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THE EFFECTIVENESS OF MANIPULATIVE MEDIA ON UNDERSTANDING THE CONCEPT OF MULTIPLING IN GRADE II MADRASAH IBTIDAIYAH

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Abstract

The purpose of the study was to find out how effective the use of manipulative media was for understanding the multiplication concept of class II at MI Gisikdrono Semarang in 2020/2021. The design of this study used a quasi-experimental method with a pretest posttest control group design. The sample of this study was 23 students of grade IIA as the experimental class and 27 students of class II B as the control class. Sample selection using simple random sampling technique. The results of statistical analysis show that by using manipulative media there is an effect on learning outcomes. This is evidenced by the results of the analysis of the N-gain score test which shows the average value of the experimental class of 0.68 or 68% which is included in the moderate or quite effective category. Furthermore, the acquisition of the count using the Paired Samples Statistics test stated that there was a difference in the average paired sample from the experimental class with the pretest of 59.13 < posttest 87.17, which means that there was a difference in the average results of the pretest and posttest of the experimental class.
Keywords: Learning effectiveness, Manipulative media, Multiplication.

INTRODUCTION

One of the lessons that can support the logical thinking of students at school is mathematics. Until now there is no specific definition for mathematics. At the basic level, mathematics is termed as a lesson in counting or what is known as mathematical arithmetic operations. In accordance with Piaget's theory, elementary level students in the age range of 7 to 12 years, their cognitive thinking patterns are still in the concrete operational phase where children already know mathematical symbols but have not been able to deal with abstract things (Muhsetyo & dkk, 2008).

The important role of mathematics, among others, can provide knowledge and form attitudes and form a logical and systematic mindset. As stated in the Regulation of the Minister of Education of the Republic of Indonesia Number 22 of 2006, that one of the goals of mathematics subjects at the elementary, junior high, high school and vocational school levels is for students to have the ability to understand mathematical concepts, explain the relationship between concepts and apply concepts or logarithms. flexibly, accurately, efficiently and precisely in problem solving (Kusrini, 2014).

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Mathematics is important to be taught from an elementary age because this lesson will be needed in everyday life. Mathematics is a basic science in various disciplines so that understanding concepts must be mastered by students (Fadil & Amran, 2020). Not only that, the rapid developments in the field of information and communication technology today cannot be separated from the results of mathematical developments. Therefore, the teaching really needs foresight or seriousness so that students really master mathematics lessons (Nurfiyanti, 2019).

The quality of learning can be seen in terms of the process and in terms of results (Guslinda & Munjiatun, 2021). Effective learning is learning that is able to actively involve all students. Learning is said to be ideal if it succeeds in achieving the learning target by empowering all potential learners to master the expected competencies (Nurmutiatun, 2018). Students will be able to respond in the form of self-exploration if the teacher provides a stimulus through apperception of the material according to the needs of students.

Indicators of the success of the mathematics teaching and learning process are marked by changes in the realm of knowledge, attitudes, and behavior in students (Handayani & Syahrini, 2019). Changes can be shown in various forms such as: growth of knowledge, growth of attitudes and behavior, skills, abilities, and abilities, as well as changes in other aspects that exist in students. Therefore mastery of mathematics is absolutely necessary and mathematical concepts must be understood correctly and correctly from an early age.

The Introduction presents the purpose of the studies reported and their relationship to earlier work in the field. It should not be an extensive review of the literature. Use only those references required to provide the most salient background to allow the readers to understand and evaluate the purpose and results of the present study without referring to previous publications on the topic. The introduction describes the background of the problem solved, the issues related to the problem solved, if there are any previous research reviews by other researchers relevant to the research undertaken.

This ideal condition has not yet been found at MI Gisikdrono Semarang. Grade II students are still unable to complete mathematical materials that require the concept of multiplication quickly and precisely. Multiplication material is one of the basic materials for mathematical arithmetic operations. In class II MI, multiplication material is introduced, so that understanding the multiplication concept must be strong. In the multiplication learning process, in general, students are given a multiplication table and the teacher asks to memorize

the multiplication of integers from 1 to 10. Often students are not taught the basic concepts of multiplication, so it is often found that students cannot solve problems related to multiplication.

The importance of understanding multiplication material for class II MI students is as a foundation or introduction to learning the next material. For example, the material for measuring time, weight, and length. Difficulties are still felt by students, from the results of formative and summative tests involving multiplication the results are still not satisfactory, meaning that they are still far from the minimum completeness value both individually and classically (Asfiah, 2010). From the results of initial observations in the last two years the grade II math test scores have not reached classical completeness of 80% of the minimum completeness criteria (KKM) of 70 multiplication materials. Therefore, the presence of learning media is needed to help improve students' understanding (Andrianto, 2017). Several previous studies have proven that the strategy of using congklak games in improving numeracy skills has succeeded in increasing numeracy skills (Lubis, 2016). Thus, this study supports previous research that the Pipolondo board learning media provides a solution to help students understand the concept of multiplication.

For this reason, the researchers took the initiative to provide a solution in learning mathematics with multiplication material by using manipulative media in the form of a pipette board as an alternative learning medium. Manipulative media is media that can be manipulated by hand, rotated, held, flipped, moved, arranged, and even cut into pieces. The research focused on the effectiveness of using manipulative media in understanding the concept of multiplication at the basic level of grade II with multiple choice questions at MI Gisiskdrono Semarang in the 2020/2021 school year. This study aims to determine how effective the use of manipulative media is to understanding the multiplication concept of class II MI Gisikdrono Semarang in 2020/2021. The results of this study are expected to be able to add insight to knowledge related to the importance of using manipulative media props in the form of a Pipolondo board.

METHOD

This study used a quasi-experimental design. The two variables in this study can be measured using the pretest posttest instrument, so that the total data can be analyzed using statistical procedures (Creswell, 2019). Furthermore, to fulfill the needs analysis, the sample will be divided into two classes, namely the control class and the experimental class.

The population of this study were all students of MI Gisikdrono Semarang for the academic year 2020/2021, while the sample of class IIA students was 23 people as the

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experimental class and class IIB students totaled 27 people as the control class. The sample selection uses a simple random sampling technique or sampling in a simple random way to determine the class that is treated (experimental) and the class that is not treated (control) which requires a homogeneous population (Sugiyono, 2019).

The data collection technique used multiple choice questions item test for pretest and posttest. The homogeneity test (variance) uses Levene's test to find out the research sample is homogeneous. Normality test with Kolmogorov-Smirnov to show the data in a normally distributed state. The data analysis technique uses parametric statistics which assumes the data is normally distributed and homogeneous.

Parametric statistics use the right-hand side one-tailed t test to determine the effect and the N-gain test to determine the increase in students' cognitive abilities. The t-one tailed test uses SPSS 16 software in the data analysis process. Test the hypothesis by looking at the value of sig. obtained from the analysis through the SPSS 16 program. The category of increasing students' quick and precise arithmetic skills is seen by using the N-gain equation as follows: (Meltzer, 2002).

$$N - Gain = \frac{\text{posttest score} - \text{pretest score}}{\text{maximum possible score} - \text{pretes score}}$$

Table 1. N-Gain Clasification

Score N-gain	Clasification
0,70 < N-gain ≤ 1,00	High
0,30 < N-gain ≤ 0,70	Medium
N-gain ≤ 0,30	Low

Meanwhile, the distribution of the N-Gain category in percent according to Richard R. Hake can be seen in the table below: (Hake, 2007)

Table 2. Classification of N-gain in percent

Score N-gain (%)	Classification
< 40	Ineffective
40 – 55	Less effective
56 – 75	Effective enough
>76	Very effective

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RESULTS AND DISCUSSION

The initial ability of students was obtained from the pretest scores before the two groups received treatment. The average pretest results of the two sample groups can be seen in table 3 below:

Table 3. Average pretest results for the experimental class and the control class

Class		N	Mean	Std. Deviation	Std. Error Mean
Pretes	1,00	23	59,1304	5,36236	1,11813
	2,00	27	58,3333	6,20174	1,19352

Based on the output of group statistics, the average value of the experimental class is 59.13 while the control class is 58.33. Thus, statistically descriptive, there are differences in the average learning outcomes between the two classes. Furthermore, to prove the difference is significant or not, further analysis is to calculate the homogeneity of the data.

Determination of the sample by looking at the homogeneity of the population. Homogeneity in the population was seen by Levene's test, normality test, and one way ANOVA test. The results of the homogeneity test are presented in table 4 below:

Table 4. Homogeneity test results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Score	Equal variances assumed	0,192	0,663	-14,438	44	0,000	-22,17391	1,53579	-25,26910	-19,07873
	Equal variances not assumed			-14,438	43,842	0,000	-22,17391	1,53579	-25,26941	-19,07841

Based on the output table, it is known that Sig. Levene's Test for Equality of Variances is 0.663 > 0.05, which means that the data variance between the control and experimental classes is homogeneous or the same. The next step is to calculate normality using the Kolmogorov-Smirnov test. From the statistical output of the calculation of the normality of the control class and experimental class data, it can be seen in table 5 below:

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Table 5. Normality Test Results

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Learning outcomes	0,191	50	0,082	0,904	50	0,064

a. Lilliefors Significance Correction

Based on the output table for calculating the normality of SPSS data, the value of Sig. of 0.082 > 0.05, then according to the basis for decision making in the Kolmogorov-Smirnov normality test, it can be concluded that the data is normally distributed. Reinforced by the results of the Shapiro-Wilk Sig test analysis. of 0.064 > 0.05 so that it can be concluded that the data of students who use the abacus are normally distributed.

Furthermore, to determine the effectiveness of the treatment given in the experimental class, a follow-up test was carried out using the right-hand one t-test. One-party t-test was carried out through the SPSS 16 program. The results of the analysis can be seen in the following table 6:

Table 6. The results of the average test of the experimental class

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post	87,1739	23	3,93876	0,82129
	Pre	59,1304	23	5,36236	1,11813

From the output of the Paired Samples Statistics table, there are differences in the results of the calculation of the average paired sample from the experimental class, this can be seen in the pretest table of 59.12 < posttest 87.17, which means that there is a difference in the average results of the pretest and posttest of the experimental class. Then to see the effect of learning using manipulative media, it can be seen in the following table 7:

Table 7. Results of the analysis of the influence of experimental class learning.

		Mean	Std. Deviation	Std. Error Mean	95% confidence interval of the difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Post-pre	28,04348	5,98087	1,24710	25,45716	30,62980	22,487	22	0,000

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Based on table 7, it can be seen that the value of sig. (2-tailed) of 0.000 which means it is smaller than the significance level of 5% or 0.05. That is, the formulation of the alternative hypothesis is accepted and the null hypothesis is rejected. So it can be concluded that there is an effect of using manipulative media in increasing understanding of the multiplication concept given in the experimental class.

The effectiveness of using manipulative media in improving students' understanding of the multiplication concept can be seen from the results of the N-gain test scores of pretest and posttest between the experimental class and the control class. The results of the analysis are presented in Table 8 below:

Table 8. Results of the N-gain analysis for the experimental class and the control class

			Statistic	Std. Error
N Gain Eksperimental class	Mean		0,6843	0,02123
	95% confidence interval for Mean	Lower Bound	0,6403	
		Upper Bound	0,7284	
	5% Trimmed Mean		0,6878	
	Median		0,7000	
	Variance		0,010	
	Std. Deviation		0,10184	
	Minimum		0,43	
	Maximum		0,88	
	Range		0,45	
	Interquartile Range		0,12	
	Skewness		-0,730	0,481
	Kurtosis		0,794	0,935
N Gain Control Class	Mean		0,09090	0,01928
	95% confidence interval for Mean	Lower Bound	0,0509	
		Upper Bound	0,1309	
	5% Trimmed Mean		0,0941	
	Median		0,1100	
	Variance		0,009	
	Std. Deviation		0,09249	
	Minimum		-0,14	
	Maximum		0,25	
	Range		0,39	
	Interquartile Range		0,13	
	Skewness		-0,547	0,481
	Kurtosis		0,195	0,935

Based on the results of the calculation of the N-gain score test, it shows that the average N-Gain score for the experimental class (using manipulative media) is 0.68 or 68% including in the medium category or quite effective in improving the basic concept of multiplication at the class level. II at MI Gisikdrono Semarang.

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Whereas in the control class, the N-gain value differs by 0.10 or 10% which is included in the low category, therefore it can be concluded that conventional learning (without using manipulative media) improves understanding of the multiplication concept.

CONCLUSION

The use of manipulative media has proven to be effective in helping to improve the ability to understand multiplication concepts for class II students at MI Gisikdrono Semarang, this is evidenced by the results of the N-gain score test showing the average N-Gain score for the experimental class (using ethnomathematical-based abacus media) is 0,68 or 68% included in the moderate category or quite effective.

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