THE INFLUENCE OF GIBRAN GIAT EDUCATION GAME ON MATHEMATICS CONCEPTUAL UNDERSTANDING OF FOURTH GRADERS

by Lovika Ardana Riswari Ummi Salamah
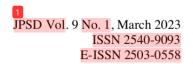
THE INFLUENCE OF *GIBRAN GIAT* EDUCATION GAME ON MATHEMATICS CONCEPTUAL UNDERSTANDING OF FOURTH GRADERS

Lovika Ardana Riswari, Ummi Salamah

Primary School Education, Teacher Training and Education Faculty, Universitas Muria Kudus, Indonesia

lovika.ardana@umk.ac.id

Abstract

Currently, many learners, while learning, tend to learn by memorizing, for example memorizing mathematics formulas. This matter made the fourth graders of Public Primary School 1 Jepang had mathematical misconceptions. Thus, they had a low mathematic conceptual understanding. This research determined the influence of the GIBRAN GIAT education game on the mathematic conceptual understanding of fourth graders at Primary School 1 Jepang. This quasi-experimental research applied one group pretest-posttest design. The sample consisted of all fourth graders at Primary School 1 Jepang, 20 students, 9 males, and 11 females. The researchers collected the data by observing, documenting, and testing. The researchers also applied expert judgment and requirement tests with the normality test of Kolmogorov-Smirnov assisted by SPSS Version 23. The researchers examined the hypotheses with a paired-sample t-test assisted by SPSS version 23. The results showed the differences in learners' mathematics conceptual understanding. The obtained paired-sample t-test results were sig < 0.05 or 0.000 lower than 0.05. Thus, the researchers concluded the implementation of the GIBRAN GIAT education game influenced the fourth graders' mathematics conceptual understanding at Primary School 1 Jepang, Mejobo District, Kudus Regency.

Keywords: Educational Game, GIBRAN GIAT

A. Introduction

Currently, many learners, while learning, tend to learn by memorizing, for example memorizing mathematics formulas. This matter made the fourth graders at Primary School 1 Jepang had mathematical misconceptions and lowered their mathematical concepts. The preliminary observation found the mean score of learners' mathematics conceptual understanding was 50.35. The score was lower than the predetermined Minimum Mastery Standard by the school, 70.

(NCTM, 2014) explains that mathematics conceptual understanding is the basic objective of mathematics lessons. (Kholidah & Sujadi, 2018) explain that learning mathematics requires mathematical conceptual understanding to facilitate learners solving the given problems. Each solving process of the given problem relies on mathematical conceptual understanding. When the learners understood the mathematics concept, they could easily solve problems in mathematics lessons (Radiusman, 2020). (Ermawati & Zuliana, 2020) Mathematical problem-solving ability is a very important ability in learning mathematics, because in its learning activities students learn about mathematical concepts while emphasizing the development of students ways of thinking

Thus, mathematics conceptual understanding is important because the understanding facilitates learners to recall the previously studied mathematics materials in long term. Excellent mathematics conceptual understanding led to critical thinking patterns. (Riswari & Bintoro, 2020) In the basic educational age, students are on the concrete operational stage. At this stage, students generally have difficulty to understand the abstract mathematical concepts or material. Understanding is important to encourage learners to express their work both orally and in a written manner in front of their peers. Thus, their peers could also understand the materials (Febriyanto, Haryanti, & Komalasari, 2018).

The researchers concluded that mathematics conceptual understanding refers to a cognitive set of learners who understand mathematics materials in the forms of notion, information management, and explanation by promoting the learning process to solve problems based on the formulated regulation from concepts. However, the Riswari & Salamah

fourth graders at Primary School 1 Jepang could not develop their knowledge, interpret the question points, and clarify and explain an object or an event with their phrases. The learners should have received a learning atmosphere to master mathematical competence instead of memorizing concepts. Therefore, teachers should focus on developing the learners' cognitive skills to find mathematics concepts based on their experience (Widyastuti & Pujiastuti, 2014).

From the problems, the researchers provided a solution to improve the learners' low mathematics conceptual understanding. With their characters preferring playing games, the learners needed an android-based educational game to make their learning fun. (Nisa & Susanto, 2022) also, explain that media mastery becomes important in classroom management to set the learning condition and pedagogical elements of the teachers. (Sulastri, 2016) explains that teachers are the center of classroom learning activities. Learners also love playing game applications based on Android (Windawati & Koeswanti, 2021). (Wijayanto & Istianah, 2017) *explain an education game* is a learning medium to improve understanding by providing interesting and active elements. One of

the educational games to solve the problems is - GIBRAN GIAT.

This game is an application with a specific design to manage mathematics conceptual problems of fourth graders on the material of squares. Here is the figure of the GIBRAN GIAT educational game.

GIBRAN GIAT Educational Game Source: (Riswari, Ermawati, & Evanita, 2022)

The procedures of using the GIBRAN GIAT educational game are similar to the Super Mario Bros game. However, the GIBRAN GIAT game has some mathematics questions related to the features of a square, such as a parameter and an area. The learners must answer the questions to continue the game.

According to (Yandari & Kuswaty, 2017) Game combination will creating learning mathematics not a scary thing however make students think that learning math is fun and easy. (Widoretno, Setyawan, & Mukhlison, 2021) found that educational games influenced the learners' understanding skills significantly. Learners, with their

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capabilities of using gadgets based on specific objectives, could learn from games and watching YouTube videos. From the research background, the concept of applying educational games was fundamentally important to determine the influential factors of mathematics conceptual understanding. In this research, the researchers applied an educational game, GIBRAN GIAT, for the fourth graders of Primary School 1 Jepang.

B. Research Methodology

The researchers promoted this research at Primary School 1 Jepang, on Kusumo Stret 1375, Neighborhood 04/Ward 12, Jepang, Mejobo District, Central Java, This quasi-experimental research applied a one-group pretest-posttest design. The research design applied pretest measurement before providing the treatment and posttest after providing the treatment. The following table shows the applied scheme of one group pretest-posttest design.

Table 1.1 the Scheme of One Group Pretest-Posttest Design

Pretest	Treatment	Post Test
T	X	T

T: The pretest before the treatment

X: The treatment with GIBRAN GIAT educational game

T: The posttest after the applied treatment

Source: (Sugiyono, 2019)

The researchers took the sample with a saturated sampling technique. The researchers applied this technique because the numbers of the sample were equal to the population, lower than 30 participants (Sugiyono, 2019). The sample consisted of all fourth graders at Primary School 1 Jepang, 20 students, 9 males, and 11 females. The researchers collected the data by observing, testing, and documenting. The applied research instruments were structured observational sheets of classroom and activity process as the preliminary findings and question test to measure the learners' mathematics conceptual understanding before and after the treatment. Then, the researchers documented the research process at the fourth grade or Primary School 1 Jepang as the evidence of GIBRAN GIAT educational game. Then, the researchers described the results with documented photographs of each meeting. The applied data analysis techniques were a normality test and a paired-sample t-test.

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C. Research Result and Discussion

The researchers obtained the data of mathematics conceptual understanding of the fourth graders at Primary School Jepang from the pretest-posttest of the GIBRAN GIAT educational game. On the test sheet, the researchers provided the posttest before the implementation of the GIBRAN GIAT educational game. In this case, the researchers provided in the first meeting. Then, in the second until third meetings, the researchers applied GIBRAN GIAT educational game. Then, in the last meeting, the fourth meeting, the researchers provided a posttest.

The analysis results also found the learners' mathematical conceptual understanding before the implementation of the GIBRAN GIAT educational game. The learners had low capabilities. From 20 learners, the researchers found 3 learners had higher scores than the minimum mastery standard while the other 17 learners were under the minimum mastery standard. On the other hand, the posttest results of the GIBRAN GIAT educational game showed 16 learners having higher scores than the minimum mastery standard while 4 learners obtained lower scores than the minimum mastery standard.

The research process lasted within some principles based on the predetermined research plan. In the initial step, the researchers asked permission from the principal of Primary School 1 Jepang. The learners and teachers were enthusiastic and supported the implementation of the GIBRAN GIAT educational game for learning. They were excited because the learners never used an android-based educational game for the learning process. The researchers used SPSS version 23 to provide descriptive analysis results of mathematics conceptual understanding between before and after the implementation of the GIBRAN GIAT educational game.

Table 1.
The pretest and posttest results of mathematics conceptual understanding

	N	Minimum	Maximum	Mean	Std. Deviation
PreTest Eksperimen	20	22	94	50.35	17.285
PostTest Eksperimen	20	59	100	77.05	11.691
Valid N (listwise)	20				

The table shows the pretest scores before GiBRAN GIAT educational game implementation: 22 for the lowest and 94 for the highest scores. Then, the mean score is 50.35. The post-test results of learners' mathematics conceptual understanding are 59 for the lowest score, 100 for the highest score, and 77.05 for the mean score. The results showed the implementation of GIBRAN GIAT for the fourth graders influenced their mathematics conceptual understanding.

Then, the researchers examined the data with the normality test of Kolmogorov-Smirnov to prove the normal distribution of the data. If the significant value is higher than 0.005, the pretest and posttest data of the fourth graders have a normal distribution. Table 2 shows the normality test result of the fourth graders' mathematics conceptual understanding.

Table 2.
The Normality Test is based on the Pretest and Posttest of Mathematics Conceptual Understanding

Tests of Normality							
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Groups	Statistic	Df	Sig.	Statistic	Df	Sig.
Mathematics Conceptual Understanding	Pretest Experiment	.085	20	.200[*]	.972	20	.790
	Posttest Experiment	.168	20	.143	.945	20	.295

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The table shows the calculation results with SPSS version 23. The obtained sig-value of the mathematics conceptual understanding pretest for the learners is 0.200 higher than 0.005 while the posttest is 0.143 higher than 0.005. Based on the criteria of deciding on the normality test, the obtained pretest-posttest of the learners' mathematics conceptual understanding had a normal distribution. Thus, the results could be analyzed.

The Paired-Sample T-Test

The calculation of the pretest-posttest showed that the data met the requirement and could be analyzed further. Thus, the researchers analyzed the data of the paired-sample t-test to determine the significant differences between the pretest and post-test results. Here are the applied hypotheses.

H_0 : No significant differences in the learners' mathematics conceptual understanding before and after the implementation of GIBRAN GIAT in the fourth grade of Primary School 1 Jepang

H_a : There is a significant difference in the learners' mathematics conceptual understanding before and after the implementation of GIBRAN GIAT in the fourth grade of Primary School 1 Jepang.

The applied criterion to examine the hypothesis was - sig lower than 0.05 denied H_0 and accepted H_a. Table 3 shows the results of the paired-sample t-test.

Table 3.
The Results of Paired Sample T-Test

Paired Samples Test								
		Paired Differences						
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pretest Experiment - Posttest Experiment	-26.700	9.212	2.060	-31.011	-22.389	-12.963	19	.000

The results show the obtained sig-value is 0.000. Thus, the sig value is lower than 0.005, denying H_0 and accepting H_a. The researchers found a significant difference in the learners' mathematics conceptual understanding before and after the implementation of the GIBRAN GIAT educational game for the fourth graders at Primary School 1 Jepang, Mejobo District, Kudus Regency. The significant difference occurred because the learners were feeling happy without burden while working on the mathematics questions in the form of a game. (Arifah, Sukirman, & Sujalwo, 2019) explains that educational game design and development focuses to facilitate learners to play and learn so they can still learn although they are playing games. This situation improved the learners to the excellent concept. (Susanto, 2016) The individuals with better or excellent concepts had excellent understanding and mental images of certain matters. (Ibrahim & Suparni, 2012) explain that "mathematics learning is an effort based on the individuals' skills to solve mathematics problems." Individuals with better skills could solve problems excellently.

(Lestari & Yudhanegara, 2015) explain that mathematics understanding skill is a skill to absorb and understand mathematics ideas. The indicators of mathematics understanding are: 1) identifying and making examples and non-examples, 2) translating and interpreting the symbols, tables,

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diagrams, figures, graphics, and mathematical notations, 3) understanding and applying mathematics ideas, and 4) creating an extrapolation.

The mastery of educational games for learning is important in this era. (Tristanti, Akbar, & Rahayu, 2021) found the mean differences between learning with a construct-baed educational game. (Satria & Hartono, 2022) also found that educational games influenced the learners to understand materials, especially tourism objects in Central Java. (Krisbiantoro & Haryono, 2017) also found that mathematics games could improve the mathematics achievement of primary school learners by 10%. The results showed some opportunities for further studies about the educational game. The researchers expected future researchers to examine the implementation of educational game media (Pratama, Bahauddin, & Lestari, 2019).

D. Conclusion

From the results, the researchers found the differences between the two conditions, before and after the implementation of the GIBRAN GIAT educational game, toward the learners' mathematics conceptual understanding. The results were observable in the result of the paired-sample t-test. The obtained p-value was 0.000, lower than 0.005. The value declined H_0 and accepted H_a. Thus, the researchers concluded GIBRAN GIAT educational game influenced the fourth graders' mathematics conceptual understanding at Primary School 1 Jepang.

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