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Android-Based Learning Media Development to Improve Student Learning Achievement

Mujiono[1] dan Siti Sarah[2]
[1]Pendidikan Fisika, FITK, Universitas Sains Al-Qur'an Jawa Tengah di Wonosobo
[2]Universitas Islam Negeri Prof. KH. Saifuddin Zuhri, Purwokerto
sitisarah@iainpurwokerto@ac.id

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Abstract

Android media is one of the learning media that is easy and interesting to use. This study aimed to develop an Android-based science learning media that fulfills valid, practical, and effective aspects. The research method used 3 stages of the 4D model, namely (1) define, (2) design, and (3) develop. The dissemination stage was not done because it took a long time. The research instruments were validation sheets, questionnaire, and test. The media validity test was carried out by material experts and media experts. Practicality tests were carried out by teachers and students. The effective tests were carried out by student. The data analysis techniques were qualitative and quantitative descriptive analysis. The effective test used a quasi-experimental method with an intact-group comparison design. The results showed that the android-based science learning media fulfilled valid criteria by material experts and media experts. The android-based science learning media fulfilled practical criteria by junior high school science teachers and students. There were differences in learning achievement for students who used Android-based science media and those who learned without using the media. The learning achievement for students who used Android-based science learning media was better than the students who learned without using android-based science learning media; this media can be the alternative of online learning.

Keywords: Android; Development; Learning; Media; Science

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INTRODUCTION

The industrial revolution 4.0 and the 21st century are times where space is increasingly fading away. It is because technology is increasingly sophisticated, including communication and information technology. In the 1990s, handphones were a rare item only owned by businesspeople. Now, handphones or smartphones are no longer a luxury item. Almost everyone uses it, including students at all levels of education. The increasing number of consumers has made the HP company innovate to issue products that are of interest to the public in various ways, such as beautifying features and adding other facilities to attract consumers.

The many features and various facilities make HP switch functions. Many students use HP to play. If this is allowed, it can result in a decrease in student achievement. The results of relavant research showed that there was

a relationship between children's tendencies to play HP with decreased motivation and learning achievement (Hanafi, 2020). Therefore, many schools ultimately do not allow students to bring HP to school (Kurniawan et al., 2019). Even so, there were still some students who brought HP to school. It shows that the control of parents, teachers, and school principals is still weak.

Anyone will not be able to avoid the changing times, including the spread of technology in the form of HP. People will be left behind if they are not ready to keep up with the times. It applies to all levels of society, including the realm of education. Technology is unavoidable. Therefore, education today must be more creative in accommodating technology to create superior human resources based on Law No. 20 of 2003.

Data from the Center for Education on the learning outcomes of students at state junior high school 1 Pejaweran (SMP Negeri 1 Pejawaran) in the 2019 Computer-Based National Examination only reached an average value of 54.80. The average score for science subjects was only 54.07. The average value obtained by 105 students in SMP Negeri 1 Pejawaran only reached 33.33 on the indicator of Waves. These results provide information that learning at SMP N 1 Penjaweran is not optimal.

The data is strengthened by the results of the analysis of the Final Semester 1 assessment at SMP Negeri 1 Pejawaran in 2018 for class VIII with an average score of only 58. Daily tests on vibrations, waves, and sounds in everyday life were only 52% of students who answered correctly. Researchers made observations of learning on a wave and sound material in everyday life. As a result, learning still uses printed books, power points, and lecture methods. Students must not open their HP during learning. Even so, some students are desperate to play HP in class. This method turned out to make students uncomfortably learn. As a result, students' learning achievement scores have not increased significantly. The results of interviews with the Principal of SMP Negeri 1 Pejawaran stated that there were no teachers who taught using technology-based and information-based media such as HP.

The demands of the times demand a way of learning according to the times. The spread of HP affects learning patterns. Various efforts to prevent students from HP in learning make them steal time to play HP Therefore, a learning pattern that accommodates the use of HP is needed to improve student learning achievement.

Android is a Linux-based mobile operating system that includes an operating system, *middleware*, and application (Karman, 2019). Android-based means that the system is based on the operation of the smartphone. The use of android as the basis for science learning media in improving learning achievement is not without consideration. Relavant research results state that Android-based mobile learning products can improve learning outcomes (Afif & Haryudo, 2016; Ibrahim & Ishartiwi, 2017; Yektyastuti & Ikhsan, 2016). HP also has a positive impact on students, namely developing reading skills and solving problems (Oktavia & Mulabbiyah, 2019).

Although android is widely used, the application used as the software is different. Ngurahrai, Farmaryanti, & Nurhidayati (2019) developed Android-based mobile learning in the android package format. Ibrahim & Ishartiwi (2017) developed it using the Eclips Helios software. Setiawan & Wiyardi (2015) use android educational games. Lubis & Ikhsan (2015) used Adobe Flash Professional CS 6 software with action script 3.0. Sari, Riswanto, & Partono (2019) developed an Android-

based mobile pocketbook using Adobe Flash.

The media developed by the three research groups above were able to attract students to learn. However, the media creation process for the three groups took a relatively long time because they used complex programming languages.

The research was designed for learning physics at State Junior High School 1 Pejaweran where some of the students were not very literate about HP technology, but the desire to learn to use HP was very high. Therefore, the media is designed to put forward simple aspects and easy to follow. The application is a google site designed using google form and sent via the Whatsapp application.

This application is easier and faster than the Flash Professional CS 6 application and Eclipse Helios software. Besides, the programming language that is simpler than Flash Professional CS 6 and Eclipse Helios software makes it easier for students to operate. Thus, learning becomes easy, fun, so that it can improve student achievement. This study aims to develop an Android-based science learning media that fulfills valid, practical, and effective aspects.

METHOD

This research is a type of Research and Development using the 4D model, including Define, Design, Develop, Dissemination. This study only carried out three stages, namely, Define, Design, and Develop, but no Dissemination stage due to time constraints (Figure 1).

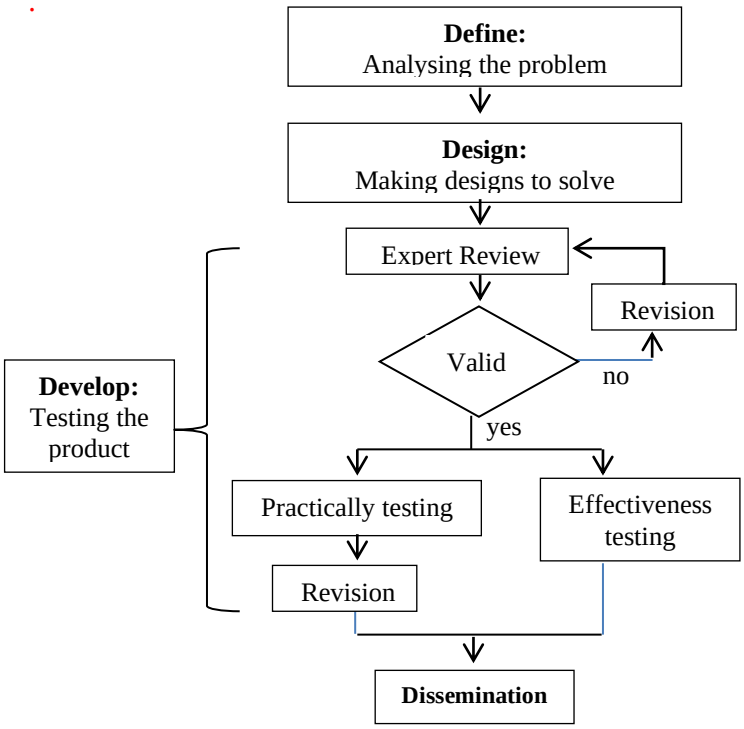

Figure 1 The Research Design

The science material in this research is in the form of vibrations, waves, and sounds in everyday life. The research instruments were validation sheets to measure the validity and questionnaires to measure the practicality of the media.

One media expert tested the validity of the media covering media display

components, namely layout design, typography, text, images, animation, and users. Two material experts tested the validity and reliability of the material in the form of content aspects, including curriculum components and users of learning media.

Practicality test to determine the practicality of the media by users, namely two teachers and three students. The component of media practicality assessment includes many aspects, namely media, learning, material, animation, and text.

The effectiveness test used a quasi-experimental method with an intact-group comparison design. The research sample was fifty students in class VIII. The sample is divided into two groups, the control class (twenty-four students) and the experimental class (twenty-six students). The control class implements science learning using textbooks, PowerPoint media, and lectures. The other carried out science learning using android media.

The data analysis technique of validity dan practicality is descriptive qualitative and quantitative analysis. The qualitative data comes from suggestions from experts and practitioners. Quantitative data comes from filling in validation sheets by experts and questionnaire sheets by practitioners. Filling in the validation sheet and questionnaire using 4 scales, namely 4 = very good, 3 = good, 2 = poor, and 1 = very poor. The total score for each component was converted based on Table 1. Measurement of the level of agreement among rater (inter-rater reliability) uses the coefficient of Cohen's Kappa by SPSS (Table 2).

Table 1. Product Quality Assessment

Interval (%)	Category	Information
76 – 100	valid	Worth
51 – 75	quite valid	Fairly feasible/ Partially revised
26 – 50	less valid	Less feasible/ Partially revised
0 – 25	invalid	Not feasible /Total revision

(Arikunto, 2013)

Table 2 Categories of Kappa Coefficients

Koefisien Kappa	Strength of Agreement
< 0.00	Poor
0.00-0.20	Slight
0.21-0.40	Fair
0.41-0.60	Moderate
0.61-0.80	Substantial
0.81-1.00	Almost Perfect

(Landis & Koch, 1977)

The research instrument in the effectiveness test was a test to assess science learning achievement. The learning achievement test consists of twenty multiple-choice items with four options and five essay items in the form of descriptions. All test items have met the validity and reliability test. The maximum score for the multiple-choice test and essay is one hundred. The analysis technique uses the t-test to determine the effectiveness of using android media. The prerequisite analysis test, namely the normality and homogeneity test, was carried out before carrying out the t-test.

RESULTS AND DISCUSSION

Define

This stage is in the form of identifying the readiness of students as a reference in preparing and developing products. Activities carried out include observation, discussion, and analysis of the characteristics of students.

Observation dan discussion

The results of observations and discussions with science teachers at

SMP Negeri 1 Pejawaran showed that science teachers did not use technology in learning due to limited facilities and infrastructure in schools. Other data shows that student achievement is still low, namely 58. Both data indicate that students are less interested in learning, resulting in low learning achievement.

Learning requires learning media to make it easier for students to understand the material, one of which is cell phones. Students like HP for learning because they are easy to carry anywhere (Irwanto, 2017). So, students are made interested in learning to be directed to increase learning achievement through HP media.

Analysis of the characteristics of students

Student data shows that the average age of students at SMP Negeri 1 Pejawaran class VIII C is thirteen to fourteen years old. Stafanus (2018) states that psychologically, students in the age range thirteen to fourteen are in a period of very rapid development from cognitive, affective, and psychomotor aspects. However, students at SMP Negeri 1 Pejawaran prefer operating their HP for playing and social media rather than studying either independently or in groups. Based on the results of the analysis, the researcher developed an Android-based learning media that was simple and easy to apply.

Design

Design is an activity to make designs to solve problems with the reality at hand. This stage is in the form of making learning materials on the google site that can be accessed by students later. Next, proceed with making flowcharts and making storyboards.

Google site contains a list of attendees of students designed to use Google Form to allow distance learning to occur. Class members will get a google site address through the Whatsapp Group application containing class members.

Science material emphasizes practicum activities. The format of the practicum report uses Google Form and is done online. In this activity, researchers collaborated with schools that provide internet networks in regulating learning media so that internet access is not used to access YouTube, games, and others.

The opening display contains menus that can be accessed by students, one of which is an attendance form (Figure 2).

Figure 2 Home Menu Display

There is also a menu of instructions for using media (Figure 3). The learning menu contains learning material and sample questions and their solutions. There are also basic competencies and core competencies. This information can make it easier for students to know the material to be studied (Figure 4).

Figure 3 Display Manual Menu for Use

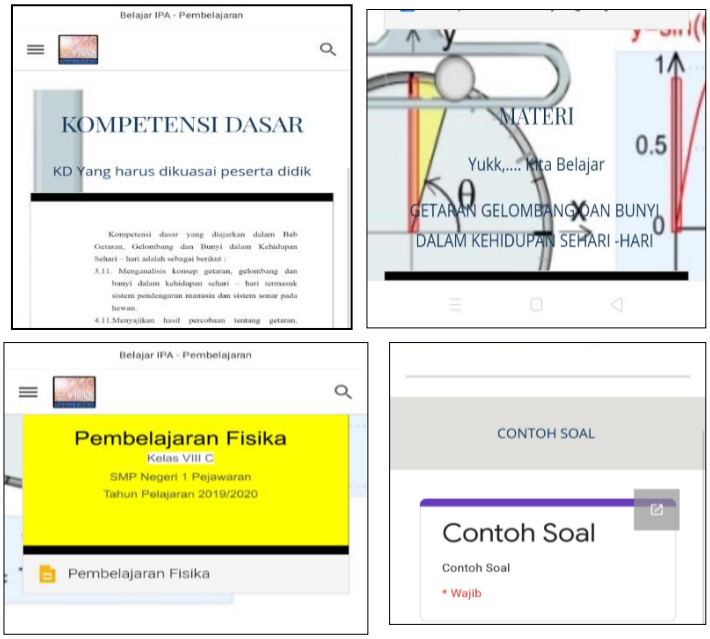

Figure 4 Display of The Learning Menu

The practicum report menu is for students to upload the practicum results report (Figure 5). Students can see the results of daily tests directly through the daily test page designed using the google form (Figure 6).

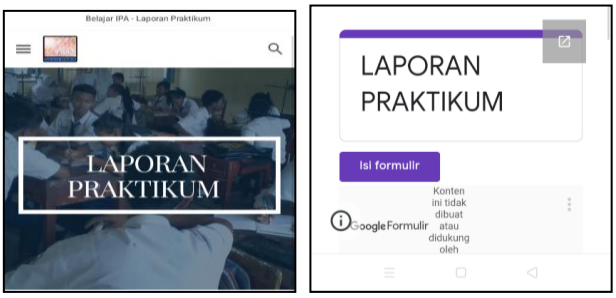

Figure 5 Display of The Practicum Report Menu

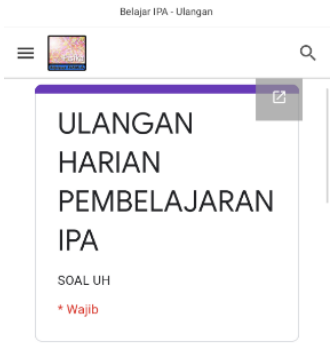

Figure 6 Display of The Daily Test Menu

Develop

The development stage is an effort to test the product. Three lecturers conduct product assessments in terms of material (two persons) and media (one person). Material assessment includes three aspects, namely curriculum, users, and learning. The media assessment of learning includes layout design, text, images, animation, and usage. The results of the assessment shown in Table 3 and Table 4.

Table 3 The Results of The Material Expert Judgment Analysis

Aspect	Mean (%)	Category
Curriculum	100.00	Valid
User	75.00	Quite valid
Learning	89.29	valid
Final score	87.50	valid

Table 4 The Results of The Analysis of The Media Expert's Assessment

Aspect	Mean (%)	Category
Layout design	87.50	valid
Teks/ tipography	83.33	valid
Picture	91.67	valid
Animations	87.50	valid
User	79.17	valid
Final score	85.83	valid

Based on the results of testing material experts and media experts, the Android-based science learning media to improve concept understanding is declared valid. Therefore, the process of measuring the practical aspect is carried out.

Table 5 and Table 6 showed the results of inter-rater reliability testing by two material experts. Table 5 shows the consistency of the interrater assessments. The two experts gave the same assessment on 18 points and differed by 2 points.

Tabel 5 Crosstabulation

			Expert2	
			0	1
Expert 1	0	Count	1	0
		Expected Count	.1	.9
	1	Count	1	18
		Expected Count	1.9	17.1
Total		Count	2	18
		Expected Count	2.0	18.0

The measure of Agreement 0.643 in Table 6 shows that the instrument is reliable with substantial criteria.

Tabel 6 Symmetric Measures

	Value	Asymptotic Standard Error[a]	Approximate Significance
Measure of Agreement Kappa	.643	.325	.002
N of Valid Cases	20		

A total of two science teachers at SMP Negeri 1 Pejawaran assessed the practicality of the media through five aspects, namely media, material, learning, animation, and text. The assessments are shown in Table 7.

Table 7 The Results of The Practicality Test for Android-Based Science Learning Media by The Teacher

Aspect	Mean (%)	Category
Media	80.00	Worth
Theory	71.88	Fairly feasible
Learning	87.50	Worth
Animation	87.50	Worth
Text	87.50	Worth
Final Skor	82.24	Worth

Three students in class IX SMP Negeri 1 Pejawaran also assessed practicality in terms of media, material, learning, animation, and text. The results of the assessment are shown in Table 8.

Table 8 The results of the media practicality test by students

Aspect	Mean (%)	Category
Media	85.00	Worth
Theory	75.00	Fairly feasible
Learning	79.17	Worth
Animation	80.56	Worth
Text	83.33	Worth
Final Skor	80.61	Worth

The results showed that the researcher had succeeded in developing an Android-based science learning media to improve the learning achievement of class VIII students that met valid and practical aspects.

Table 9 contains data on student learning achievement along with the results of data analysis.

Table 9 The student learning achievement and the result of data analysis

Data Description	Control Class	Experiment Class	Data Conclusion
Mean	70.41	77.18	The experiment class is higher than the control class.
Standard Deviation			There is an Increase
Minimum value	63.30	63.30	Both classes are the same.
Maximum value	83.30	90.00	The experiment class is higher than the control class.
Normalitas (Signifcance of Shaphiro Wilk)	0.085	0.499	Normal distributed data
Homogenitas (Significance of Levene test)		0.700	Homogeneous Data
T-test		0.000	Significant differences

Table 9 shows that the learning achievement of the experimental class is better than the control class. The next step is to conduct a more in-depth data analysis to determine the level of significance of the data. The normality test used Shapiro-Wilk tests. The significance value is more than 0.05, namely 0.085 (control class) and 0.499 (experimental class). These results indicate the data were normally distributed. The homogeneity test used the Lavene test. The significance value of Lavene test is more than 0.05, namely 0.70. That is, the data comes from a homogeneous population.

The t-test result shows a significance value of less than 0.05, namely 0.000.

Thus, there are differences in learning achievement for students who use Android-based science media and those who learn without using the media. The result of the t-test confirms that the average value of learning achievement for students who use Android-based science learning media (77.18) is higher than the learning achievement of students who learn without using android-based science learning media, namely 70.41. The maximum learning achievement value of students who use Android-based science learning media is higher than the students who learn without using the media (90.00> 83.30).

Similar research has been carried out by several researchers in various fields and levels of education. Prasetyo (2017) develops science learning using android media at the elementary level. Relavant research developed physics science learning using android media at the junior high school (Fatimah & Mufti, 2014; Ibrahim & Ishartiwi, 2017; Ismatullah & Fathoni, 2018). Lubis & Ikhsan (2015) develop chemistry learning using android media at the high school level. Afif & Haryudo, (2016); Wijaya & Wibawa, (2017); I. Wijaya & Firmansyah (2018) develop physics learning using android media at the SMK level on different subjects.

Many developments in Android-based learning media are not without reason. There is a lot of evidence that shows that there is an increase in the learning achievement of students who carry out learning using android as done Afif & Haryudo (2016); Yektyastuti & Ikhsan (2016), as well as Ramadhani & Ikhsan (2015). Even Ismanto, Novalia, & Helandy (2017) carry out community service activities in the form of training high school teachers in developing information technology in education.

The easy use of HP and the increasing variety of HP features provide an opportunity to use HP as a potential learning medium. Even so, it still needs to be considered so that the use of HP does not lead to negative things, such as the spread of hoaxes and pornographic content for the future of Indonesia's generation who are not only intelligent but also faithful and pious.

CONCLUSION

The Android-based science learning media developed fulfills the validity and practicality test. The validation test shows an average score of 89.14% (valid) by material experts and an average score of 85.83% (valid) by media experts. The practicality assessment showed an average score of 85.25% (practical) by the teacher and an average score of 80.61% (practical) by students. There are differences in learning achievement for students who use Android-based science media and those who learn without using the media. The average value of learning achievement for students who use Android-based science learning media (77.18) is higher than the learning achievement of students who learn without using android-based science learning media, namely 70.41. The results of this study can add insight into the various languages of the Android program in learning. This media can also be used in learning physics to improve learning achievement at the junior high school level.

The effectiveness test was only on students at SMP N 1 Pejawaran, one of 136 junior high schools in Banjarnegara Regency. Therefore, these results do not represent all junior high schools in Banjarnegara Regency. It is necessary to carry out the same research with more respondents further. Other further research is in the form of dissemination of research results.

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