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Effect of Mobile Learning toward the Effectiveness of Mathematics Learning for Fourth-Grade Students in the Net Generation Era

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Abstract

The net generation is born simultaneously as new technologies are being developed, exposing them to those technologies from infancy. The constant coexistence with technology in their early lives imparts technological literacy to the fictional characters. Smartphones, for example, are an inseparable part of today's children, and this generation is not only familiar with them but also proficient at utilizing them. Most children solely use their phones for media consumption. In particular, the mathematical abilities of this generation stand to benefit from the widespread adoption and proper use of smartphones. Students at all educational levels, from elementary school on up, now view mathematics as a formidable foe. There has to be a breakthrough that utilizes emerging technology, specifically mobile learning, to put an end to this terrifying phenomenon in learning mathematics. Therefore, this study was carried out to demonstrate the effectiveness of mobile learning in teaching mathematics to fourth-grade students (9-10 years old) in this net generation era. This research was conducted to provide educators and education administrators with a point of departure for creating new approaches that better reflect the traits of that generation. One of the hoped-for outcomes of this study is an improvement in individuals' capabilities.

Keywords: *Net Generation, Mobile Learning, Effectiveness*

1. Introduction

The advancement of Indonesia as a nation and the production of capable citizens are goals to which education contributes. The ever-evolving world of education is being impacted by these developments, particularly in formulating new strategies for applying established methods, one of which is using mobile devices for educational purposes. The term "mobile learning" refers to employing electronic digital devices such as smartphones, PDAs, and tablet PCs as learning media that can be accessed without regard to time or location. Given that people of all ages are using smartphones today. Of Indonesia's total population of 267 million people, 95.4% of internet users (or 197 million people) perform it exclusively through their smartphones [1]. Thanks to the proliferation of smartphone ownership, Indonesia is now the world's fifth-largest mobile phone market. Considering the facts, most smartphone owners use their devices to make and receive phone calls and text messages. Not everyone has jumped on the bandwagon of people using their smartphones to study on the go. It occurs because there is still a dearth of content readily available through mobile devices. Most people nowadays favor entertainment with no educational purpose. Since information on mobile-based devices is widely accessible, easy to use, and varied, it is required to build content incorporating these data to address issues and fulfill demands in education [4].

Mathematics proficiency is an essential cognitive skill for students to cultivate. Their abilities to apply mathematics in the real world rely primarily on the

mathematics foundation they obtain in school. Unfortunately, Indonesia has a poor interest level in mathematics. In 2018, the Program for International Student Assessment (PISA) reported results from exams and assessments [2]. In a field featuring 78 other nations, Indonesia scored a lowly 72nd with a score of 379. Despite this improvement, PISA claims that students' overall performance is still subpar. Poor mathematics competency is linked to inefficient teaching practices that fail to fully leverage each student's unique set of skills.

Traditional classroom teaching methods are inefficient because they require students to be passive observers who do nothing more than listen, read, and memorize what they are told. Compared to the learning methods used in advanced economies, this approach is seen as obsolete. PISA [4], for instance, places Singapore second overall. It is becoming increasingly common for countries like Singapore to include technology-based learning in their school curricula. Integrating technology-based learning into Indonesia's educational system is seen as having the potential to play a role in future initiatives to improve the country's inefficient pedagogical practices. The present government policy, particularly the school digitalization initiative, is consistent with the use of technology in education [7,8]. The initiative's first step is to equip schools with information and communication technology (ICT) classroom resources, such as desktop computers, laptops, LCD projectors, routers, and external hard drives. Students in elementary school to 12th grade are being provided tablets as part of the government's effort to promote mobile learning as a platform for innovative pedagogical approaches. The present generation has reached the Z generation age, often known as the net generation, making it easier to implement technology-based education. The net generation is born when PCs, the internet, and smartphones have been widely available to the public. These technologies have now become deeply ingrained in everyday life for most people. The clarification, as mentioned earlier, will serve as a lens through which the effectiveness of a mobile learning application in elementary school mathematics education is evaluated.

2. Method

2.1. Types of Research

This study employed an experimental method because it requires a treatment in which the independent variable receives the treatment, and the results are observed in the dependent variable. A quantitative quasi (pseudo) experiment design [5,6] was applied. It belongs to a quasi-experimental study since it utilized a control class but could not exclude all potential confounding variables. Therefore, this quasi-experiment helped determine the effect on study participants exposed to special treatment and the causal relationships. The following figure displays the quasi-experimental design.

This experiment involved two classes: control and experimental. The experimental class was given special treatment, consisting of learning and question-answering utilizing mobile learning, particularly a mathematics learning application. While the control class learned and responded to questions using the traditional method or non-mobile learning.

After administering the treatment outlined in the initial experimental design to the two classes, a test was conducted to determine their difference.

The mathematics learning accomplishment scores of the fourth-grade students at SDN 1 Kelayu Selatan were subjected to a test for the average difference based on the data collection findings. The mean difference test consisted of three stages: the

data normality test, the homogeneity test, and the average difference test using the t-test.

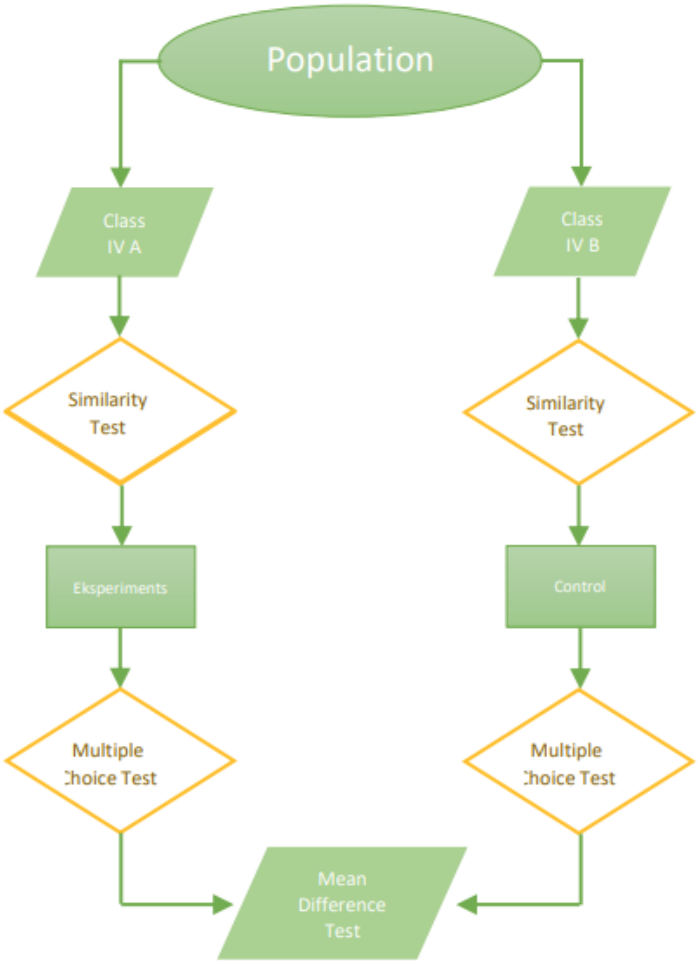

Figure 1. Quasi-experimental Design

2.2. Application Development

The application employed in this research is conceptually similar to one developed previously created by Kevin Chandra Putradi [3]. However, the application in this study was tailored to the research requirements by modifying its contents, including its display, materials, and questions. The following images illustrate the customized application.

Figure 2. Customized application display

3. Analysis Results

3.1. Presentation of Research Data

Table 1 displays the study findings conducted at SDN 1 Kelayu Selatan to determine the impact of the mobile learning application on the effectiveness with which students in the fourth grade learned mathematics.

Table 1 Learning Achievement of the Experimental Class

No	Code Name	Gender	Score
1	KE - 01	M	75
2	KE – 02	F	75
3	KE – 03	M	67
4	KE – 04	M	58
5	KE – 05	F	92
6	KE – 06	M	92
7	KE – 07	F	83
8	KE – 08	M	75
9	KE – 09	F	50
10	KE – 10	M	50
11	KE – 11	F	75
12	KE – 12	F	92
13	KE – 13	M	58
14	KE – 14	M	92
15	KE – 15	M	33
16	KE – 16	M	58
17	KE – 17	M	33
18	KE – 18	M	58
19	KE – 19	M	58
20	KE – 20	M	58
21	KE – 21	F	50
22	KE – 22	F	58
23	KE – 23	M	50
24	KE – 24	M	50
	Total		1,542
	Average		64.11

Table 2 Learning Achievement of the Control Class

No	Code Name	Gender	Score
1	KK - 01	M	50
2	KK – 02	M	42
3	KK – 03	F	50
4	KK – 04	M	58
5	KK – 05	M	42
6	KK – 06	M	58
7	KK – 07	M	50
8	KK – 08	F	58
9	KK – 09	F	42
10	KK – 10	F	58
11	KK – 11	F	42
12	KK – 12	M	33
13	KK – 13	M	67
14	KK – 14	F	25

No	Code Name	Gender	Score
15	KK – 15	M	33
16	KK – 16	F	67
17	KK – 17	F	33
18	KK – 18	F	75
19	KK – 19	F	67
20	KK – 20	M	67
21	KK – 21	M	75
22	KK – 22	F	58
23	KK – 23	F	67
24	KK – 24	M	50
	Total		1,267
	Average		52.79

3.2. Test Results of Data Prerequisite

Data Normality

Table 3 exhibits the results of the Chi-squared (X^2) test for data normality.

Table 3 Normality Test Results of the Two Variables

No	Class	X^2count	X^2table	Description
1.	Experimental	1.50	7.81	Normal
2.	Control	6.17	7.81	Normal

Data Homogeneity

Before conducting the mean difference test, an F test was performed to determine the homogeneity of variance. The calculations revealed that the variance for the experimental class (using the mathematics learning application) was 304.83, the largest. Conversely, the control class obtained 197.26, the smallest variance. It resulted in the F count being higher than the F table, with the dk-numerator of 24 – 1= 23, the dk-denominator of 24 – 1 = 23, and a significance level of 5% of 2.01. The calculation yielded an F count of 1.55, smaller than the F table of 2.01. In other words, the variance was homogeneous.

3.3. Mean Difference Test Results with T-Test

The t-test was run to verify the hypothesis to determine if the average of the experimental class (the one that used the mathematical learning application) was higher than the average of the control class [9,10]. Table 4 demonstrates the hypothesis test results.

Table 4 Hypothesis Test Results

Kelas	X	S^2	T_{hitung}	T_{tabel}	Tingkat Pengaruh	Keterangan
Eksperimen	64,11	304,83	2,79	2,01	14,50%	$T_{hitung} > T_{tabel}$
Kontrol	51,33	197,26				Hipotesis (Ha) diterima

If the t-count is greater than the t-table, Ha is accepted. The analysis generated an error rate of 0.05, with the dk of $n1 + n2 - 2 = 24 + 24 - 2 = 46$. The t−table obtained

2.01, and the t-count acquired 2.79. The t-count of 2.79 is greater than the t-table of 2.01, meaning that Ho is rejected and Ha is accepted. In short, the mobile learning application affected the effectiveness of learning mathematics with an influence level of 14.50%.

3.4. Discussion

The primary purpose of this research is to evaluate the effectiveness of using a mobile learning application to teach mathematics to fourth-grade students in the context of the Internet age. Figure 3.1 displays the stages this research underwent to achieve the goal. Two homogenous samples, one from the population of Classes A and B and another from the population of Classes IVa and IVb, were drawn for the experiment. The experimental class utilized a mathematics learning application as a treatment, whereas the control group received no such treatment.

One class received treatment while the other did not, and both were given the same test to determine the difference. The test findings unveiled that fourth-grade students at SDN 1 Kelayu Selatan benefited from a more practical approach to studying mathematics. The high enthusiasm of students and the factor of their generation currently technologically literate could make a difference in the results. Hence, it is highly possible to utilize the mathematics learning application to increase the enthusiasm for learning and the attention of students in the net generation era in learning activities. The typical students believed mobile learning was more engaging than traditional study methods. The hypothesis test unveiled that the effectiveness with which one learns mathematics is affected by the learning application.

Cognitively proving there was a difference in learning results between the experimental and control classes, student motivation in learning stood out throughout mobile learning deployment at SDN Kelayu Selatan. The goal of studying how students' motivation to learn shifts after interacting with learning materials designed for that level of proficiency has become apparent.

The findings of this study suggest that a mobile-based learning application has been more effective in improving learning outcomes and interest than traditional methods and independent learning experiences without applications. It is because application-based learning allows students more room for individual expression and autonomy.

Four-grade students at SDN 1 Kelayu Selatan benefited from using mobile learning to improve their mathematical knowledge. The t-test generated a t-count of 2.79, higher than a t-table of 2.01 at a 5% significance level. Therefore, Ho is rejected, and Ha is accepted. It serves as a reference for demonstrating the 14.50% effects of the mobile learning application on the effectiveness of mathematics learning for fourth-grade students at SDN 1 Kelayu Selatan.

4. Conclusion

The study results at SDN 1 Kelayu Selatan revealed that mobile learning impacted the effectiveness of mathematics learning for fourth-grade students in the internet era. The t-test yielded an influence level of 14.50%. Fourth-grade students at SDN 1 Kelayu Selatan benefited from using a mathematics learning application. Compared to students who did not use mobile learning, those who did depict significant gains in their academic performance. Fourth-grade students at SDN 1 Kelayu Selatan exhibited increased proficiency in technology due to using mobile learning. No one who had to utilize the application encountered trouble getting started.

5. Suggestion

a. The school's principal is highly expected to rely on his wisdom and allocate funds to purchase mobile learning and sufficient internet connectivity to improve the effectiveness of the school's teaching and learning activities.

b. Teachers of mathematics, not just those at SDN 1 Kelayu Selatan, should be able to select the most appropriate approach for classroom activities to raise their students' achievement and achieve the desired results. It will also help make mathematics learning applications easier, making learning more efficient.

c. Students must develop their brain abilities by studying diligently to improve their learning outcomes.

d. There is a need for more studies on using mobile learning applications as a pedagogical strategy in the classroom, not just for the fourth grade but for other grades.

e. Others working on the mathematics applications are anticipated to make more improvements to help students better absorb the subject being taught.

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