THE EFFECTIVENESS OF THE NUMBER HEAD TOGETHER *(NHT) TYPE COOPERATIVE LEARNING MODEL* ASSISTED BY PLAQUE PROPS IN IMPROVING STUDENTS' MATHEMATICAL COMPREHENSION SKILLS

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui efektivitas penerapan model pembelajaran kooperatif tipe *Number Head Together* (NHT) berbantuan alat peraga plakat dalam meningkatkan kemampuan pemahaman matematis siswa kelas IX pada materi perpangkatan dan bentuk akar di MTs Syarif Hidayah Doro. Penelitian ini merupakan penelitian eksperimen dengan desain *pretest posttest control group desain*. Sampel pada penelitian ini yaitu 68 siswa dengan menggunakan teknik *simple random sampling*. Data kemampuan pemahaman matematis diperoleh menggunakan tes. Analisis data pada penelitian ini menggunakan uji *Mann Whitney*. Berdasarkan hasil analisis data diperoleh nilai signifikansi $0,000 < 0,05$ yang berarti H_0 ditolak dan H_a diterima. Sehingga terdapat perbedaan yang signifikan antara kelas eksperimen dan kelas kontrol. Oleh karena itu, dapat disimpulkan bahwa penerapan model pembelajaran kooperatif tipe Number Head Together (NHT) berbantuan alat peraga plakat efektif dalam meningkatkan kemampuan pemahaman matematis siswa pada materi perpangkatan dan bentuk akar di MTs Syarif Hidayah Doro.

Kata kunci: Model Pembelajaran Kooperatif, *Number Head Together* (NHT), Alat Peraga Plakat, Kemampuan Pemahaman Matematis, Perpangkatan dan Bentuk Akar.

ABSTRACT

This study aims to determine the effectiveness of the application of the Number Head Together (NHT) type cooperative learning model assisted by plaque props in improving the mathematical understanding ability of grade IX students on the rank and root shape material in MTs Syarif Hidayah Doro. This research is an experimental research with pretest posttest control group design. The sample in this study was 68 students using a simple random sampling technique. Data on mathematical comprehension abilities are obtained using tests. Data analysis in this study used the Mann Whitney test. Based on the results of data analysis, a significance value of 0.000 < 0.05 was obtained, which means that H_0 is rejected and H_a is accepted. So there is a significant difference between the experimental class and the control class. Therefore, it can be concluded that the application of the Number Head Together (NHT) type cooperative learning model assisted by plaque props is effective in improving students' mathematical understanding ability on the rank material and root form in MTs Syarif Hidayah Doro.

Keywords:

Cooperative Learning Model, Number Head Together (NHT), Teaching Aids, Mathematical Comprehension Ability.

INTRODUCTION

The quality of education in Indonesia, especially in the field of mathematics, has not shown satisfactory results. This is evidenced from TIMSS (*Trends in International Mathematics and Science Study*) data in 2015, mathematics achievement in Indonesia obtained an average score of 397 out of an international average score of 500 and was ranked 44th out of 49 countries. The results of the study show that students' mathematical comprehension ability in Indonesia is still low (Hadi & Novaliyosi, 2019).

The ability to understand mathematics is one of the important foundations to be able to achieve other cognitive aspects, such as students' problem-solving, communication, reasoning, and mathematical connections (Sarwoedi, etc., 2018). In addition, students' mathematical comprehension ability is also the most

important aspect in learning mathematics. Because if students' mathematical comprehension skills are low and left alone, it will affect other cognitive aspects and in the real world they will stay away from everything related to mathematics (Khoirunnisa, etc., 2021). According to Yudhanegara, indicators of mathematical comprehension ability are (Pujiani, 2017):

1) Restate a concept
2) Classify certain objects according to their properties
3) Classify examples and non-examples
4) Using and utilizing and selecting specific procedures or operations
5) Apply concepts or algorithms in problem solving.

Researchers made observations at MTs Syarif Hidayah Doro and also conducted an interview with one of the mathematics teachers who said that the mathematical comprehension ability of grade IX MTs Syarif Hidayah Doro students was still relatively lacking. This is based on the average success in achieving KKM 70 in the rank and root form material for the 2022/2023 academic year, which is 51.25% or almost half of grade IX students have not been completed. One of the low mathematical comprehension skills of students is because the mathematics learning process in this school is still dominated by teachers, making grade IX students have difficulty in understanding, remembering, and memorizing mathematical formulas, especially in the rank material and root form. In the material of rank and root form there are many theories and properties that must be memorized and truly understood. Even to do the question of rank and root shape, these qualities must be memorized outside the head. There are still many students who have memorized the nature but still can't do the questions. This is because students' mastery in understanding the material is still limited.

Low understanding of students' mathematics is a problem that must get serious attention. To improve students' understanding of mathematics can be done with several things, one of which is choosing the right learning model so that it can make it easier for students to understand the material taught. The learning model is a form of learning that is illustrated from beginning to end presented by the teacher concerned (Martawijaya, 2016). The cooperative learning model can be an alternative option to improve students' mathematical understanding. Cooperative

learning is a learning strategy that involves student participation in one small group to interact with each other (Rusman, 2013). Cooperative learning models have many types. One of them is the *Number Head Together* (NHT) type cooperative learning model. *The Number Head Together* (NHT) learning model is one of the cooperative learning that conditions students to think in groups where each student is given a number and has the same opportunity to answer problems posed by the teacher through random number dialing (Miftahul Huda, 2011). In its implementation, *Number Head Together* (NHT) has five stages of learning, including: *numbering* , *questioning* , *head together* , *call out* , and *answering* (Anwar Barutu, etc., 2017).

According to Dira Puspita, the *Number Head Together* (NHT) learning model can provide higher results in students' mathematical comprehension abilities compared to the teacher-centered learning model (2018: 196). Siti Nurpaidah also revealed that the *Number Head Together* (NHT) learning model can improve the quality of the learning process in the classroom, so that students' grades can be better (2018: 20). The same thing was conveyed by Rika Firma, that by applying *the Number Head Together* (NHT) learning model was able to provide improved learning outcomes and student activeness in the classroom (2016: 33).

In addition to the use of appropriate learning models, teaching aids are also important in classroom learning. Props are everything that is still abstract and then made concrete or real with tools so that it can be reached by a simple mind and can be seen, viewed and felt (Arsyad Azhar, 2019). With teaching aids, students will more easily capture and understand the message conveyed by educators (Nuvera &; Aulia Gustina, 2018). In this study, in addition to using the *Number Head Together* (NHT) type cooperative learning model, it was also assisted by using plaque props. Plaque props (rank number board) are large square or rectangular props made of boards/cork. The function of this teaching aid is to assist students in understanding the properties of rank numbers. The following is the design of plaque props that will be used in the study:

Figure 1. Plaque Props Design

This research is a type of experimental research with *a pretest-posttest control group design research design.* This design means that the control and experimental classes both do *pre-test* and *post-test* , but only the experimental class gets treatment or *treatment* (John W. Creswell, 2016). This research approach is quantitative because the specifications are systematic, planned and clearly structured from the beginning to the making of the research design (Sugiyono, 2013).

Data collection techniques in this study are tests, observation, and documentation. The test was used to determine students' mathematical comprehension ability between the experimental class and the control class. Before the study, validity and reliability tests were carried out on test instruments with the help of the SPSS application. As a prerequisite for this study, normality tests and homogeneity tests were carried out. To test the hypothesis used *Mann Whitney test* with the help of SPSS application.

DISCUSSION

The research was conducted at MTs Syarif Hidayah Doro in the odd semester of the 2023/2024 academic year by utilizing the *Number Head Together* (NHT) type cooperative learning model assisted by plaque props in improving students' mathematical comprehension skills. The population in this study was all grade IX students totaling 140 students and the sample of this study was class IX A as an experimental class and IX C as a control class. This study was conducted for approximately one month.

Before conducting research, researchers first make lesson plans (RPP), teacher and student observation sheets, and test instruments. For the learning implementation plan (RPP), before being used in research, expert validation is carried out first. In the validation of the learning implementation plan (RPP) carried out by 3 validators, namely 2 lecturers and 1 teacher of mathematics subjects. As for the test questions, validity and reliability tests were carried out using the SPSS application.

The initial stage in conducting this research is to look at the test scores of classes IX A and IX C on the previous material to mathematics subject teachers. This value was used as a *pre-test* in this study. *Pre-test* is needed to ensure that the experimental class and the control class have the same initial ability. Here are the *pre-test scores* from the experimental class and the control class.

Table 1. *Student* Pre-Test Score Statistics

Statistics	Experimental Class	Control Class
Average	75,63	71,81
Median	77,5	70
Mood	70	70
Max Value	90	85
Min Value	60	55
Range	30	30
Standard Deviation	8,90	8,75

After that, learning will be carried out in experimental classes and control classes of rank and root shape material. In the experimental class, the learning model used is cooperative type *Number Head Together* (NHT) assisted by plaque props and in the control class, the learning model used is a conventional learning model. This learning was carried out twice and in the third meeting a *post-test* was carried out to measure students' mathematical comprehension ability. Here are *the post-test scores* from the experimental class and the control class.

Table 2. *Student Post-Test* **Score Statistics**

Statistics	Experimental Class	Control Class
Average	84,34	70,92
Median	88,5	73,5
Mood	91	57
Max Value	100	91
Min Value	67	57
Range	33	34
Standard Deviation	11,68	11,01

Before the hypothesis test is carried out, prerequisite tests in the form of normality and homogeneity tests of data need to be carried out. These prerequisite tests are used to determine the appropriate analysis method. In this study, *the Kolmogorov-Smirnov* normality test was used with a significant level of 5% or 0.05. If the significance value is more than α (, then it can be said that the data is normally distributed. However, if the $sig > 0,05$)significance value is less than α (, then it can be said that the data is not normally distributed. $sig < 0,05$)The following are the results of the *pre-test* and *post-test* data normality tests for both classes.

Table 3. Pre-Test *Data Normality Test Results*

Data Type	Kolmogorov-Smirnov		
	Statistics	Df	Sig.
Pre-Test Experiments	.141	32	.105[*]
Pre-Test Control	.142	36	.066

Table 4. Post-Test *Data Normality Test Results*

Data Type	Kolmogorov-Smirnov		
	Statistics	Df	Sig.
Post-Test Experiments	.213	32	.001[*]
Post-Test Control	.177	36	.006

Based on table 3, the significance value of the experimental class and control class is more than 0.05. Then it can be said that *the pre-test data* are normally distributed. However, in table 4, the significance value of the experimental class and the control class is less than 0.05. Then it can be said that *the post-test* data are not normally distributed.

The next prerequisite test is the homogeneity test. The homogeneity test was carried out using Levene*'s test* with a significant level of 5% or 0.05. If the significance value is more than 0.05, then it can be said that the variance of the data is homogeneous. However, if the significance value is less than 0.05, then it can be said that the variance of the data is not homogeneous. The following are the results of the pre-test, and *post-test* data *homogeneity* test for both classes.

Table 5. Pre-Test Data Homogeneity Test Results

Test of Homogeneity of Variances		Levene Statistic	df1	df2	Sig.
Pre-Test Results	Based on Mean	1.541	1	66	.219
	Based on Median	1.068	1	66	.305
	Based on Median and with adjusted df	1.068	1	64.6	.305
	Based on trimmed mean	1.588	1	66	.212

Table 6. Post-Test Data Homogeneity Test Results

Test of Homogeneity of Variances		Levene Statistic	df1	df2	Sig.
Post-Test Results	Based on Mean	0.002	1	66	.962
	Based on Median	0.078	1	66	.780
	Based on Median and with adjusted df	0.078	1	61.6	.780
	Based on trimmed mean	0.009	1	66	.924

Based on table 5, a significance value is obtained based on an average of 0.219 so that it shows a significance value of more than 0.05. Then it can be said that the data has homogeneous variance. And in table 6 obtained a significance value based on an average of 0.962 so that it shows a significance value of more than 0.05. Then it can be said that the data has homogeneous variance.

Furthermore, to test the hypothesis, it is carried out with a non-parametric statistical test in the form of the Mann Whitney *test.* This test was carried out because the data in this study did not meet the requirements, namely *the post-test* data was not normally distributed. Before conducting a hypothesis test, a provisional conjecture or hypothesis is required. The hypothesis of this study is as follows:

H_0 : The application of the Number Head Together *(NHT)* type cooperative learning model assisted by plaque props is not effective in improving students'

mathematical understanding skills on rank material and root form in MTs Syarif Hidayah Doro

H_a : The application of the Number Head Together *(NHT)* type cooperative learning model assisted by plaque props is effective in improving students' mathematical understanding skills on rank material and root form in MTs Syarif Hidayah Doro.

If in the calculation of *the Mann Whitney* test with SPSS the significance value or Asymp. Sig. (2-tailed) is less than 0.05, then it H_0 is rejected and accepted. However, if H_a the significance value or Asymp. Sig. (2-tailed) is more than 0.05, it is H_0 accepted and rejected. The results of the H_a *Mann Whitney* test with SPSS are as follows.

Table 7. *Mann Whitney Test Results*

Ranks			
Class	**N**	**Mean Rank**	**Sum of Ranks**
Ex	32	45.13	1444.00
Control	36	25.06	902.00
Total	68		

Test Statistics[a]	
	Post-Test Results
Mann-Whitney U	236.000
Wilcoxon W	902.000
Z	-4.204
Asymp. Sig. (2-tailed)	0.000

Based on table 7, the significance value or Asymp. Sig. (2-tailed) is 0.000 where the number is less than 0.05. So in *the Mann Whitney* test this H_0 was rejected and accepted. Thus, there is a significant difference between experimental classes using Number H_a *Head Together* (NHT) type cooperative learning models assisted by plaque props and control classes using conventional learning models. This also means that the mathematical understanding ability of experimental class students is better than that of the control class. Thus, the application of the *Number Head Together* (NHT) type cooperative learning model assisted by plaque props is effective in improving students' mathematical understanding ability on the rank material and root form in MTs Syarif Hidayah Doro.

This is in accordance with research conducted by Paskalina Tukly, Usep Sholahudin, and Giyanti (2022: 139), in their research entitled "The Effect of *the Numbered Head Together* (NHT) Type Cooperative Learning Model Assisted by Concept Maps on Improving Students' Mathematical Understanding Ability". The results of this study stated that the learning outcomes achieved in the control class and experimental class with the same subjects, namely straight-line equations were different. Control classes that did not receive treatment with concept map-assisted NHT learning models had decreased learning outcomes in contrast to experimental classes that received treatment using concept map-assisted NHT learning models. So the use of *the Numbered Head Together* (NHT) type cooperative learning model can improve students' mathematical comprehension skills.

This result is also in line with research conducted by Ila Wasilatun Pratiwi (2019: 83), in her research entitled "The Effect of *Number Head Together* (NHT) Learning Model Assisted by Gamification Concepts in Improving the Ability to Understand Mathematical Concepts and Learning Interests of Junior High School Students". The results of this study stated that the understanding of mathematical concepts and students' learning interest in *Pythagorean* theorem material using the Number Head Together *(NHT) learning model assisted by gamification concepts in experimental classes was better when compared to conventional learning models in control classes.*

CONCLUSION

Based on the results of research conducted at MTs Syarif Hidayah Doro, in the analysis of *the Mann Whitney* test obtained a significance value or Asymp. Sig. (2-tailed) of 0.000 where the number is less than 0.05. So in *the Mann Whitney* test this was rejected and accepted. This shows that there is a significant difference between experimental classes using $H_0 H_a$*Number Head Together* (NHT) type cooperative learning models assisted by plaque props and control classes using conventional learning models. In addition, the average score obtained by the experimental class was higher compared to the control class. The experimental class obtained an average of 84.34 while the control class obtained an average of 70.92. Thus, it can be concluded that the application of the *Number Head Together* (NHT)

type cooperative learning model assisted by plaque props is effective in improving students' mathematical understanding skills on the rank and root form material in MTs Syarif Hidayah Doro.

This research provides an alternative in improving students' mathematical comprehension skills by applying the *Number Head Together* (NHT) type cooperative learning model assisted by teaching aids. The weakness in this study is that each number given to each group member does not all get the opportunity to be called a teacher because of limited learning time. For future researchers who are still relevant to this research, they are expected to be able to look for other media or teaching aids that are more innovative to be applied in learning, especially mathematics.

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