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Multimedia Development of Android Based Mathematics Learning in Elementary School Students

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*Abstract: This research uses a research and development (R&D) approach. by adapting Alessi and Trolip's development model, namely (1) planning, includes: problem analysis and needs analysis, (2) Design, includes: manufacture flowcharts, storyboards, and interface design, (3) the media development stage, includes material gathering, product manufacturing, code writing, alpha testing, revisions, and beta testing. Data collection tools used were questionnaires, data obtained then analyzed by quantitative descriptive techniques. The research results note that: (1) multimedia development results mathematics learning in the form of an android application with the format * .apk, (2) online general multimedia learning developed is very suitable for use as learning support with an eligibility percentage of 83.34% of the experts media, 70.5% from material experts, and 92.9%, from users, and (3) completeness of the results student learning after using multimedia learning mathematics very much good, which is 80%, thus it can be concluded that the application has a positive impact on student learning outcomes.*

Keyword: multimedia learning mathematics, android,

INTRODUCTION

In Indonesia it self, mathematics education is still far behind compared to other countries even though in the international arena individually, there are Indonesian students who excel, but this cannot be used as a portrait of education in Indonesia (Le Qin, 2019). Mathematics tends to be a scourge for students and is considered a frightening subject (Kumullah, 2020). Even though in everyday life this science is often used (S Tan, 2020). For this reason mathematics education needs to be taught from an early age and students' understanding of this subject needs to be improved. Mathematics education in elementary schools is very important, because it is the basis for the use of mathematics at the next level (Sari, 2020). The opinion of mathematics as a scary subject should be eliminated and replaced with a fun lesson. In elementary school most of the subject matter is delivered conventionally. So that the material looks less attractive. For that we need a learning innovation so that the material looks more attractive and motivates students to learn.

Along with the development of globalization, the world is experiencing technological changes leading to the advancement of the times where technology is created that facilitates human activities (Wijaya, 2020). One of them is the development of smartphones. In Indonesia itself, quoted from kemenperin.go.id as saying that the penetration or growth of cellphones in Indonesia reaches 62% per year. Data quoted from teknoflas.com said that the analysis predicts smartphone sales in Indonesia in the near future will reach 12 million to 15 million units. The market share is divided into two major pieces, namely smartphones with Android OS reaching 50-60%, followed by Blackberry with 30% market share. However, along with technological advances and the number of smartphone users in Indonesia, it is inversely proportional to the less than optimal use of smartphones, especially in the world of education (Batubara, 2017). Among the students

themselves, smartphones are mostly used to access social networks such as Facebook and Twitter and have not played an important role in the field of education. Whereas in elementary school children, smartphones are often only used to play games.

For this reason, by looking at the problems above and the development of smartphones that have not been used optimally in the world of education, an idea emerged to develop multimedia learning for Android-based mathematics for grade 4 elementary school students with "flat-up" learning material. This learning media aims to optimize the use of smartphones, especially Android in education.

METHOD

This research is included in the type of research and development or often known as Research and Development (R&D). According to Sugiyono (2015), research and development methods are research methods used to produce certain products and test the effectiveness of these products. This study uses a development model adapted from the Alessi and Trolip development models. According to Allesi and Trolip (2001), the stages of multimedia development include: (1) the planning stage, (2) design, and (3) development. The test in this study is used to assess the feasibility of the product.

The subjects in this study were 30 students of grade IV SDN 28 Tumampua II, with their address in Tumampua District, Pangkajene and Archipelago Regencies. The data collection technique in this research is to use a questionnaire or a questionnaire. The measuring instrument used in this study was a questionnaire with the measurement scale used was a Likert scale. The questionnaire used contains questions that are given responses by the research subjects. The type of answer used is in the form of a check list (√).

RESULT AND DISCUSSION

1. Planning Stage

This research produced a product in the form multimedia of Android based mathematics learning for grade IV SDN 28 Tumampua II students. The planning stage is carried out by identifying problems and identifying needs.

The first step in this research is to determine the problem. At this stage, the identification of the problems and solutions needed for the school is carried out. Researchers found potential problems in mathematics in grade 3 elementary school. What is obtained is based on the results of interviews conducted by researchers to teachers. From the interview, it was found that the scores obtained by students in mathematics subjects in grade 3 SD mostly had not reached minimum completeness, besides that there was no independent learning media that could help students with these subjects. Making multimedia learning mathematics applications for 3rd grade elementary school students can solve the problems encountered.

The second step, identifying needs, including material analysis, media analysis, and specification analysis. At the stage of analysis, the material that was entered began to be narrowed down. To compile multimedia learning mathematics, the authors use core competencies, basic competencies, indicators based on the syllabus. Furthermore, at the media analysis stage, the media is made using several supporting programs, namely Adobe Flash CS6 as the main application, because Adobe Flash CS6 has the advantage of providing support for Android with the latest Adobe Flash payer, faster loading performance of large photos. Adobe Flash CS6 has a feature to develop media whose output is .apk by utilizing Action Script 3.0. Because the application created is based on Android, Adobe Flash CS6 is suitable for media creation. Other applications used in media creation are Adobe Photoshop CS4 and Corel Draw X4. Both of these applications are applications that are used

to manage images which will later be included in multimedia learning. And the last stage is the specification analysis stage, Mathematics learning multimedia can be run on cellphones with the following specifications: a) Android operating system 2.2 (Froyo), Gingerbread (2.3), Honeycomb (3.0, 3.1 and 3.2), Ice Cream Sandwich (2.4 or 4.0)), and Jelly Bean (4.1-4.3); b) minimum RAM of 225; c) Screen with a minimum resolution of 4 inches (recommendation).

2. Design

At this stage, a multimedia program flow is designed in the form of flowcharts, storyboards, and interface designs so that media creation is more focused. The flowchart shows the program flow of the multimedia created which starts with an intro and then a page appears which will display a menu of options, namely KI, KD, materials, quizzes, instructions, profiles, and exit. These menus will take the user to the desired page. After creating a flowchart the next step is to create a story board. After developing the story board, the next step is to create an application interface design. This design is useful for determining design details that will be used for multimedia displays.

3. Development

The development stage is the stage of making a product. At this stage the design that has been previously made is processed into a product. This stage consists of creating views, writing code, alpha testing, revision, and beta testing. This media is designed as attractive as possible and adapted to the characteristics of grade IV elementary school students.

4. Media Validation Results

Testing in this study was carried out to experts in 3 fields, namely testing research instruments, media experts, and material experts. Instrument testing serves to assess the feasibility of the instrument before it is used in collecting research data. Media expert testing serves to assess the feasibility of the media in terms of design, appearance and running of the program. Meanwhile, the material expert test serves to provide an assessment of the media in terms of the material contained in the media.

Media validation was carried out by two media experts using a Likert scale of 1 to 5. The score obtained can be seen in Table 1 below.

Table 1. Media Expert Assessment Score

No	Assessment Aspect	Number of Items	Maximum Score	Acquisition Score	Percentage of Feasibility
1	Navigation	2	20	19	95%
2	Convenience	5	50	42	84%
3	Posts	6	60	48	80%
4	Views	7	70	55	78,58 %
Final Value					84,34 %

Material validation was carried out by 1 material expert and 1 grade IV SD teacher using a Likert scale of 1 to 5. The results of the validation carried out by material experts are as shown in Table 2 below.

Table 2. Material Expert Assessment Score

No	Assessment Aspect	Number of Items	Maximum Score	Acquisition Score	Percentage of Feasibility
1	Learning	8	80	56	70%
2	Theory	11	110	78	71%
Final Value					70,5 %

This test is implemented for grade IV students of SDN 28 Tumampua II with a total of 30 students. The following is the percentage score of the eligibility of the respondents.

Table 3. Respondent Assessment Result

No	Assessment Aspect	Number of Items	Maximum Score	Acquisition Score	Percentage of Feasibility
1	Convenience	4	600	562	93,7%

2	Motivation	6	900	830	92,2%
3	Attractiveness	2	300	275	91,7%
4	Usefulness	7	1050	989	94,2%
Final Value					**92,9%**

5. Implementation Product

Field trials are activities to assess the products being developed. Field trials are carried out using pre-test and post-test methods which function to find out how much benefit the application is made of when implemented in a real environment. The results are shown in table 4 below.

Table 4. Pre-test and Post-test Results

Responden Number	Pre-Test	Post-Test	Responden Number	Pre-Test	Post-Test
1	60	75	**16**	40	90
2	70	70	**17**	80	90
3	70	80	**18**	70	70
4	70	80	**19**	40	60
5	55	70	**20**	40	80
6	40	70	**21**	80	95
7	40	80	**22**	50	60
8	70	90	**23**	60	70
9	80	90	**24**	85	90
10	50	70	**25**	80	90
11	50	70	**26**	55	60
12	80	90	**27**	80	90
13	50	70	**28**	50	70
14	60	60	**29**	35	60
15	60	70	**30**	55	60

The standard value of the minimum completeness criteria that has been set by the school is 70. Based on the trial of 30 students, after the pre-test it was found that 12 students had completed and 18 students had not. Meanwhile, at the time after the post-test was carried out there were 24 students who had completed and 6 students who had not.

Based on the data above, it is known that the percentage of students who meet the completeness score at the pre-test is 40%, while at the post-test it is 80%. This shows that the application of learning media has a positive impact on student learning completeness. This shows that the application of learning media has a positive impact on student learning completeness.

CONCLUSION

The conclusions that can be drawn from the research conducted are as follows: The results of the media expert's assessment showed that the percentage score of media feasibility from the navigation aspect was 95%, the convenience aspect was 84%, the writing aspect was 80%, and the display aspect was 78.58%. Based on the scores for these four aspects, the final score of media feasibility is 84.34% in the "Very Appropriate" category. Assessment of learning media by material experts, from the learning aspect is 70% and the material aspect is 71%, so that the final feasibility percentage is 70.5% in the "Eligible" category. The results of the assessment by students are from the aspect of ease of 93.7%, aspects of motivation of 92.2%, aspects of attractiveness of 91.7%, and aspects of benefit of 94.2%, so that the final percentage is 92.9% with the category "Very Worth it". From the results of using the media, it is known that the percentage of students who meet the completeness score at the pre-test is 40%, while at the post-test it is 80%. Thus the learning media application can be said to be useful in its use.

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