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The Effect of Manipulative Learning Media on Students' Mathematical Concept Understanding Ability in SMP Swasta Mawar

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Abstrak

Salah satu permasalahan pada pembelajaran matematika di SMP Swasta Bunga Mawar yakni kemampuan pemahaman konsep matematis siswa yang masih kurang. Adapun tujuan penelitian ini yaitu mengetahui Pengaruh Media Pembelajaran Manipulatif Terhadap Kemampuan Pemahaman Konsep Matematis Siswa di SMP Swasta Bunga Mawar.Jenis penelitian ini adalah penelitian kuantitatif dengan menggunakan metode eksperimen semu (quasi exsperimen design). Penelitian ini di laksanakan di SMP Swasta Bunga Mawar, dengan populasi penelitian adalah kelas IX Tahun Pelajaran 2023/2024. Sampel penelitian diambil secara random sampling, kelas yang yang menjadi sampel penelitian adalah kelas IX-B sebagai kelas eksperimen, dan kelas IX-C sebagai kelas kontrol. Instrumen yang digunakan dalam penelitian ini adalah tes tertulis dalam bentuk tes uraian dan terdiri dari tes awal dan tes akhir. Hasil penelitian menunjukan bahwa rata-rata nilai tes awal yang diperoleh kelas eksperimen 53,75 (kategori kurang) dan kelas kontrol 40,89 (kategori kurang). sedangkan rata-rata nilai tes akhir kemampuan pemahamankonsep matematis yang diperoleh kelas eksperimen 71,60 (kategori baik) dan kelas kontrol 55,18 (kategori cukup). Dari hasil penelitian yang diperoleh berdasarkan uji hipotesis, yaitu th = 3,994 dan tt= 1, 701. Karena th = 3,994>t_t= 1,701, maka tolak H0 terima Ha yang berarti "Terdapat pengaruh media pembelajaran manipulatif terhadap kemampuan pemahaman konsep matematis siswa di SMP Swasta Bunga Mawar".

Kata kunci : Media Pembelajaran Manipulatif, Kemampuan Pemahaman konsep, dan Matematis.

Abstract

One of the problems in learning mathematics at SMP Swasta Bunga Mawar is that students' ability to understand mathematical concepts is still lacking. The aim of this research is to determine the effect of manipulative learning media on students' ability to understand mathematical concepts at SMP Swasta Bunga Mawar. This type of research is quantitative research using a quasi-experimental method (quasi experimental design). This research was carried out at SMP Swasta Bunga Mawar, with the research population being class IX for the 2023/2024 academic year. The research sample was taken by random sampling, the classes that were the research sample were class IX-B as the experimental class, and class IX-C as the control class. The instrument used in this research is a written test in the form of a description test and consists of an initial test and a final test. The research results showed that the average initial test score obtained by the experimental class was 53.75 (poor category) and the control class was 40.89 (poor category). while the average final test score for the ability to understand mathematical concepts obtained by the experimental class was 71.60 (good category) and the control class was 55.18 (fair category). From the research results obtained based on hypothesis testing, namely t_h = 3.994 and t_t= 1.701. Because t_h = 3.994> t_t= 1,701, then reject H_0 and accept H_a which means "There is an influence of manipulative learning media on ability students' understanding of mathematical concepts at SMP Swasta Bunga Mawar".

Keywords : Manipulative Learning Media, Ability to Understand Concepts and Mathematics

Introduction

Education is one of the factors that determine the success of the nation's development, because it can improve the quality of human resources. Education itself has the main purpose of being a medium for developing potential and educating humans to be ready for life to come. Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System states that Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state.

Based on the description above, it can be concluded that education is the maturation of students so that they can develop their talents, potential and skills in living life, therefore education should be designed to provide understanding and improve learning achievement in the stages of learning, one of the lessons that must be designed activities is mathematics.

Mathematics is one component of a series of subjects that have an important role in education that supports the development of science and technology. The importance of mathematics subjects in students' daily lives is very directly related, especially simple calculations (Yulisman Zega, 2020). Based on the content contained in the Regulation of the Minister of National Education, it is known that one of the indispensable abilities in mathematics is concept understanding. This is because the ability to understand mathematical concepts can help students not only memorise formulas but can understand the meaning of mathematical concepts or material. According to Sayekti (2019) The ability to understand mathematical concepts is a very important aspect in the principle of mathematics learning. in line with Mendrofa's opinion, Ratna Natalia (2018) Understanding mathematical concepts is an important foundation for thinking in solving mathematical problems and everyday problems.

Based on the results of observations made by researchers at Bunga Mawar Private Junior High School, it was found that students' ability to understand mathematical concepts was categorised as lacking. This is due to the teacher's habit of usually using the lecture method which is sometimes interspersed with group discussions and still focuses on teacher activeness, learning tends to be informative, so that active student involvement in learning is still lacking. In the learning process students also rarely ask questions if there are still things that are not understood and rarely respond back when the teacher asks or asks for student responses, so that students' concept understanding abilities are still classified in the deficient category, this is supported by the results of tests given to students that have not met the criteria for indicators of mathematical concept understanding ability.

The following is presented one of the mathematical concepts understanding test answer sheets given to students, as shown in the following figure:

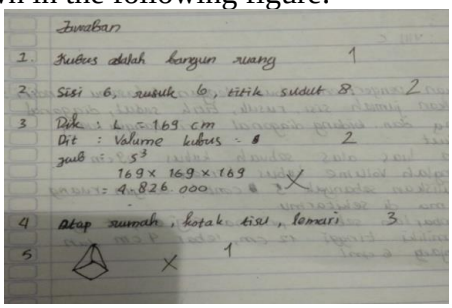

Figure 1.1 Student Answer Sheet

When viewed from the picture above, students' ability to understand concepts is still lacking, students in general are not optimal in answering questions about understanding mathematical concepts. Whereas understanding the concept is a very important component in learning.

Therefore, in order for students to

understand mathematical concepts easily, certain methods are needed in learning. One way that can be done to improve the ability to understand mathematical concepts is to use manipulative teaching aids (manipulative materials) which are teaching aids used by the teacher in explaining the subject matter, so that it is easy to give students an understanding of abstract mathematical concepts to be more concrete, using objects that are designed.

Based on the description of the problems above, the researcher is interested in providing solutions regarding understanding mathematical concepts by conducting scientific research with the title "The Effect of Manipulative Learning Media on Students' Mathematical Concept Unde

Methods

This study used a quasi-experimental research method with a research design of nonequivalent control group design with a quantitative approach. This study was conducted to determine the effect of manipulative learning media on students' mathematical concept understanding ability at Bunga Mawar Private Junior High School.

The population in this study was class IX with the sampling technique in this study taken by random sampling. with the instruments that researchers took to collect data in this study, namely using test instruments.

In this study the test is divided into two there is an initial test and a final test containing questions of concept understanding ability, has also been validated by a validator, and tested in a trial school, so it is feasible to use.

The test results were processed by correcting student answers and giving scores using scoring guidelines.

Results and Discussion

rstanding Ability at Bunga Mawar Private Junior High School".

From the results of validation by validators, the initial test and final test of student learning outcomes are declared valid and suitable for use as research instruments.

1) Test validity test

Based on the validity test data of the mathematical concept understanding ability test, the validity test results for each item number are obtained, which can be seen in the table below

Table 4.1 Test Validity Test Results

No. Item	N	$\sum X$	$\sum X^2$	$\sum Y$	$\sum Y^2$	$\sum XY$	r_{hitung}	r_{tabel}
1	28	126	639	844	28415,5	4053,75	0,553	0,374
2	28	124	610	844	28415,5	3924,25	0,438	
3	28	228	2196	844	28415,5	7443	0,568	
4	28	168	1404	844	28415,5	5617,5	0,510	
5	28	198	2412	844	28415,5	7377	0,812	

1) Test reliability

Based on the calculation of the instrument reliability test, rcount = 0, 382 for all items is the same and rtable = 0.374. Because rcount> rtable, the overall test is declared reliable.

Table 4.2 Test Reliability1) Test reliability test

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Table 4.2 Test Reliability

r_{hitung}	r_{tabel}
0,382	0,374

1) Test Level of Test Difficulty

Based on the results of the calculation of the level of difficulty of each test item then, all items test items 1 to 5 have their respective difficulty levels. The results of the calculation of the level of difficulty obtained as in the following table:

Table 4.3 The results of the calculation of the level of difficulty

Class	N	$\bar{X}$
Experiment	25	44,52
Control	25	35,08

Item Soal	Tingkat Kesukaran	Keterangan
1	0,750	Mudah
2	0,738	Mudah
3	0,679	Sedang
4	0,500	Sedang
5	0,295	Sukar

1) Calculation of Distinguishing Power
Based on the results of the calculation of differentiating power in the upper student group and the lower student group, it is obtained as in the following table:

Table 4.4 Calculation of Differentiating Power

No. Soal	D_p	Interprestasi
1	0,250	Cukup
2	0,202	Cukup
3	0,321	Baik
4	0,214	Cukup
5	0,339	Baik

Processing of Concept Understanding Ability Test and Learning Outcomes

Class	N	$\bar{X}$
Experiment	28	71,60
Control	28	55,18

1) Initial Test of Concept Understanding Ability
In this study, an initial test was given before being given the manipulative learning media treatment where the number of students who took the initial test was 28 experimental class students and 28 control class students, so that the total was 56 students.
Thus, the average value for each class can be seen in the following table:
Table 4.5 Description of the Mean Value of Mathematical Concept Understanding Ability of Experimental Class and Control Class.

Class	N	$\bar{X}$
Experiment	28	53,75
Control	28	40,89

So it can be concluded that in the initial test the average acquisition of students' mathematical concept understanding ability is still in the poor category, this is because it has not been given any treatment.
1) Initial Test of Learning Outcomes
The processing carried out by researchers as in the initial test attachment. Thus, the average value for each class can be seen in the following table:
Table 4.6 Description of the Average Value of Student Learning Outcomes of Experimental Classes and Control Classes

So it can be concluded that in the initial test the average acquisition of students' scores is still in the poor category, this is because they have not been given any treatment.

1) Final Test of Concept Understanding Ability

Value processing carried out by researchers as in the final test attachment. So, for the acquisition of the average value can be seen in the following table:
Table 4.7 Description of the Average Value of Mathematical Communication Ability of Experimental and Control Classes

So, it can be concluded that in the final test after being given the treatment of using manipulative media, the average value of students' mathematical concept understanding ability in the experimental class is greater than the average value of students' mathematical communication

ability in the control class which is given the convention learning model treatment.

1) Final Test of Learning Outcomes

Value processing that is done researchers as in the appendix of the final test. So, for the acquisition of the average value can be seen in the following table:

Table 4.8 Description of the Average Value of Student Learning Outcomes of Experimental Classes and Clas Control.

Class	**N**	$\bar{X}$
Experiments	25	68,18
Control	25	35,98

Based on the table above, it can be seen that the average student score on the initial test in the experimental class is 68.18 which is in the sufficient category while the average student score on the initial test in the control class is 35.98 which is in the very poor category.

5. Normality Test

Based on the results of the normality calculation using the Liliefors test in the appendix, the data on the final test, both the initial test and the final test are normally distributed. The results of the normality test can be seen in the following table:

Hasil kemampuan pemahaman konsep	Jumlah sampel	x^2 hitung	x^2 tabel	Kesimpulan
Tes awal	28	0,5040	0,5249	Homogen
Tes akhir	28	0,3838	0,5249	Homogen

Tabel 4.9 Hasil Uji Normalitas

Kelas	**Tes**	l_{hitung}	l_{tabel}
Experiments	**Awal**	0,0960	0,1641
	Akhir	0,1360	
Control	**Awal**	0,1390	
	Akhir	0,1391	

5. Homogeneity Test

The homogeneity test used is the fisher test. Based on the results of the homogeneity test calculation on the initial test, the results obtained Fhitung < Ftabel or 0.5040 < 0.5249, while the results of the homogeneity test calculation on the final test obtained Fhitung < Ftabel or 0.3838 < 0.5249 so that the data is declared homogeneous.

Table 4. 10 Homogeneity Test Results of concept understanding ability

5. Hypothesis Test

Statistical hypothesis formulation, namely:

Ha : μ_(1)>μ_(2) (Alternative hypothesis)

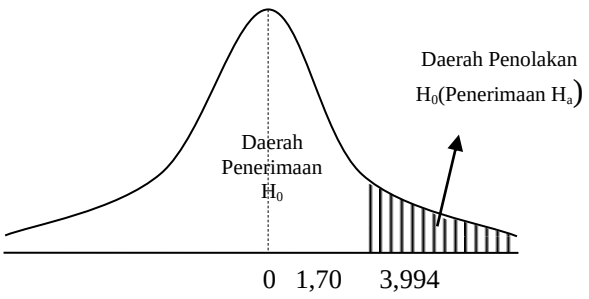
Ho : μ_(1) ≤ μ_(2) (Main hypothesis)

Based on the hypothesis test calculation, because tcount = 3.994 > ttable = 1.701, then reject H0 accept Ha which means "There is an effect of manipulative learning media on students' mathematical concept understanding ability at Bunga Mawar Private Junior High School".

$H_a : \mu_1 > \mu_2$ (Hipotesis alternatif)

$H_o : \mu_1 \leq \mu_2$ (Hipotesis utama)

Be



Picture .5 Kurva Penerimaan Ha

8. Coefficient of Determination

Based on the calculation of the coefficient of determination, the coefficient of

determination is 0.848 with a correlation value of 0.924 based on data processing using excel.

Table 4.11 Percentage of the Effect of Manipulative Learning Media on Mathematical Concept Understanding Ability

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate					
							df 1	df 2	Sig. F Change
1	,924[a]	,853	,848	4,45764	,853	151,353	1	26	,000

a. Predictors: (Constant), eksperimen

From the output above, it is known that the correlation value (r) is 0.924. From the table, the coefficient of determination is 0.848, which means that the percentage of the influence of manipulative media on the ability to understand concepts at SMP Swasta Bunga Mawar is 85%.

Conclusion

In terms of the formulation of the problem and research objectives, conclusions can be drawn, namely from the results of hypothesis testing obtained tcount = 6.505> ttable = 1.671, then Ho is rejected and Ha is accepted, which means: "There is an effect of manipulative learning media on students' ability to understand mathematical concepts at Bunga Mawar Private Junior High School".

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