the development of interactive multimedia learning with macromedia flash [10].

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Is it useful and effective if mathematics uses mobile learning in an effort to improve student learning outcomes, especially in this pandemic condition? In order to achieve this goal, it is necessary to innovate the learning model, learning methods, and the media used in the learning process in accordance with the level of education of the student and the characteristics of the student. The accuracy in choosing learning models, learning methods, and learning media is very influential for students to understand the concept of learning, especially mathematics. Presentation of material by displaying text and images, as well as videos about some impact analysis on online learning makes students more enthusiastic [3]. Mobile learning really needs media in applying technology to establish communication between teachers and students. The interactive mobile learning application makes it easy for students to learn without limitation of time and place. With this interactive mobile learning application, it is hoped that it can help students understand mathematics lessons. The use of interactive mobile learning applications in mathematics learning has several advantages, such as 1) it can be used anywhere and anytime 2) increases student motivation, 3) improves learning according to student needs [25].

The purpose of this study is to develop and test the feasibility of interactive multimedia applications in mathematics learning for elementary school students as an effort to support online learning during the pandemic. Mixed learning patterns are two main elements, namely classroom learning with online learning [4]. Research and development carried out to determine student responses to mathematics learning media with mobile learning. In addition, this media also provides animation and games to stimulate student motivation.

METHOD

This research is a research and development (R&D) type. The development method is a way that can be used to find, develop and test a product based on a systematic procedure, so that the product that has been produced has high scientific value and can be trusted. This type of research was chosen because the procedures contained in it are very appropriate for developing a medium that has the aim of developing and validating products [12].

The development model in this study uses the APPED development model, in which this development model consists of 5 stages, namely Initial Analysis and Research, Design, Production, Evaluation and Dissemination [11].

Figure 1. APPED Model Cycle

This R&D research with the APPED model produces a multimedia application product for mathematics learning that will be tested or evaluated by media or application experts and subject teachers. Evaluation is important to do to get the feasibility value before it is used by students.

Data collection techniques and instruments in this study were quantitative which were obtained from the results of analysis through questionnaires and interviews at SD 01 Padang City at the time of identification of needs analysis and analyzed with a Likert scale.

For the feasibility questionnaire evaluated by the teacher using a score, very feasible = 5; worth = 4; enough = 3; less feasible = 2; Inadequate = 1. The final score will be converted into a score on a scale of 5.

Table 1. Likert Scale Conversion

Score	Category	Score Interval
A	Very high	X > 4.21
B	High	3.4 < X ≤ 4.21
C	Moderate	2.59 < X ≤ 3.4
D	Less	1.79 < X ≤ 2.59
E	Very less	X ≤ 1.79

From table 3 above, the application quality standards are obtained with details, namely:

1. The application can be declared very feasible (A) if it gets an average score greater than 4.21.
2. 2. The application can be declared feasible (B) if it gets an average score greater than 3.4 to 4.21.
3. 3. The application can be declared sufficient (C) if it gets an average score greater than 2.59 to 3.4.

4. 4. The application can be declared inadequate (D) if it gets an average score greater than 1.79 to 2.59.
5. 5. The application can be declared unfit (E) if it gets an average score of less than 1.79.

RESULTS AND DISCUSSION

In this study, researchers developed using the APPED model, the first stage of the APPED model is analysis and initial research. At this stage of the analysis, the researcher did several things related to the analysis to meet the needs of students in the mathematics learning process. The analysis carried out at this stage is the subject, learning resources, and location or place. Subject analysis aims to determine the competency standards that must be achieved by students. Analysis of learning resources aims to find out what learning sources are used by students during the learning process. While the analysis of the research site aims to determine the readiness of schools to implement learning using interactive multimedia learning media.

The second stage of the APPED model is design. At this stage the researcher allocates system requirements both hardware and software by forming the overall system architecture. Software design involves identifying and visually depicting basic system relationships. At this stage, it is necessary to clarify the learning program that is designed so that the program can achieve the learning objectives as expected. At this stage 3 steps are carried out, namely: (a) Developing Usecase; (b) Class Diagram; (c) Activity Diagram.

Usecase Diagram is a function description of a system, and represents the interaction between actors and the system. The usecase explains the process that actors can do with the relation menu as a pointer as shown in Figure 2 below.

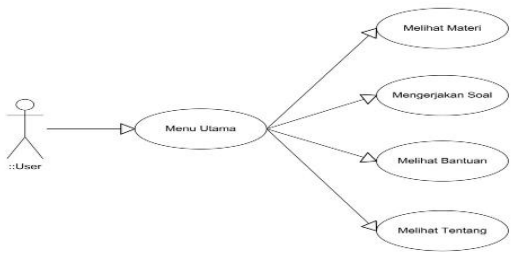

Figure 2. Usecase Diagram

Class diagram is a description of the system structure in terms of its classes. Class diagrams consist of attributes and operations in order for programmers to make a relationship between design documentation and software. As seen in Figure 3 below.

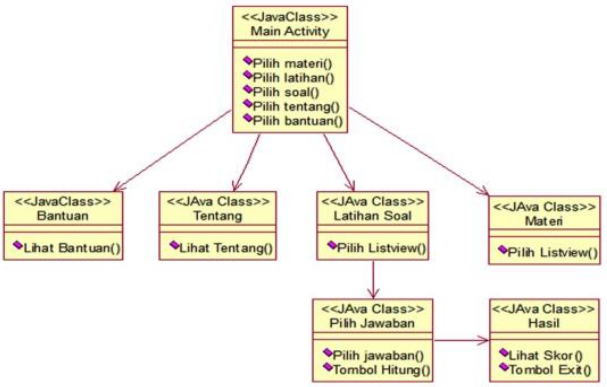

Figure 3. Class Diagram

Activity Diagram is a flow image of the activities in the system. Activity Diagrams are used to describe the sequence of business process activities. As seen in Figure 4 below.

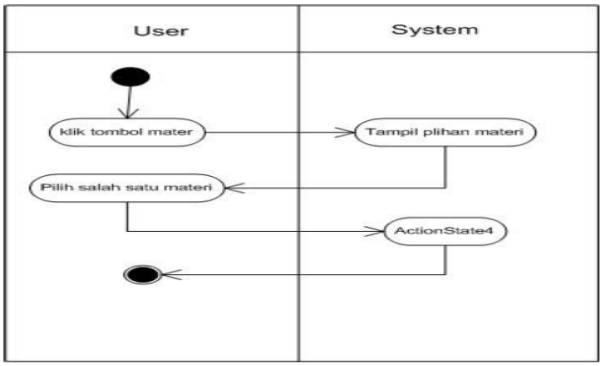

Figure 4. Activity Diagram

The third stage of the APPED model is production. At this production stage, the design results in the second stage are continued by producing interactive multimedia learning media products that are needed by teachers and students. From this development stage, it will produce a product to accompany books or other teaching materials.

The design of the main page in each application production process serves as a communication medium between the user and the system. The right design will produce a system that is easy to understand and develop. As seen in Figure 5 below.

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Figure 5. Main Page

Furthermore, in this interactive multimedia application there is a material interface page. The function of this page is to display the material discussed in the application. As seen in Figure 6 below.

Figure 6. Material Pages

Furthermore, in this interactive multimedia application there is also an exercise menu. The practice questions are displayed according to the material with a total of 10 questions in 1 practice. Each exercise will feature a different question. As seen in Figure 7 below.

Figure 7. Exam Page

Furthermore, after answering all the questions presented, students can see the correct answers to these questions and the scores obtained. As seen in Figure 8 below.

Figure 8. Exercise Values page

The fourth stage of the APPED model is evaluation. Researchers guarantee that the interactive multimedia products that are built are fit for use after being tested. The product validation process was carried out by 2 media or application experts and 1 mathematics subject teacher.

The following are the results of assessments from experts and teachers:

Table 2. Average assessment results of media or application experts

Indicator	Information	Score
1. Display	1. Title page	3
	2. Display quality	4
	3. Attractive design	4
	4. Use of Language	5
	5. Position of the menu	4
	6. Color composition	3
	7. Title page and subtitles	4
2. Media	1. Image selection	4
	2. Voice clarity	4
	3. Animation	3
3. Technical	1. Ease of using the application	4
	2. Application waiting time	5
	3. Ease of understanding the workflow	4
	4. Navigation	4
	5. Consistency of buttons	4
	6. Application instructions	4
	7. Freedom to choose material	4
	Average	**3.9**

From the results of the media or application expert's assessment, an average value of 3.9 is obtained as shown in table 4.

Table 3. Average teacher assessment results

No	Information	Score
1.	Completeness of the information presented	4
2.	Clarity of material	4
3.	Formula conformity	4
4.	Completeness of practice questions	3
5.	The effectiveness of the learning process	3
6.	The effectiveness of learning outcomes	5
	Average	**3.8**

From the results of the media or application expert's assessment, it was obtained an average value of 3.8 as shown in table 5.

Table 4. Results of conversion of expert and teacher assessments

NO	Evaluator	Score	Conversi
1.	Expert	3.9	High
2.	Teacher	3.8	High
	Average Score	**3.85**	High

The fifth stage of the APPED model is dissemination. Researchers are responsible for disseminating the resulting products to users, namely teachers and students.

CONCLUSION

This Android-based interactive multimedia can be an alternative in the online learning process, especially in pandemic conditions like today. This application can create an effective and integrated learning process between teachers and students in different times and locations. The trial and evaluation was carried out by 2 media or application experts and 1 teacher. In trials or evaluations involving media experts or applications, an average score of 3.9 was obtained. Meanwhile, in a trial or evaluation involving a math teacher, the score was 3.8. On average, the 2 trials or evaluations get a score of 3.85. If converted, the score of 3.85 is in the high category ($3.4 < X \leq 4.21$). This means that this interactive multimedia application can be declared suitable for use in the mathematics learning process.

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