THE EFFECT OF USING DIGITAL GAME-BASED LEARNING METHOD THROUGH MATHPLAYGROUND TO IMPROVE STUDENT LEARNING OUTCOMES IN MATH SUBJECT AT AVICENNA GEMILANG ELEMENTARY SCHOOL

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ABSTRACT

This study aims to determine the effect of using digital game-based learning methods to improve student learning outcomes in mathematics subject at Avicenna Gemilang Elementary School using mathplayground as the learning media. This research uses an experimental method with one group pretest posttest design. The samples used in this study were 25 grade one students in Avicenna Gemilang Elementary School. The data collection of this study was with a test instrument in the form of a multiple-choice question test given at the beginning and end of learning. Data analysis was carried out based on quantitative data by calculating the average pretest and posttest. To find out if there is a significant increase, the researcher conducted a normality test, and t test, namely paired sample test with the assistance of SPSS 26. The results of this study showed that the average pretest student score was 64.40 and posttest 76.80 and the results of the paired sample test data analysis showed a sig. (2-tailed), 0 < 0.05 (0.000 < 0.05). Therefore, it can be concluded that there is an effect of using digital game-based learning methods to improve student learning outcomes in math subjects at Avicenna Elementary School using mathplayground.

Keywords: game-based learning; mathplayground; math

ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh penggunaan metode pembelajaran berbasis permainan digital untuk meningkatkan hasil belajar siswa

pada mata pelajaran matematika di SD Avicenna Gemilang dengan menggunakan mathplayground sebagai media pembelajaran. Penelitian ini menggunakan metode eksperimen dengan desain one group pretest posttest design. Sampel yang digunakan dalam penelitian ini adalah 25 siswa kelas satu SD Avicenna Gemilang. Pengumpulan data penelitian ini adalah dengan instrumen tes berupa tes soal pilihan ganda yang diberikan pada awal dan akhir pembelajaran. Analisis data dilakukan berdasarkan data kuantitatif dengan menghitung rata-rata pretest dan posttest. Untuk mengetahui apakah terdapat peningkatan yang signifikan, peneliti melakukan uji normalitas, dan uji t, yaitu uji paired sample t-test dengan bantuan SPSS 26. Hasil penelitian ini menunjukkan bahwa rata-rata nilai pretest siswa adalah 64,40 dan posttest 76,80 dan hasil analisis data paired sample t test menunjukkan nilai sig. (2-tailed), 0 < 0,05 (0,000 < 0,05). Oleh karena itu, dapat disimpulkan bahwa terdapat pengaruh penggunaan metode pembelajaran berbasis permainan digital untuk meningkatkan hasil belajar siswa pada mata pelajaran matematika di SD Avicenna menggunakan mathplayground.

Kata kunci: pembelajaran berbasis permainan; mathplayground; matematika.

A. Introduction

Mathematics is one of the subjects given to all learners, starting from elementary school to college. The provision of mathematics subjects to students aims to enable students to build the ability to think critically, logically, systematically, creatively, and to work together. In addition, math helps students in various aspects of life, such as making decisions, solving problems, and building creativity. By understanding math, students can have a better ability to overcome problems in everyday life. Without the contribution of basic mathematical concepts and processes, humans will experience many difficulties. In a good way in education and coaching for students to learn since elementary school. However, there are many obstacles experienced by students in learning mathematics, resulting in low learning outcomes. In reality, students learn math to pass exams and teachers focus on getting students to pass in math or in some rare cases, score high on exams (Pokhrel, 2018). Therefore, every student would have experienced difficulties in understanding and even solving math

problems (Sugianto et al., 2022). This is also inseparable from the learning process carried out and some students tend to consider math as a subject that is difficult to understand and frightening.

In Figure 1, the results of the PISA (Programme International of Student Assessment) survey show that in the most recent period in Indonesia (2018-2022) the gap between the highest scoring students (top 10%) and the lowest scoring students (bottom 10%) narrowed in math, while the gap did not change significantly in reading and science (*PISA 2022 Results (Volume I)*, 2023). In math, high-achieving students became weaker, while performance did not change significantly among low-achieving students. In addition, in Indonesia, 57% of students reported that in most math lessons, teachers show interest in each student's learning (OECD average: 63%), and 64% of students said that teachers provide extra help when students need it (OECD average: 70%). In 2012, the percentages were 62% and 69% respectively. Math test results in 2022 are less likely to decline, on average, in an education system where more students report that teachers provide extra help when students need it, compared to ten years earlier. Vogt et al. (2020) argue that the perspectives of educators also need to be considered. Therefore, mathematics educators generally agree that teaching and learning mathematics requires different skills compared to other subjects (Pan et al., 2022).

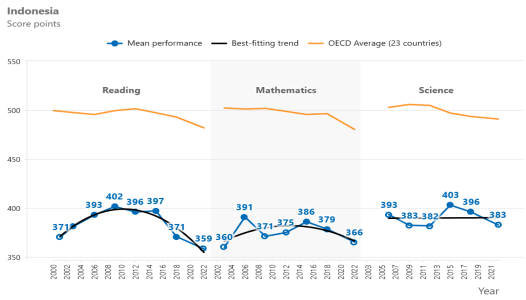

Figure 1. Achievement trends in math, reading, and science in Indonesia (*PISA 2022 Results (Volume I)*, 2023).

The use of game-based learning methods in math can encourage students to actively participate in learning by discovering the accompanying knowledge themselves, which can help students express mathematical problem-solving skills. Four aspects are important in a play-based approach to mathematics in early childhood

education: (i) 'math content should be part of the game mechanics'; (ii) it needs to be 'presented correctly'; (iii) it is 'important for further learning' and (iv) the game should be 'appropriate to the individual learning needs of the child' (Scott et al., n.d.). The potential of educational games as a new educational transformation force has been widely recognized (Zeng et al., 2020). Well-managed math games will be able to help develop intellectuality, can assist students in developing students' critical thinking skills, improve various skills, especially in solving problems and transferring material, and add insight into how to learn mathematics (Darmayanti, 2023). An effective method that suits students' needs will help them better understand mathematical concepts.

One of the learning media that can be used for the application of game-based learning method is mathplaygrond.com which has a variety of math learning in the form of games. The use of digital devices can produce a more interactive and customized learning experience (Husna et al., 2023). Mathplaygrond is a digital platform that contains 133 math games that can be opened through the website www.mathplayground.com. In the realm of education, math cannot be separated from technological advancement. Therefore, math plays an important role as a subject that must be taught at every level of education (Amsul et al., 2022).

Based on observations conducted by researchers at Avicenna Gemilang Elementary School, it was found that mathematics learning at the school was still centered on the role of the teacher. As a result, students are less active in the teaching and learning process, and teachers are also less innovative in utilizing learning media. During math learning, students also seemed unfocused and did not pay attention to the teacher when explaining. Showing a good attitude and paying attention to the teacher during learning is a sign that the student has an interest in the learning material (Syarifatus Sadiah & Aldila Afriansyah, 2023). The school has not really implemented learning that utilizes digital technology due to limited facilities and lack of knowledge. To overcome this, teachers have to find ways to create interesting and effective learning so

that students do not feel bored. Utilizing technology such as online learning platforms like mathplaygrond can increase students' creativity and enthusiasm in learning mathematics. From the data analysis and testing conducted by (Setyawan & Sutriyani, 2023), it can be concluded that the use of mathplayground media has a positive impact in increasing elementary school students' interest in learning mathematics.

From this explanation, a problem formulation can be found regarding the effect of using digital game-based learning methods to improve student learning outcomes using mathplayground in mathematics subjects at Avicenna Gemilang Elementary School. This study aims to determine the effect of using a digital game-based learning method using mathplayground to improve student learning outcomes in math subjects at Avicenna Gemilang Elementary School.

B. Method

This research uses a quantitative research type with a one group pretest posttest design and a pre-experimental design approach. This research only uses one group. In the pre-experimental design approach, students are tested with an initial test before receiving treatment, and then tested again after the treatment is given (Sari et al., 2020). Analysis and discussion were conducted on the test results to verify the impact of the treatment using the variable (O_2). This research was conducted at Avicenna Gemilang Elementary School located in Cileungsi, Bogor, West Java. The population of this study was 25 grade one students of Avicenna Gemilang Elementary School consisting of 7 boys and 18 girls. To determine the improvement of student learning outcomes, researchers used data collection techniques in the form of 10 multiple choice questions given before treatment, and 10 other multiple-choice questions given after treatment.

Table 1. Research Design

Pre-Test	Treatment	Post-Test
O_1	X	O_2

Description:

X: The treatment is given by applying digital learning media mathplayground.

O_1: The result of the experiment before using digital learning media mathplayground

O_2: The result of the experiment after applying digital learning media mathplayground

The instruments and steps applied were as follows: (1) The preparation stage, which includes determining the research schedule, determining the time allocation, selecting media, making a question framework, and preparing questions based on the prepared question framework; (2) at the implementation stage, students are given a pre-test (O_1) to find out the initial situation, then students are given treatment (X) using mathplayground as a digital learning media. After being given treatment, students will be given a post-test (O_2) to determine the effect of the application of mathplayground media to improve student learning outcomes in math subjects. (3) After the test is conducted, an analysis involving normality test and t-test is conducted.

C. Results and Discussion

In this study, to determine the effect of using the game-based learning method to improve student learning outcomes in mathematics, pre-test and post-test assessments were carried out through giving 10 multiple choice questions. The test was only conducted in one class totaling 25 students of grade 1 Avicenna Gemilang Elementary School as the research subject or there was no comparison class. The study was conducted for 2 hours. The first 20 minutes were used for giving pretest questions. After the pretest, the researcher gave the material and the treatment using digital game-based learning. The researcher introduced the learning media that would be used, namely “Jumping Chicks” as games that would be used on mathplayground. After the students understood the game, the researcher divided the class into 5 groups and each group had 5 students. The mechanism of the game is as follows: (1) Each group will make a line up to take turns playing the games on the screen. (2) Student in the first row will answer the question first, after that move to the back row. (3) Next,

student in the second row will come forward to answer the questions and continue until all members have completed all the questions in the game. After the application of learning media using mathplayground, students were given post-test questions which were solved in 20 minutes. The results of this study resulted in pre-test and post-test scores which can be seen in table 2 below:

Table 2. Average Pre-Test and Post-Test Scores

Test Description	Average
Pre-test	64,40
Post-test	76,80

Based on the results of the average score, there is an increase in student learning outcomes by using the game-based learning method through mathplayground. This can be seen from the average pretest score before being given the game-based learning method using mathplayground is 64.40 and the average post-test score of students after being given the game-based learning method using mathplayground is 76.80.

After obtaining the pre-test and post-test data, a prerequisite test was carried out in the form of a normality test. According to Setyawan & Sutriyani (2023), to find out whether the research data is normally distributed or not, then a normality test is carried out. The normality test was carried out using Shapiro Wilk with the help of SPSS because the sample used was less than 50 students. If the sig value> 0.05, it can be said that the data is normally distributed, while if the sig value <0.05, it means that the data is not normally distributed. The results of the data analysis can be seen in the following table:

Table 3. Test of Normality

	Shapiro-Wilk		
	Statistic	df	Sig.
Pretest	,967	25	,573
Posttest	,933	25	,104

Based on the results of the normality test on Shapiro Wilk, the pretest shows a significance value of 0.573 > 0.05 and the post-test shows a significance value of 0.104 > 0.05. Hence, it is concluded that the

research data is normally distributed and meets the requirements for parametric analysis and research data.

After the normality test, then the hypothesis test will be used to determine whether there is a significant difference in student learning outcomes before and after the treatment using game-based learning methods through mathplayground. Hypothesis testing is done using the t-test with the help of SPSS 26. Decision making in hypothesis testing is sig. (2-tailed) <0.05 then H0 is rejected and Ha is accepted.

H0: There is no significant effect on the learning outcomes of grade one students in Avicenna Gemilang Elementary School after implementing learning with the Game-Based Learning method using Mathplayground.

Ha: There is a significant effect on the learning outcomes of grade one students in Avicenna Gemilang Elementary School after learning implementation with the Game-Based Learning method using Mathplayground.

Table. 4 Paired Sample Test

		Paired Differences					t	df	Sig. (2-tailed)
				Std. Error	95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Mean	Lower	Upper			
Pair 1	Pretest - Posttest	-12,40000	7,78888	1,55778	-15,61509	-9,18491	-7,960	24	,000

Based on the results of the paired sample test, the significance value (2-tailed) of 0.000 <0.05 means that H0 is rejected and Ha is accepted. This shows that there is a significant effect on the learning outcomes of grade one students in Avicenna Gemilang Elementary School after applying learning with the Game-Based Learning method using Mathplayground.

D. Conclusion

Based on the average results of the pre-test and post-test, there is an increase in the average of student learning outcomes with the Game-Based Learning method using Mathplayground. This shows that the average pre-test of students before using mathplayground is 64.40. Then the average post-test score after using mathplayground is 76.80. This is evidenced by the results of the paired sample test data analysis which shows the sig value. (2-tailed), 0<0.05

(0.000 <0.05). Therefore, H0 is rejected and Ha is accepted, it can be concluded that there is a significant effect on the learning outcomes of grade one students of Avicenna Gemilang Elementary School after implementing learning with the Game-Based Learning method using Mathplayground.

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