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The Effectiveness Factorization Media Based on Android on The Achievement of Students' Learning Outcomes

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Abstract. The purpose of this research is to describe the effectiveness of developing android-based prime factorization learning media in improving mathematics learning outcomes. The research design used in this research is to use the experimental research method Quasi-Experimental Design in the form of Nonequivalent Control Group Design consisting of control and experimental classes. Data collection techniques using observation, documentation, and tests. While the data analysis technique used is a descriptive quantitative analysis of the results of the pretest and posttest scores using SPSS 23 software. The normality test uses Shapiro Wilk because the sample is less than 50 students. The homogeneity test aims to determine whether the object under study has the same variance using the Levene homogeneity test. The analysis used to test the research hypothesis is the independent sample t-test and Normalized Gain (N-Gain). The results of the study in the form of pretest and posttest values using android-based prime factorization learning media showed that at t-count of 19,544 or 19,544 > 4,004. It means that there is a significant difference in learning outcomes of prime number factorization material before implementing learning and after implementing learning using learning media android-based prime factorization. The value of n gain% is 56.3108 on a fairly effective interpretation, which means Learning using android-based prime factorization learning media is quite effective in improving student learning outcomes for fourth-grade elementary school students in the factorization of prime numbers.

INTRODUCTION

The COVID-19 pandemic has had a wide impact all over the world, including Indonesia. The impact is extraordinary, especially in the world of education in Indonesia. The policy not to carry out face-to-face learning activities in class requires teachers to adapt learning by implementing online learning. However, there are still some problems with its implementation. In addition to being constrained by signals, teachers cannot use learning media like face-to-face learning which causes learning objectives to be difficult to achieve. One of the factors that influence students' understanding of mathematical concepts is online learning. However, pandemics should not be used as a reason for decreased learning motivation even though in its implementation there are shortcomings [1]. A teacher must be smarter and more innovative in determining learning media, especially media that can be used online. Online learning provides convenience in providing information transfer in various situations and conditions [2]. Online learning systems by utilizing digital platforms at the elementary and secondary school levels tend to change the face of education towards a better, more effective, and more enjoyable direction [3]. Teachers are also becoming more innovative in packaging teaching materials and more creative in developing learning methods to attract student enthusiasm.

IT-based learning media has a positive influence on achieving learning objectives [4]. To fun, interactive learning media can reduce bad perceptions of mathematics as a difficult and scary subject [5]. The android-based learning media is very practical which helps students understand the material. Meanwhile, the application of math mobile learning media can improve students' mathematical problem-solving abilities [6]. Learning using interactive

multimedia produces better learning achievement than conventional learning. The use of learning media in the form of a weblog-based android application is more effective than learning without using an android application media [7].

Learning media that is easily accessible by anyone and done anywhere is a driving factor for the development of Android learning media. Students can learn independently with android-based educational games without knowing place and time and eliminating boredom [8]. Android learning media can be developed creatively and innovatively so that students are more interested and easily accept the subject matter in the Android learning media. The development of android-based learning media can provide fresh air for education. The practical, flexible, and personal nature of learning media will increase students' interest, motivation, and creative power in carrying out the learning process. So that the digital media owned by students also influences the digital interactions they do every time. Prime factorization learning media used by teachers When face-to-face learning cannot be used during online learning. Therefore, it is necessary to develop android-based learning media.

Media comes from the Latin Medius which means 'middle', 'intermediary', or 'introduction'. Media has a broad definition and can be understood as an intermediary to convey information or messages. Media are all forms and channels of conveying messages/information from the source of the message to the recipient that can stimulate the mind, arouse enthusiasm, attention, and students' abilities based on the purpose of the information conveyed.

Learning media has a function to stimulate learning by presenting real objects; making imitations of real objects; making abstract concepts into concrete; equating perceptions; overcoming barriers of time, place, number and distance; representing information consistently; providing fun and interesting learning atmosphere so that learning objectives are achieved [9]. Media is a distributor of messages from the sender to the recipient as a subject and the message is expected to stimulate the thoughts, feelings, concerns, and interests of students so that the learning process can take place as intended. The message to be conveyed must be processed properly so that the communicant receives the message properly and without interpreting the intent and purpose of the message. The hope is that with the learning media the messages conveyed will be conveyed more quickly because with the learning media the messages to be conveyed can be packaged in an interesting and not boring way.

The learning media developed is an android-based prime factorization learning media. The media was developed using the software development life cycle. The application of the software development life cycle (SDLC) method will reduce the occurrence of a software crisis [10]. Media is developed using open-source software to produce interesting media. The development of learning media using open source software is expected to produce various variations of learning media to achieve certain learning objectives to be achieved. In a game-based Interactive Media program, besides the need for designs that meet market tastes, a programmer who understands scripting is also needed to create interactive learning media like games [11]. Digital delivery can provide information in the form of text and images that make digital more interesting and dynamic.

However, there are still many problems in learning. The results of the researcher's interview with the 4th grade teacher at one of public elementary school in Demak Regency, Indonesia howed that most of the students had difficulty in determining prime factorization and its solution. This is because students do not understand the prime factor of a number, the media used is simple and unattractive, teacher teaching methods are not optimal, many students easily forget the subject matter, short learning time. Learning using online causes students to have to learn to understand the material themselves so that students are less interested in lessons that cause students to get bored in the learning process. Although the online method is also combined with discussions between friends, students are still less active.

Based on the problems that occur as well as the many alternative solutions to problems carried out by previous researchers regarding the use of android-based media. The researcher is interested in doing this research. The purpose of this study is to describe the effectiveness of developing android-based prime factorization learning media. The results of the study will be used as a recommendation whether or not the learning media is used in learning

METHOD

The research design used in this study is an experimental research method of Quasi-Experimental Design in the form of a Nonequivalent Control Group Design. This design can be described in FIGURE 1.
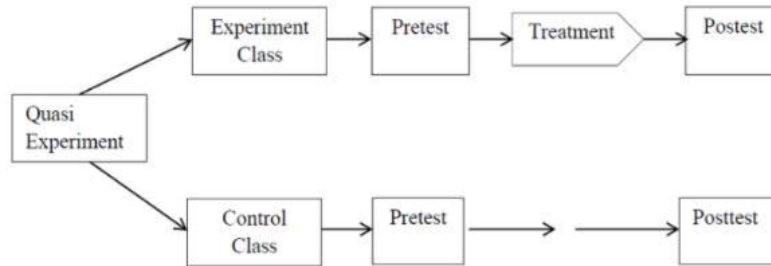
FIGURE 1. Research design

The first stage of the experiment was carried out as a prerequisite before further experiments were carried out. The purpose of the first implementation was to determine the functioning of the media and the initial response of students in the Android-based media trial. The instruments used are observation notes, documentation, and tests. The first stage of the experiment was tested on 20 students from 2 elementary schools. The follow-up experiment sample was 30 students from 3 elementary schools. Methods in analyzing this research include data description, prerequisite test, and the final analysis (hypothesis test).

Research data in the form of quantitative data. Quantitative data is data in the form of numbers from test scores from the control class and the experimental class. The description of the data is processed using SPSS. The analysis prerequisite test is carried out to test the data that has been obtained so that the hypothesis can be tested. The analysis prerequisite test consisted of a normality test and a data homogeneity test. Normality test is used to determine whether the data population is normally distributed or not, in this study using Shapiro Wilk because the number of data for each sample is less than 50 students. Homogeneity testing aims to determine whether the object under study has the same variance in this study using the Levene homogeneity test with SPSS.

Paired T-Test is a parametric test that can be used on two paired data. The purpose of this test is to see if there is a difference in the mean between two paired or related samples. After being tested for N-gain, the pretest and posttest value data were analyzed by t-test. Before the t-test was carried out, the normality test analysis phase was carried out to determine whether the results of the pretest and posttest experienced a significant increase. formulated hypothesis:

H0 = The use of android-based prime factorization learning media cannot improve the learning outcomes of 4th-grade elementary school students.

Ha = The use of android-based prime factorization learning media can improve the learning outcomes of 4th-grade elementary school students

The decision-making is:
a. if the value of Sig. (2 tails). When Sig. (2 tailed) $\geq$ 0.05 then H0 is accepted.
b. If the value of Sig. (2 tailed) $\leq$ 0.05 then H0 is rejected.

FINDINGS AND DISCUSSION

Descriptive analysis

The first phase of the experiment was conducted in the second grade of a public school in Demak Regency, Indonesia. A total of 10 students in elementary school A as the control class and 10 students in elementary school B as the experimental class. The data were obtained from the pretest and posttest results in the control class and the experimental class:

TABLE 1. Description of First stage experiment

		Pre-Test Control Class	Control Class Post Test	Pre-Test Experiment Class	Experiment Class Post Test
N	Valid	10	10	10	10
Mean		33.00	54.00	34.00	81.00
Std. Deviation		14.181	8.433	15.776	13.703
Minimum		10	40	10	60
Maximum		60	70	60	100
Sum		330	540	340	810

Based on table 1 shows that the average score of students in the pre-test control class and experimental class is still below the minimum completeness criteria. Meanwhile, in the post-test score, the average score in the control class is still below the minimum completeness criteria even though there has been an increase. And the post-test value in the experimental class increased in the average value. Data in TABLE 1 can be made a diagram to clarify the increase in the average score in each class, as in FIGURE 2.
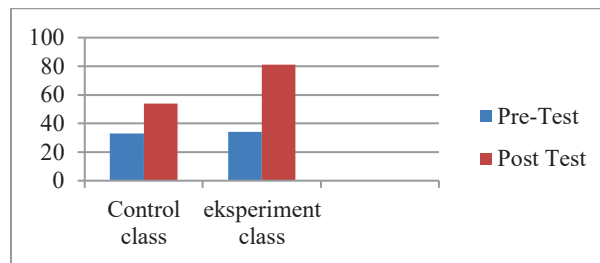
FIGURE 2. Description of the post-test score

a. T-test

The t-Test is also called the Independent Sample t-Test which is used to prove the hypothesis in the study. The t-test is one of the statistical tests to test the truth of the hypothesis proposed by the researcher in differentiating the mean in the two populations. Parametric statistical tests have several types of tests that are used to obtain conclusions about the population from the samples taken. The result of the t-test is shown in Table 2.

TABLE 2. First stage experiment t-Test Results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Nilai Post Test	Equal variances assumed	2.841	.109	5.306	18	.000	27.000	5.088	16.310	37.690
	Equal variances not assumed			5.306	14.962	.000	27.000	5.088	16.153	37.847

Based on the TABLE 2 shows that the results of the t-test with Sig. (2-tailed) of 000 < 0.05 . The t-count value is 5.306. The t-table value with df=18 is 2.1009, so the t-count value > t table (5.306 >2.1009). This means there is a difference in the average of the two samples, namely a significant increase.

b. N-Gain test

The N-gain test is used to determine an increase in the learning value of fourth-grade elementary school students in number factorization by using android-based prime factorization learning media.

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TABLE 3. First stage experiment N-Gain Test Results

No	Score	N-gain/ Ngain%	Criteria	Interpretation
1	Experiment class	0, 6983 / 69.83%	Medium	Effective enough
2	Control class	0,2769 / 27.69%	Low	Ineffective

Based on TABLE 3, it shows that in the experimental class the gain value of 0.6983 is included in the range in the range of $0.3 < g < 0.7$. Improvement of student learning outcomes in the medium category. The value of N-Gain % is 67.833 in a quite effective interpretation. Learning using android-based prime factorization learning media is quite effective to increase the learning value of fourth-grade elementary school students with prime number factorization material. In the control class, the N-Gain value is 0.2769 in the range of $g < 0.3$ included in the low category. The N-Gain % value is 27.69 in an ineffective interpretation. This means that conventional prime factorization learning without using android-based prime factorization learning media is not effectively used to increase learning scores.

The advanced experiment was carried out on fourth-grade students at in elementary school C, elementary school D, and elementary school E. The following TABLE 4 are the results of the pre-test and post-test scores on the advanced experiment.

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TABLE 4. Description of advanced experiment

	Pre-Test score	Post Test score
N Valid	30	30
Mean	41.67	76.00
Std. Deviation	15.992	12.205
Minimum	10	50
Maximum	70	100
Sum	1250	2280

Based on the TABLE 4 shows an increase in the average value from 41.67 to 76. This means that there is a difference because of the treatment, namely using android-based prime factorization learning media.

a. T-test

Paired T-Test is a parametric test that can be used on two paired data. The purpose of this test is to see if there is a difference in the mean between two paired or related samples. The t-test on an advanced experiment uses an independent Paired Sample t-test. Paired T-Test is a parametric test that can be used on two paired data. The purpose of this test is to see if there is a difference in the mean between two samples that are paired or related. The result of paired t-test in Table 5 below.

TABLE 5. Paired Samples Test
Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	Df	
Pair 1	Math Learning Values	57.333	22.723	2.934	51.463	63.203	19.544	59	.000

Table 5 shows that t count is 19,544 while t table with df = 59 is 4,004 or 19,544 > 4,004. It means that there is a significant difference in learning outcomes of prime number factorization material before and after implementing learning using android-based prime factorization learning media.

b. N-Gain test

TABLE 6 Advanced experiment N-Gain Test Results

N-gain/ Ngain%	Criteria	Interpretation
0,5631 / 56.3108	Currently	Effective enough

Based on these data, it shows that the gain value of 0.5631 is included in the range in the range of 0.3 < g < 0.7. in the medium category. The N-Gain % value is 56.3108 in a quite effective interpretation.

The results obtained in the first stage of the experiment showed an increase in the results of the pre-test and post-test scores in the control class and the experimental class. The post-test value of the experimental class was higher than the control class. These results indicate that the use of android-based prime factorization learning media is able to improve mathematics learning outcomes for fourth grade elementary school students.

The results of the t-test on the first stage experiment test obtained that the t-value data was 5.306. The t-table value means the t-count value > t-table (5.306 >2.1009). This means that there is a significant increase in the learning value of fourth-grade students in number factorization by learning using android-based prime factorization learning media. While the gain value in the first stage experiment of 0.69833 is included in the range of 0.3 < g < 0.7. In the medium category. The value of N-Gain % is 67.833 in a quite effective interpretation. learning using android-based prime factorization learning media is quite effective to increase the learning value of fourth-grade elementary school students with prime number factorization material.

In the advanced experiment, the t-count data was 19,544 while the t-table was 4,004 or 19,544 > 4,004. It means that there is a significant difference in learning outcomes of prime factorization material before and after learning by using android-based prime factorization learning media. the gain value of 0.5631 is included in range in the range of 0.3 < g < 0.7. in the medium category. The N-Gain % value is 56.3108 in a quite effective interpretation. Learning using android-based prime factorization learning media is quite effectively used to increase the learning value of fourth-grade elementary school students with prime number factorization material as evidenced by an increase in the average value before and after the implementation of learning. In the developed android media, it contains several display materials about prime factors, rules and methods of prime factorization. By using android media, students can learn mathematics in a more interesting way so as to make mathematics learning outcomes increase. Students who study using android media can become more independent in learning and improve their mathematical problem-solving skills [12].

The android media used in the research also contains practice math problems. By trying the questions in the application, students can hone their abilities and measure their learning success. By experimenting with the questions given by the teacher in the media, students' critical thinking skills emerge [13]. Mathematics learning that is integrated with technology makes students have a positive response to learning.

The results showed that android-based learning media was effective in improving mathematics learning outcomes. The same thing happened in several other studies in different mathematical materials [14,15]. Educational game media material about fractional operations is very suitable for use in learning [16]. The use of games based on android games in learning can increase students' creativity and cognitive achievement in learning was significantly higher [17].

Based on the results of the research and discussion, it can be concluded that learning using Android-based prime factorization learning media is quite effective in improving the learning outcomes of fourth-grade elementary school students in mathematics lessons on prime factorization material.

CONCLUSIONS

Based on the results of the research and discussion, it can be concluded that learning using Android-based prime factorization learning media is quite effective in improving the learning outcomes of fourth-grade elementary school students in mathematics lessons on prime factorization material. This conclusion is proven by the results

Pretest and posttest values using android-based prime factorization learning media showed that at t-count of 19,544 or 19,544 > 4,004 it means that there is a significant difference in learning outcomes of prime number factorization

material before implementing learning and after implementing learning using learning media. Android-based prime factorization. The value of n gain% is 56.3108 on a fairly effective interpretation, which means Learning using android-based prime factorization learning media is quite effective in improving student learning outcomes for fourth-grade elementary school students in the factorization of prime numbers.

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REFERENCES

1. Y. Fitriyani, I. Fauzi, M.Z. Sari, "Motivasi Belajar Mahasiswa Pada Pembelajaran Daring Selama Pandemik Covid-19", *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran*, **6**(2), pp. 165-175(2020).
2. P. Hendikawati, M.Z. Zahid, and R. Arifudin, "Keefektifitas Media Pembelajaran Berbasis Android terhadap Kemampuan Pemecahan Masalah dan Kemandirian Belajar". *PRISMA, Prosiding Seminar Nasional Matematika*. **2**, pp. 917–27 (2019).
3. I. Setyorini, "Pandemi COVID-19 dan Online Learning: Apakah Berpengaruh Terhadap Proses Pembelajaran Pada Kurikulum 13?", *Journal of Industrial Engineering & Management Research,* **1**(1b), pp. 95-102 (2020).
4. S. A. Wibowo, Fatimatuzzahro, L. N. Santi, E. Puspitasari, and I. Faizah, "Garymatika Media Pembelajaran Matematika Berbasis Game Android Untuk Siswa Sekolah Dasar", *FKIP e-PROCEEDING, FKIP-UNIVERSITAS JEMBER* (2018)*, pp. 155-159.
5. I.H. Batubara, "Improving Student's Critical Thinking Ability Through Guided Discovery Learning Methods Assisted by Geogebra", *International Journal for Educational and Vocational Studies,* **1**(2), pp. 116–119 (2019).
6. N. Nikmah, R. Rahayu, and N. Fajrie, "Penerapan Media Pembelajaran Math Mobile Learning Untuk Meningkatkan Kemampuan Pemecahan Masalah Siswa Kelas I", *WASIS: Jurnal Ilmiah Pendidikan*, **1**(2), pp. 44–52 (2020).
7. Y. S. Pangestu, and D. Setyadi, "Pengembangan Media Pembelajaran Aplikasi Android Pytha Fun untuk Teorema Pythagoras SMP", *Jurnal Cendekia: Jurnal Pendidikan Matematoka*, **4**(1), pp. 113–125 (2020).
8. Y. Pratama, Z. Muchtar, and A. Darmana, "Develop an Android-Based Learning Media Integrated with a Scientific Approach to the Colligative Solution's Nature", *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal,* 4(1), pp.322–329 (2021).
9. H. A. H. Sanaky, *Media Pembelajaran Interaktif-Inovatif* (Kaukaba Dipantara, Yogyakarta, 2013).
10. Y. S. Dwanoko, "Implementasi Software Development Life Cycle (SDLC) Dalam Penerapan Pembangunan Aplikasi Perangkat Lunak", *Jurnal Teknologi Informasi: Teori, Konsep, dan Implementasi*, **7**(2), pp.83–94(2016).
11. R. Sastra, "Metode pengembangan perangkat lunak waterfall dalam perancangan sistem informasi e-learning", *IJSE – Indones J Softw Eng Metod*, **3**(1), pp. 27–33 (2017).
12. E. C. Bouck, C. Maher, J. Park, and A. Whorley, "Learning fractions with a virtual manipulative based graduated instructional sequence", *Education and Training in Autism and Developmental Disabilities*, **55**(1), pp.45–59 (2020).
13. Z. Zainudin, B. Pambudi, "Efektifitas Penerapan Perangkat Pembelajaran Fisika Dasar Berbasis Keterampilan Berpikir Kritis Menggunakan Aplikasi Edmodo Berplatform Android", *Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram,* **7**(1), pp.17-26(2019).
14. M. A. Zakiy, M. Syazali, and F. Farida, "Pengembangan Media Android dalam Pembelajaran Matematika", Triple *S (Journals of Mathematics Education).* 2018;1(2):87–96.
15. U. Cahyana, Y. Yusmaniar, and P.A. Zahari, "Development of mobile learning on acid and base to improve student performance", *Journal of Physics: Conference Series. IOP Publishing,* **1402**(5), p. 055062 (2019).
16. T. R. Amirulloh, M. Risnasari, and P. R. Ningsih, "Pengembangan Game Edukasi Matematika (Operasi Bilangan Pecahan) Berbasis Android Untuk Sekolah Dasar", *Jurnal Ilmiah Edutic: Pendidikan dan Informatika*, **5**(2), pp. 115–123 (2019).

17. K.H. Sugiyarto, J. Ikhsan, and I.R. Lukman, "The use of an android-based-game in the team assisted individualization to improve students' creativity and cognitive achievement in chemistry", *Journal of Physics: Conference Series. IOP Publishing,* **1022**(1), p. 012037(2018).