Development Of Android-Based Interactive Multimedia On Science Learning Achievement of 5th Grade Elementary School Students

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Abstract. This study aims to: (1) developing an interactive multimedia program for Android-based science learning with material in the form of changing object shape content for fifth grade students at Elementary Schools in the Diponegoro Cluster, Banyumas District, (2) describe planning and the learning process using interactive multimedia based on android science learning content material changes object form for fifth grade students at Elementary Schools in the Diponegoro Cluster, Banyumas District, (3) describes the effectiveness of Android-based interactive multimedia developed for science learning content material for changes in the form of objects for fifth grade students at Elementary Schools in the Diponegoro Cluster, Banyumas District. The research and development (RnD) is the method used in this study. The fifth grade students are the population in this study . The sampling method uses group samples (Cluster Sampling). The test subjects at the product trial stage were 17 students and at the usage trial stage were 70 students divided into the control class and the experimental class. Data collection for this study was carried out through several steps, namely interviews, administering needs analysis questionnaires, administering assessment questionnaires to media and material experts, providing response questionnaires from teachers and students, and student achievement tests.. The data analysis technique used an independent t-test with a significance level (α=0.05) with the results that Ho was rejected and Ha was accepted. The results of this study are (1) android-based interactive multimedia meets the eligibility criteria with a very feasible category, (2) the learning process uses interactive multimedia based on android, the content of science learning material changes in the form of objects is carried out with a scientific approach, (3) interactive multimedia based on android is stated to be effective in increasing student achievement.

Keywords: interactive multimedia, science learning, learning achievement.

1 Introduction

Indonesia began to face the industrial revolution 4.0 era, Indonesia has began developed rapidly and dynamically to be connected digitally. This affects all sectors, one of them is education. This condition affects students current the learning behavior at this time. They use technological devices for the learning process. As stated by Benny [1], learning patterns and methods of students have changed along with development of information technology and computer networks. The teaching and learning process no longer dependson space and time.

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Teaching and learning activities can be carried out anytime and anywhere according to the needs of student learning.

In the learning process, teachers can use media in the form of technological devices to convey learning materials to students, one of which is by using mobile phones or smartphones. Ikhsan and Yektyastuti [2] said that the use of smartphones and tablets can have a positive influence on cognitive, affective, metacognitive and socio-cultural dimensions. Smartphones and tablets have the power to transform learning experience.

Interactive multimedia is one of the learning media that can be developed at this time. According to Noviana [3] Multimedia is combination of images, text, animation, sound, and video delivered by a computer or manipulated digitally. Benny [1] said that multimedia programs are products of digital technology advances that are currently developing. Multimedia programs that are used as teaching materials in learning activities are able to provide more learning experiences for theirs users.

The development of interactive multimedia for learning can be done at various levels of education, one of which is elementary school. One of the lessons carried out in elementary school is the learning of Natural Sciences (Science). Natural Science Education (IPA) in elementary schools aims to make students have knowledge, facts, concepts, principles, discovery processes and scientific attitudes, which will be beneficial for students in studying themselves and the environment. According to Sapriati [4], science education emphasizes providing direct experience to find out and do so as to be able to explore and understand the environment scientifically. Science learning emphasizes the learning process by using information processing skills so that students can find their own facts easily, build concepts, theories and scientific attitudes from the understanding they already have so as to achieve learning goals.

In fact, the science learning process still encounters many obstacles. The author as well as a grade V teacher found that the learning achievement of students, especially in basic competence 3.7 analyzing the influence of heat on changes in temperature and the form of objects in everyday life, is still relatively low. This can be seen from the results of daily assessment of science KD 3.7 in grade V of the Diponegoro Cluster elementary school, Banyumas sub-district, students who are declared complete in new learning on average only reach 55%. This has not been in accordance with the expected results.

In addition to the above, other problems that arise are based on the results of interviews with teachers related to the learning process, it was found that the majority of teachers only use teacher handbooks (BSE), as well as media in the form of images that are less attractive to students. This can be seen when the learning process takes place, students who are following the lesson are seen chatting with their friends, and do not pay attention to the material presented by the teacher. Students look unfocused and less interested in following learning. Of course, this is very influential on students' understanding of teaching material.

These problems become urgent to be resolved so that students can achieve learning goals a at school. This is a challenge for researchers to be able to develop technology-based learning media and the needs of students. Based on the above background, researchers proposed a study entitled Development of Android-Based Interactive Multimedia on Science Learning

Achievement of Class V Students of Diponegoro Cluster Elementary School, Banyumas District.

Android-based interactive multimedia products are the goal of this development research so as to produce feasible and effective products to be applied to learning. This Android-based interactive multimedia product can be considered feasible if it has been approved by experts. Android-based interactive multimedia can be said to be effective if there is a significant difference between the learning outcomes of the experimental class students and the control class students [5].

The products produced in this research and development are android-based interactive multimedia material for changing the form of objects in class V science learning. This interactive multimedia contains five main menus, namely (1) competence, (2) material, (3) animated videos (4) digital experiments (5) exercises. The excellent feature in this product, is the digital experiment menu, which has an impact on increasing student learning achievement.

Benny [1] stated that one of theadvantages in the use of multimedia programs is being able todeliver information and knowledge with a high level of realism. In this case, interactive multimedia is able to provide a learning experience that is close to reality because it can display digital-based manipulative teaching materials that resemble concrete objects that exist in students' daily lives. In this interactive multimedia development, product specifications will be generated in the form of output files in the form of apk, namely applications that can be installed and operated on Android smartphones.

This application can be used by students without using internet quota and signal network. Android-based interactive multimedia is an integration of several media so that it contains animation, images, audio and video and can be used interactively using the navigation buttons provided. This Android-based interactive multimedia is made using the Adobe Animate CC 2020 application program and supporting applications such as Correl Draw, Format Factory, Camtasia, and Swivel.

This result of this study are expected to provide benefits in the field of education. In addition, it can also be useful for teachers, other researchers, principals and institutions, namely the University of Muhammadiyah Purwokerto.

2 Method

In this study, researchers will develop a learning media product using a model developed by Sugiyono [6]. The research and development procedure in the Sugiyono [5] model consists of ten stages, namely (1) problem attention, (2) data collection, (3) product design, (4) design vision, (5) design revision, (6) product revision, (7) product revision, (8) usage trial, (9) product revision, (10) mass production. The populationin this study is an elementary school in the Diponegoro Cluster, Banyumas District, then the sample is obtained using a random sampling technique, where the sample used is determined randomly. The total sample taken in this study amounted to 50% of the population, namely four schools consisting of two experimental classes and two control classes.

The first stage in this development research is to determine potential problem. This development research is based on potential existing problems. The potential problems raised in

this study are based on the results of analysis of empirical data in the field. Based on the results of the analysis of the results of the daily assessment of science lesson content on the material of changing the form of objects in basic competence 3.7, it was found that the average percentage of learning completeness in elementary schools of the Diponegoro cluster had only reached 55%. This condition is still far from expected. In addition to analyzing empirical data in the field, interviews were also conducted with several grade V teachers in the Diponegoro Cluster to find out the conditions and problems faced in the science learning process. Based on the results of the interview, it was concluded that the use of learning media is still not optimal so that it has an impact on student understanding and achievement.

The second stage is data collection. The data collection process carried out by researchers is by distributing questionnaires analyzing the needs of teachers and students. The results of collecting information through questionnaires on the needs of teachers and students are used as consideration for media development to be carried out. Therefore, researchers developed learning media in the form of android-based interactive multimedia. The final product produced is an application that can be installed by students on smartphones.

The third stage is product design. Product design in the form of android-based interactive multimedia in this study, carried out using the steps of android-based interactive multimedia production delivered by Noviana [3], as for the stages that must be carried out consisting of the concept stage, design stage, material collecting stage, assembly stage, testing stage, distribution stage (distribution).

The fourth stage is design validation. After the product is completed, the next stage is to validate Android-based interactive multimedia products. Before design validation, all instruments used in this study were validated by experts first. Once declared valid, then a new instrument can be used. Product validation aims to determine the feasibility of the developed media before being tested in the field. Product validation is assessed by media experts and material experts.

The fifth stage is therevision of the design. After the product has been validated by material experts and media experts, based on input from experts, a revision of this product is immediately carried out.

The sixth stage is product testing. After material and media validation, it is then given to students for product trials. This stage is carried out to obtain responses to interactive multimedia products based on Android. Product trials are carried out by providing android-based interactive multimedia to students. Researchers accompany students and teachers to use android-based interactive multimedia. Students and teachers who participated in the limited trial filled out student response questionnaires and teacher responses at the end of the activity.

The seventh stage is product revision. In product trials, there are suggestions and comments given. Based on these suggestions and inputs, product revisions were made. After the product has been revised, the learning media product in the form of Android-based interactive multimedia with material for changing the shape of objects are ready to be used on a wider scale.

The eighth stage is the trial use. Field testing to a wider scale. It is determined that there is a group of students who become an experimental class, namely students who will be given product trials with a control class, namely a group of students who will carry out learning as

usual. Revise the main product (product revision based on suggestions from the results of the main field trial).

The ninth stage is product revision. This product revision is carried out, if in use in wider educational institutions there are shortcomings and weaknesses.

The tenth stage is mass production. After testing the effectiveness and feasibility, this product can be mass-produced.

Quantitative data were obtained from the results of filling out questionnaires and student achievement test results, while qualitative data were obtained from comments and suggentions.. The data collection instruments used are interview guidelines, scales, questionnaires and tests. Interview guidelines are used to determine the initial condition of learning, questionnaires are used to collect data on teacher and student needs. Scale to assess media validity from subject matter experts and media experts. The test is used to assess the effectiveness of media from student achievement data.

Qualitative data analysis was used as a data analysis technique in this study. The data is processed objectively by grouping or classifying, analyzing and describing, then making conclusions based on the data. Furthermore, quantitative data analysis techniques using feasibility tests using validation scales from material experts and media experts. Test the effectiveness of the product using independent t-test analysis.

In the effectiveness test using the help of the IBM SPSS 26 Statistics program [7]. Before the effectiveness test was carried out, a prerequisite test was carried out first, namely the data normality test using the Kolmogrov-Smirnov test and the data homogeneity test using Levene Statistics. Test the hypothesis using the Independent t Test which aims to determine whether there is an increase in the dependent variable, namely student learning achievement in the control class and experimental class. To find out the effectiveness of the use Android-based interactive multimedia on the learning outcomes of fifth grade students, the N-Gain Score test was used, by calculating the difference between the pretest and posttest scores or Gain Score.

3 Result and Discussion

Interactive multimedia development products are validated by material experts and madia experts. The validation results from material experts reached 90% with very valid and usable criteria. Suggestions and comments for media improvement are related to the content of the material such as adding pictures of examples of changes in the form of objects that occur in everyday life. The validation results from media experts reached 88% with very valid and usable criteria. Suggestions and comments for media improvements are related to setting the music backsound off when entering the animated video menu and coding improvements in the navigation buttons. These suggestions and comments became the basis for media improvement. The level of validity will be explained by media and material experts will be recapitulated based on percentages, comments and suggestions given as improvements to interactive multimedia products based on android.

Table 1. Recapitulation of the Validity of Android-Based Interactive Multimedia

No.	Validator	Earning Percentage	Judging Criteria
1.	Material Expert	90 %	Products worth using without revision
2.	Media Members	88 %	Products worth using without revision
Average		93,5 %	

Based on the results of the data above, the product in the form of Android-based interactive multimedia is suitable for use without revision.

Furthermore, the product effectiveness test was used using the help of the IBM SPSS 26 Statistics program. The data used are data on student test result scores, namely pre-test and post-test in the control class and experimental class. The following are the results of the pre-test and posttest experimental class and control class presented in Table 2 below:

Table 2. Pre Test and Post Test Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Pretesteksp	36	53	77	61.89	5.746
Postteseksp	36	85	98	92.31	3.725
Pretestkon	34	46	72	63.03	6.842
Postteskon	34	58	78	69.94	4.830
Valid N (listwise)	34				

Kolmogorov-smirnov is used as a prerequisite test for the normaly test before conducting the effectiveness test. The calculation results obtained pretest experimental class sig = 0.074 > 0.005. The experimental class pretests are normally distributed. Postes experimental class sig = 0.200 < 0.05. The experimental class postes are normally distributed. Sig control class pretest = 0.149 > 0.05. Control class pretests are normally distributed. Postes control class sig = 0.200 < 0.05. Postes of the control class are normally distributed. Furthermore, the homogeneity test using Levene Statistics, the calculation results obtained values based on mean = 0.160 > 0.05 then the data was declared homogeneous.

After going through these prerequisite tests, the data is declared to be normally distributed and homogeneous. Then the effectiveness test can be done using N-Gain Score and Independent T Test. To see the effectiveness of using android-based interactive multimedia, use the calculation of N Gain Score. The following is the calculation of the average value of N-Gain Percent, which is presented in table 3 below:

Table 3. Average N Percent Gain

Group Statistics

	Class	Mean	Std. Deviation	Std. Error Mean
NGain_Persen	Experimental class6	79.7869	9.24309	1.54052
	Control Class 4	17.9766	8.57385	1.47040

Based on the calculation results, *N Gain Score* data was obtained in the experimental class of 79.78 or greater than 76 so that it was included in the effective category. Therefore, it can be concluded

that android-based interactive multimedia is effective for student learning achievement. After calculating the N Gain Score, to see whether or not there was a difference in the learning achievement of experimental and the control class, the independent T-test is used. In the independent T test H_0 is rejected if the significance < α (0.05) . H_0 in this study is "There is no difference in the learning achievement of students who use android-based interactive multimedia with those who do not use android-based interactive multimedia". Based on the calculation results of the Independent T Test, a significance value of 0.000 < 0.05 was obtained, therefore Ho was rejected. Based on the calculation results of the Indepent T test, it can be concluded that there are differences in the learning achievement of students who use android-based interactive multimedia with those who do not use android-based interactive multimedia.

4 Conclusions and Advice

3.1 Conclusion

Based on validation of material expert, media expert validation, and the results of android-based interactive multimedia trials, object transformation material is declared very feasible and can be implemented in learning. In addition, android-based interactive multimedia material for changing the form of objects is also declared effective in learning.

3.1 Suggestion

In order for the resulting product to be utilized optimally in learning, there are several suggestions related to interactive multimedia as follows:

1. SD Cluster Diponegoro Banyumas District adds a variety of technology-based science learning media and the needs of students to be optimal in achieving learning goals and science learning achievements.
2. Android-based interactive multimedia development must begin with a needs analysis. The content of the media is in accordance with the needs in it through the validation and trial stages to be feasible and ready to be used as media in learning
3. Android-based interactive multimedia is used in learning so that teachers are helped and students can learn material anytime and anywhere.
4. Android-based interactive multimedia is very helpful for students to learn because in it is an integration of various media such as audio, visual, text, video and animation.
5. Android-based interactive multimedia material for changing the form of science objects in class V elementary school is used in learning in order to improve student science learning achievement.
6. Teachers are responsive to the problems faced by students in learning, have the will and ability as well as creativity and innovation in creating effective and interesting learning media and optimizing technology and technological devices in the surrounding environment to support learning.
7. The school encourages and facilitates teachers in developing adequate learning media.
8. Parents monitor and support their children's learning.
9. The Education Office can facilitate teachers in improving their ability to implement technology in designing learning media.

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