Effectiveness of Educaplay Games on Students' Cognitive Understanding in Mathematics Learning in Grade II at SDN Bugih 3 Pamekasan

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Abstract

This study aims to evaluate the effectiveness of educational games utilizing the Educaplay platform in improving cognitive understanding of second- grade students in Mathematics at SDN Bugih 3 Pamekasan. The approach used was a quasi-experiment, with a one-group pretest-posttest design with 30 students as subjects. Multiple-choice tests were used as instruments to assess students' understanding before and after the intervention. The results of the Wilcoxon Signed-Rank test showed a significant difference between the pretest and posttest scores ($p < 0.05$), indicating an increase in understanding after using Educaplay. Furthermore, the N-Gain analysis showed an average increase of 82.33%, which is included in the high category. These results indicate that combining interactive game-based learning effectively improves students' motivation, engagement, and conceptual understanding. Thus, Educaplay is recommended as an innovative alternative tool for elementary education.

Keywords – Educaplay, educational games, cognitive understanding, mathematics, elementary school students.

1. Introduction

Education is one of the fundamental aspects in shaping students' character and intellectual abilities from an early age. In today's digital era, the world of education continues to experience transformation, especially in terms of teaching methods and learning media(Cadena Villegas et al., 2023; Páez-Quinde, Infante-Paredes, et al., 2022b; Sánchez Cumbanama & Moreno Artieda, 2024). Technological innovation has become an important part of improving the teaching and learning process, including the use of interactive digital media. One innovation that is increasingly being applied in the learning environment is the use of educational games(Cad et al., 2022; Graça, Quadros-Flores, et al., 2022; Soledispa Baque et al., 2023).

Educational games like educaplay serve as interactive learning tools that provide students with a fun and meaningful learning experience. With an engaging interface and features that promote active learning, educaplay is believed to increase student motivation and engagement in learning, especially in subjects that are often considered challenging, such as mathematics(Páez-Quinde, Armas-Arias, et al., 2022; Santana Holleday & Estrada Senti, 2022). The use of educaplay allows students to directly interact with learning materials in a game format, making it easier for them to understand and master concepts. Edugames, or educational games, are applications designed for technological devices such as smartphones, with the main purpose of supporting the learning process(Batitusta & Hardinata, 2024; Clerici et al., 2022; Quinde Cristina Páez et al., 2022). One example of a web-based Edugame platform is Educaplay, which is easily accessible without requiring registration or account login. Educaplay offers a variety of interactive games, such as quizzes and knowledge-based challenges, that can be played individually or in groups. This platform is perfect for online learning, allowing teachers and students to engage with learning materials in a more engaging and flexible way(Jurado, 2022; Jurado Enríquez, 2022).

Educaplay is a global platform launched in 2010 to enhance interactivity in teaching and learning activities. It enables educators to create a variety of

educational games designed to enhance student learning outcomes(Barrera et al., 2022; Chimbo-Caceres et al., 2022; Kovalchuk et al., 2022). By incorporating an interactive multimedia approach, Educaplay offers a variety of game types including adventure games, card games, board games, quizzes, and role-playing activities. This makes Educaplay an effective learning tool for both online and offline education, providing a fun and dynamic learning experience.

At SDN Bugih 3 Pamekasan, efforts to improve the quality of mathematics learning for second grade students continue to be made, one of which is through the implementation of the educational game Educaplay. Cognitive understanding, which includes students' ability to understand, process, and apply information, is the main focus in elementary mathematics education. Therefore, the implementation of educational games is expected to optimally support the development of students' cognitive skills.

This study aims to test the effectiveness of using educaplay games in improving second grade students' cognitive understanding in mathematics at SDN Bugih 3 Pamekasan. Through this study, it is expected that effective, relevant, and interesting digital learning strategies can be identified to support the achievement of educational goals in the digital era.

So in this scientific article research, the researcher draws a common thread in a Research Gap related to this journal research, including the first journal research which was presented by Febbi Nur Fadillah and Asri Diah Susanti in their research entitled "The Effect of Using Educaplay-Based Gamification Media on Basic Accounting Learning Motivation of Vocational High School Students," from the results of their research they stated that there is an effect of using Educaplay-based gamification media on the motivation to learn basic accounting of vocational high school students. There is an increase in student learning motivation after using Educaplay-based gamification(Graça, Quadro-Flores, et al., 2022).

In addition, in the second study, which has been presented by Aisyah Falah Agdiyah, Syukriyah Mustopa, and Kowiyah with their research entitled "The Effect

of Interactive Media Educaplay on Mathematics Learning in Grade II of Elementary School", the use of technology-based learning media has been shown to have a positive impact on students' academic achievement and engagement, while also contributing to efforts to improve the quality of mathematics learning at the elementary school level(Mykytka et al., 2022; Páez-Quinde, Infante-Paredes, et al., 2022a) . Therefore, the use of education is recommended as a teaching tool to encourage active student participation and improve learning outcomes.

Based on the previously formulated research questions, an initial hypothesis was developed related to the study entitled "The Effectiveness of Educaplay Games on Cognitive Understanding in Mathematics Learning of Class II Students at SDN Bugih 3." A hypothesis is an initial conclusion or tentative proposition regarding the relationship between two or more variables. The hypothesis is formulated as H0: There is no effectiveness of using educaplay games on cognitive understanding in mathematics learning of class II students at SDN Bugih 3. And H1: There is effectiveness of using educaplay games on cognitive understanding in mathematics learning of class II students at SDN Bugih 3.

2. Method

This research is a quasi-experimental research with a one group pretest posttest design. In this design, one group of participants is used to be given a certain treatment. Data collection is carried out twice , namely before treatment given a pretest for know condition the initial variables studied , and after treatment given a posttest for evaluate changes that occur consequence intervention The X variable (independent) in this study is game educaplay and the Y variable (dependent) in the study is students' understanding in learning mathematics .

Table 1. One Group Pretest Posttest Design Table

Pretest	Treatment	Posttest
O1	X	O2

Note:

O1: Pretest is carried out before implementation

X: Treatment in the form of educatplay games

O2: Posttest is conducted after treatment

The place of this research was conducted at SDN Bugih 3 Pamekasan with the population of this research being all students of class II-B SDN Bugih 3 Pamekasan consisting of 30 students. The number of male students was 13 students and female students were 17 students. The learning process was carried out using one class with the treatment of implementing the educaplay game. Multiple-choice written tests were given at the beginning and at the end of learning to measure the level of effectiveness of students' cognitive understanding after treatment.

The collected data were analyzed using the data normality test with Saphiro Wilk to determine the data distribution. If the data is normally distributed, then the statistical test used is the Paired Sample T-Test, Paired Sample T-Test is an analysis involving two measurements on the same subject against a particular influence or treatment. If the data is not normal, the Wilcoxon Signed Rank Test is used. Furthermore, the N-Gain calculation is carried out to measure the level of effectiveness of learning media on improving students' cognitive understanding. The data were analyzed with the help of IBM SPSS Statistics Software

3. Result and Discussion

a. The Effectiveness of Educaplay Games on Students' Understanding of Addition and Subtraction Material in Mathematics Learning for Class II B

Based on the research conducted by the researcher related to educational game-based media, the results obtained showed that there was an effectiveness of using the Educaplay game in mathematics learning in grade

II of elementary school, namely increasing students' cognitive understanding, especially in the material of addition and subtraction in sequence. The researcher used a pre-test to determine students' initial knowledge, and the results showed that most of the students' scores were below average. In learning activities, the researcher delivered material interspersed with a learning style while playing, namely using interactive games on the Educaplay platform, which has proven effective in arousing students' interest and increasing their participation in the mathematics learning process. During the learning process, the Educaplay game used has been equipped with various interactive practice questions, such as multiple-choice quizzes that contain interesting pictures. Educaplay is a platform that can present interactive and interesting teaching media through various available features, including the Quiz feature, Unscramble Letters Game, Words Game, Puzzle, Abc Game, Memory Game, Matching Column Game, Dialogue Game, Riddle, Froggy Jumps, Video Quiz, and so on.

The researcher used one of the features in the educaplay game, namely Froggy Jump, with the context in the game containing multiple-choice questions that require students to answer correctly to secure the frog from falling into the water, Froggy Jumps (Frog Jump Game) in this game, players are challenged to help the frog jump safely from one point to another until it reaches dry land. To do this, they must choose the correct answer from the multiple-choice questions. If the wrong answer is chosen, the frog will fall into the water and the player will lose the game. This is designed to evaluate student understanding while increasing their active participation. The researcher gave students the opportunity to answer questions directly through the game, and there was high enthusiasm from the students, such as scrambling to answer and showing understanding of the material. This is an indicator that the Educaplay game media is really effective in improving students' cognitive understanding.

After the learning process, the researcher conducted a post-test in the form of multiple-choice questions related to the material of addition and subtraction in sequence. The results showed a significant improvement, where many students managed to answer the questions correctly. Students also seemed more confident and enthusiastic when working on the post-test, because they had previously learned the material through fun activities in the Educaplay game.

b. *How Effective is the Use of the Educaplay Game on the Cognitive Understanding of Class II B Students?*

Researchers used pretest and posttest to class II B students at SDN Bugih 3 Pamekasan which was to see the initial and final abilities of students after receiving treatment from a game-based media, namely the educaplay game. As well as seeing students' cognitive abilities using digital-based learning media.

Based on the observation results, the researcher obtained data showing how effective the use of the educaplay game was on the cognitive understanding of class II B students in mathematics learning at SDN Bugih 3. A normality test was conducted to test whether the pretest posttest data was normally distributed or not, as shown in the following output:

Table 2. Tests of Normality

Tests of Normality						
	Kolmogorov-Smirnov [a]			Shapiro Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Pretest Student Understanding	.186	30	.010	.909	30	.014
Posttest of Student Understanding	.291	30	.000	.767	30	.000
a. Lilliefors Significance Correction						

Based on the results of the normality test conducted using the Shapiro-Wilk method, it was obtained that the pretest and posttest data of student understanding were not normally distributed. The decision-making criteria if the sig value <0.05 then the data is considered to meet the normality

assumption and vice versa if the sig value > 0.05 then the data is normally distributed. This is indicated by the significance value (Sig.) in the normality test is less than 0.05. For the pretest data of student understanding, the significance value in the Shapiro-Wilk test is 0.014. Meanwhile, for the posttest data of student understanding, the significance value in the test is 0.000. Because all significance values are below the critical limit of 0.05, it can be concluded that the data does not meet the normality assumption. Thus, the test that will be done after get such data is a non-parametric test that does not require normal data distribution.

Namely, for further analysis, the researcher used the Wilcoxon test to analyze data that did not meet the normality assumption, the Wilcoxon signed-rank test was used to determine whether there was a significant difference between the pretest and posttest of student understanding, namely in the following table.

Table 3. rank test result

Ranks				
		N	Mean Rank	Sum of Ranks
Posttest Student Understanding - Pretest Student Understanding	Negative Ranks	0 [a]	.00	.00
	Positive Ranks	30 [b]	15.50	465.00
	Ties	0 [c]		
	Total	30		
a. Posttest Student Understanding < Pretest Student Understanding				
b. Posttest Student Understanding > Pretest Student Understanding				
c. Posttest Student Understanding = Pretest Student Understanding				

Based on the results of the analysis using the Wilcoxon Signed-Rank Test, it is known that all data show an increase in student understanding after the treatment was given. This is indicated by the number of Positive Ranks of 30 students, with a mean rank of 15.50 and a sum of ranks of 465.00. There was not a single student who experienced a decrease in understanding after

the treatment, as seen in the Negative Ranks which were 0. In addition, there were no students who showed the same score between the pretest and posttest (Ties = 0). These results descriptively indicate that all students experienced an increase in understanding after being given treatment, so that the learning model or strategy applied in this study contributed positively to improving student abilities. To ensure that this increase is statistically significant, it needs to be supported by the significance value of the accompanying statistical test table.

Table 4. Statistics test

Test Statistics [b]	
	Posttest Student Understanding - Pretest Student Understanding
Z	-4.823 [a]
Asymp. Sig. (2-tailed)	.000
a. Based on negative ranks.	
b. Wilcoxon Signed Ranks Test	

Based on the output in the Test Statistics table from the Wilcoxon Signed-Rank Test, the Z value is -4.823 and the significance value (Asymp. Sig. (2-tailed)) is 0.000. This significance value is much smaller than the critical limit of 0.05 ($p < 0.05$), which means that there is a significant difference between the pretest and posttest values of students' understanding.

Thus, it can be concluded that there is a statistically significant increase in students' understanding after being given interesting treatment through the educaplay game. This result strengthens the previous findings from the "Ranks" table which shows that all students experienced an increase in posttest scores compared to pretest.

Overall, the learning model or treatment used in this study was effective in improving student understanding, as evidenced by the results of this non-parametric statistical test.

Table 5. Then finally the researcher conducted an N-Gain test.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Ngainscore	30	.40	1.00	.8233	.20103
Ngainskorpersen	30	40.00	100.00	82.3333	20.10318
Valid N (listwise)	30				

Based on the output above, it can be interpreted as follows;

1. N-Gain Score (NGAINSKOR) shows an average value of 0.8233 (or 82.33% if converted to a percentage). This value is in the range of 0.40 to 1.00, with a standard deviation of 0.20103. In accordance with the N-Gain value category, namely if the g value <0.3 = low, 0.3 – 0.7 = medium, and 0.7 = high. Therefore, the value of 0.8233 is included in the “high” category, which means that the increase in student learning outcomes is classified as very good after using the educaplay game.
2. N-Gain Percent Score is the conversion of N-Gain score into percentage. The minimum score obtained by students is 40%, and the maximum score is 100%, with an average of 82.33% and a standard deviation of 20.10. This strengthens the conclusion that most students experienced a high increase in understanding.

The results of the N-Gain test showed that the use of the educaplay game applied in this study succeeded in increasing students' understanding significantly and effectively, with an average increase in the high category. This increase was also supported by the results of the previous Wilcoxon test which showed statistical significance.

4. Conclusion

This study shows that the use of educational games based on the Educaplay platform is effective in improving the cognitive understanding of grade II students at SDN Bugih 3 Pamekasan, especially in learning mathematics on the

material of addition and subtraction in sequence. Through quantitative methods with pre-test and post-test instruments, students experienced a significant increase in understanding scores. Game-based learning not only attracts students' interest, but also creates an active, interactive, and enjoyable learning atmosphere, thus accelerating the process of understanding basic mathematical concepts.

The results of the analysis using the Wilcoxon Signed-Rank Test showed that all students experienced an increase in value after learning with Educaplay was implemented, which was indicated by a significant p value <0.05. In addition, based on the N-Gain test, the increase in students' cognitive understanding reached an average of 82.33%, which is included in the high category. This proves that the integration of interactive technology-based learning media such as Educaplay has a very positive effect on value obtained students at the level school base .

So Educaplay media can be an alternative innovative solution to improve the effectiveness of mathematics learning in lower grades. Teachers are advised to continue to develop and utilize similar digital media in the learning process to increase student engagement and understanding. This success also reinforces the importance of adopting technology in the world of education, in line with the development of the times and learning needs.

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