Mathematical Learning Outcome Differences Through the Implementation of Cooperative Learning Model of Numbered Head Together and Think Pair Share

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ABSTRACT

This research is an experimental study with Pre-test and Post-test Equivalent Group Design that aims to determine the difference in the quality of mathematics learning using cooperative model type Numbered Head Together with type Think Pair Share in grade VIII students of Muhammadiyah 6 Makassar junior high school. The differences can be seen from the learning outcomes and student activity process during learning and learning implementation. The population in this study was all grade VIII students of Muhammadiyah 6 Makassar junior high school, while the samples in this study were two classes chosen using Cluster Random Sampling. Data were collected using mathematics learning tests and student activity sheets. The experiment was conducted in five meetings by giving the sample classes a pre-test, different treatments, and a post-test. The results showed that the average scores of students' learning outcomes before and after the application of cooperative models of type Numbered Head Together were 31.96 and 80.25, respectively, and the average score of students' mathematics learning outcomes before and after applying the cooperative model type Think Pair Share were 45.31 and 78.12, respectively. Therefore, it can be concluded that there is no significant difference between the mathematics learning outcomes of grade VIII students of SMP Muhammadiyah 6 Makassar taught using the cooperative model type Numbered Head Together and type Think Pair Share.

Keywords: Mathematics Learning Results, NHT Type Cooperative Model, TPS Type Cooperative Model.

1. INTRODUCTION

The development of the world of education does not escape the influence of the application of the curriculum. Since the last few years, the curriculum applied in Indonesia has changed several times. The purpose of all this is to improve the quality of education that has been low. By curriculum change, the government and people expect that our education quality will be better than ever. But seeing the realities in the field that the problem is not on the curriculum, but the classroom learning process is sometimes not good. In other words, the quality of education is not only influenced by the curriculum but also is affected by the learning process in the classroom, especially in math subjects in schools. In the school, there are still many mathematics teachers who use conventional techniques in teaching, namely direct instruction, so that students are likely to become quickly bored and lazy in following the learning process of Mathematics. As a result, if students are not passionate about learning and are lazy in following the learning process, there will be a decrease in activities and learning outcomes in mathematics. Learning outcomes have an important role in education because they can determine the quality achieved by students. Understanding the learning outcomes referred to by researchers is the results of learning obtained by students in certain subjects who use the test to measure student success.

It is necessary to develop a learning model that places students as a learning center or student-centered. One of them is the selection of learning models. The model itself consists of various kinds, where each model has its advantages and disadvantages. These teaching and learning models can encourage students to own and do things like the following: accept others, help others, face challenges, and work in teams. In applying direct instruction, there is a fundamental drawback, namely, the lack of ways to build structural interactions between students and teachers closer.

In direct instruction, students are not separated into groups so that there is no interaction of students in the group that implies a passive learning process. In direct instruction, all activities are centered on the interaction between teachers and students in one direction. Students become passive because they only wait for the teacher to explain the material. To overcome that, one of the alternatives that can be considered is applying the cooperative learning model. Cooperative learning can provide opportunities for students to learn actively. As a result, students learn mathematics with joy and can operate their brains to the maximum to absorb the knowledge provided by the teacher and from the learning environment. Cooperative learning also allows teachers to pay attention to students more so that more intimate relationships can be established between teachers and students and between students and students.

The number of students involved in cooperative learning groups varies. The variation in the number of students in the group determines the effectiveness of the implementation of learning that allows students to experience meaningful learning that supports the improvement of learning outcomes, especially mathematics. Two types of cooperative learning models that focus on the number of students involved in the group are Number Head Together (NHT) type, and Type *Think Pair Share* (TPS).

Numbered Head Together (NHT) allows students to share ideas and consider the most appropriate answers by improving student cooperation. The three objectives to be achieved in NHT-type cooperative learning are structural academic learning outcomes to improve student performance in academic assignments, recognition of diversity with various backgrounds, and the development of social skills. As the groups are heterogeneous, each member of the group has a different head number and thinking. The Cooperative Type Numbered Head Together (NHT) consists of four steps. The first is numbering. At this step, the teacher divides the students into groups of 3 - 5 people, and each group is numbered 1 to 5. The second is asking questions. At this stage, the teacher asks students a question about the materials taught variously. The third is thinking together. At this step, students unite their opinions on the answer to the question and convince each group member who knows the answer. The fourth step is Answering. At this final stage, the teacher calls a specific number, then the students whose corresponding number raises their hand and try to answer the question for the entire class.

The Think Pair Share Type Cooperative Learning Model (TPS) is one of the cooperative learning models that can change the assumption that the discussion method needs to be organized in the overall group setting. With this model, students can communicate directly, inform each other, exchange ideas, and practice to maintain their opinions if they are worthy of preservation. The implementation of the Cooperative Learning Model Type Thinks Pair Share consists of three steps. The first step is *thinking.* At this step, the teacher asks questions or issues related to the material taught, and then students are asked to think about the question or issue independently. The second is p*airing*. At this step, the teacher asks the students in pairs with the other students to discuss what they have thought at the first stage. Interactions at this stage are expected to share their answers if a question has been asked or shared ideas if a specific issue has been identified. The time for pairing is $4 - 5$ minutes. The final stage is *pairing*. In this stage, the teacher asks the student pair to share what they have been talking about with the entire class. This is effectively done by taking turns partner by partner and continued until about a quarter of couples have had the opportunity to report. The important thing teachers should do in receiving every answer is to reward teachers for finding ways to reward the efforts of students' learning, especially in group learning.

One alternative for solving the problems above is applying the *Numbered Head Together* (NHT) learning model and *Think Pair Share* (TPS). They provide a pleasant learning atmosphere that improves mathematical learning activities since students no longer feel monotonous and saturated situations. Type *Numbered Head Together* (NHT) is a type of cooperative learning involving 3 - 5 students per group, while type *Think Pair Share* (TPS) involves only two students in pairs. Some of the important points in the application of the *Numbered Head Together* (NHT) and *Think Pair Share* (TPS) types are the choice of the appropriate materials, the formation of student groups, the introduction of assignments and roles of students, and the determination of time and space to be used. Various studies have shown the

efficiency of NHT and TPS models in improving learning outcomes [1]. Certainty about the efficacy of both learning models empirically can only be done by conducting experiments. Based on the background that has been described, the problem in this study is whether there are differences in the results of mathematics learning students of grade VIII Muhammadiyah 6 Makassar junior high school taught using the NHT model and the TPS model.

2. RESEARCH METHOD

This study is experimental research with pre-test and post-test equivalent Group Design shown in Figure 1. This study aims to compare the effectiveness of the cooperative learning model type Numbered Head Together (NHT) and the cooperative learning model type Think Pair Share (TPS) in improving mathematics learning outcomes of 8th-grade students at SMP Muhammadiyah 6 Makassar. There were two variables in this study, namely the independent variable, in the form of a Numbered Head Together (NHT) cooperative learning model with the Think Pair Share (TPS) type, and the dependent variable, in the form of students' mathematics learning outcomes. Two classes were randomly selected, then given a pre-test to determine the difference in initial learning outcomes between groups of experiment I and group experiments II. Group experiment I was the group taught using the cooperative learning model type Numbered Head Together (NHT), while group experiments II was a group taught using cooperative learning model type of Think Pair Share (TPS). After implementing the treatment, each group was given a post-test to find the difference between the learning outcomes of students in groups I and II.
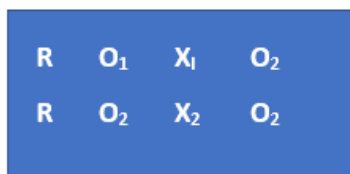
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\begin{array}{cccc}
R & O_1 & X_I & O_2 \\
R & O_2 & X_2 & O_2
\end{array}
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Figure 1. Pre-test and Post-test Equivalent Group Design

Description:
R = Random Class
X1 = The treatments in group I
X2 = The treatments in group II
O1 = Pretest
O2 = Posttest
[2]

The population in this study were all eighth-grade students of SMP Muhammadiyah 6 Makassar. The population was said to be homogeneous because the schools do not classify students based on class-specific. Samples were chosen using the cluster random sampling method to choose two homogeneous classes. The class experiment I was taught using the cooperative learning model type Numbered Head Together (NHT), while class experiment II was conducted using the cooperative learning model type of Think Pair Share.

Before carrying out the research, observations were conducted on the school participant to see the problem. The problem that experienced by teachers and students in learning, determining the group of experiments which a model of cooperative will teach Numbered Head Together (NHT) and cooperative type think Pair Share (TPS), specify the subject of discussion that will be conducted during 5x meetings in each class, prepare the device learning in the form of a plan of learning either be material taught and LKPD, prepare for the test or instrument of research in the form of the results of learning in the form of matter essay or description for pre-test and post-test to see students' mathematics learning outcomes before and after the NHT and TPS learning models were applied.

Data were analyzed using descriptive and inferential statistical. Analysis of descriptive statistics was used to describe data collected as presence, without intending to conclude the applicable general. This analysis shows mean, median, mode, standard deviation, variance, minimum, and maximum scores. The students' mathematics learning outcomes were also divided based on the categorization by the Ministry of National Education of Indonesia as follow:

Table 1 Categorization Standard The assigned the Ministry of National Education.

Number	Score	Category
1	$0 \leq x \leq 54$	POOR
2	$54 < x \leq 64$	LOW
3	$64 < x \leq 79$	AVERAGE
4	$79 < x \leq 89$	GREAT
5	$89 < x \leq 100$	EXCELLENT

Besides that, the result of learning students is also directed to the achievement of learning in the individual and classical. The criteria for student learning completeness can be seen from the learning outcomes that reached the Minimum Completeness Criteria (KKM) determined by the school, namely, 75 out of an ideal score of 100. Otherwise, the criteria are incomplete. If a minimum of 85% of students reached a value of 75, then the classical completeness was said

to be satisfied. The formula for the classical completeness (CC) is given in the following formula:

$$CC = \frac{number\ of\ students\ by\ score \geq 75}{overall\ number\ of\ students} \times 100\% \quad (1)$$

While inferential statistical analysis is used to test the research hypothesis by using a t-test.

3. RESULTS AND DISCUSSION

In part, this is presented the results of the analysis based on the results of research that has been done. The analysis of descriptive statistics shows the characteristics of the distribution of scores result of learning from each group research at once answers on issues formulated in the study.

Table 2. Mathematics pre-test and protest result with NHT model

Statistic	Pretest statistic score	Posttest statistic score
Sample size	32	32
The highest score	91	100
The lowest score	5	48
Ideal score	100	100
Score range	86	52
Average score	31,96	80,25
Deviation standard	20,78	11,69
Variance	431,90	136,71

Table 3. Distribution and percentage table of students' pre-test and post-test mathematical learning outcome score with NHT model

No	Score	category	Pretest frequency	Pretest percentage	Posttest frequency	Posttest percentage
1	0 – 54	poor	27	84,375	1	3,125
2	55 – 64	low	2	6,250	3	9,375
3	65 – 79	average	2	6,250	14	43,750
4	80 – 89	high	0	0	5	15,625
5	90 – 100	Very high	1	3,125	9	28,125
Total			**32**	**100**	**32**	**100**

Table 4 Description table of mathematical Pre-test and Post-test outcome data with Model TPS

Statistic	Pretest statistic score	Posttest statistic score
Sample size	32	32
The Highest score	86	100
The lowest score	14	40
Ideal score	100	100
Score range	72	60
Average Score	45,31	78,12
Deviation Standard	18,55	13,28
Variance	344,41	176,79

For the experimental class, which was selected as the research unit with the *Numbered Head Together* (NHT) type of cooperative learning model, data was obtained from the description of the results of the NHT type of mathematics pre-test and post-test. The average score of students' mathematics test in the topic of function before applying the treatment (pre-test) was 31.96 from the score ideal of 100. The highest score was 91, and the lowest was 5, with a standard deviation of 20.78. If the score of the test results to learn math students before treatment are grouped into the five categories, it was obtained that 32 students had a level of the result of learning mathematics in the category of very low with a scoring average of 31.96 from the score ideal 100. In addition, only 2 students, or 6.25%, achieved learning completeness, while the others did not achieve learning completeness. After giving the treatment (post-test), it was obtained that the average score of mathematics learning outcome was 80.25 on the score ideal scores of 100 as shown in Table 1. The highest score was 100, and the lowest score was 48, with a standard deviation of 11.69. If grouped in five categories, in general, it has a level of the result of learning mathematics in the moderate category with an average of 80.25 from the score ideal 100. In addition, 28 of the 32 students with a percentage of 87.50 achieved learning completeness

while the others with a percentage of 12.50% did not reach the standard completeness score. Thus, it can be seen that the average score of students after giving treatment is higher than before the application of the treatment.

Table 5. Distribution and percentage table of students' pre-test and post-test mathematical learning outcome score on with PTS model

No	SCORE	Category	Pretest frequency	Pretest percentage	Posttest frequency	Posttest percentage
1	0 – 54	poor	21	65,625	3	9,375
2	55 – 64	low	5	15,625	1	3,125
3	65 – 79	average	4	12,500	13	40,625
4	80 – 89	high	2	6,250	9	28,125
5	90 – 100	Very high	0	0	6	18,750
	total		32	100	32	100

For the experiment class II taught using cooperative learning model type Think Pair Share (TPS), the average score of students' learning outcomes before applying the treatment (pre-test) was 45.31 out of an ideal score of 100. In addition, the highest score reached by the students was 86, and the lowest was 14, with a standard deviation of 18.55. Based on the student learning outcome categorization, students were in the low category with an average of 45.31. Based on Minimum Completeness Criteria, 2 of 32 students were in a complete category, while the others as many as 30 of 32 students, 93.75%, were in the incomplete category.

Meanwhile, the post-test results showed that the average score of students' mathematics learning outcomes was 78.12 from the ideal score of 100. The highest score achieved by students was 100, and the lowest score was 40, with a standard deviation of 113.28. If grouped in category ratings, students were in the average category with an average score of 78.12 of the score ideal 100. In addition, 28 students with a percentage of 87.50% reached the Minimum Completeness Criteria, while four students with a percentage of 12.50% did not reach that score. Therefore, it can be seen that the average score before and after applying the learning model increased with a score range of 72.

Before testing the hypothesis using inferential statistical analysis, the tests of normality and homogeneity were carried out to determine whether the scores of students' learning outcomes were distributed normally and homogenously, with the significant value of a = 0.05. Based on the students' learning outcomes, the significant value for the experiment class I was 0.122, which was much large than 0.05. In experiment II obtained sign = 0.200, which was larger than 0.05. Therefore, it can be concluded that the data distribution was normal. The criteria for homogeneous testing were that if the p-value of 0.05, then the second variance is equal, and if

the p-value <0.05, the variances of the two classes are different. Based on the result of the homogeneity test, it was obtained that the learning outcomes of both groups were homogeneous because the sign value (0.335) is greater than 0.05. Since the data were normally distributed and homogenous, the hypothesis can be tested using a two-independent sample t-test with SPSS. It was obtained the value of *sign (2-tailed)* = 0.072. This indicated that the sign value is greater than 0.05, which implies H0 to be accepted and H1 to be rejected. Therefore, it can be concluded that there was no difference between the results of learning mathematics of students taught using the cooperative learning model type Numbered Head Together (NHT) and type Think Pair Share (TPS) on grade 8th of SMP Muhammadiyah 6 Makassar.

The result of this study is in line with the research findings of [3],[4] that the students' learning outcomes increase after implementing the cooperative learning model of TPS and NHT type.

4. CONCLUSION

Based on the results of the research were conducted, obtained the conclusion that there is no difference significantly between students' results of learning mathematics which is taught by a model Cooperative Type Numbered Head Together (NHT) by Type of Think Pair Share (TPS) to gain the result of learning mathematics with the sign > or (0.072> 0.05) in the student class VIII SMP Muhammadiyah 6 Makassar.

Results of the study are expected to address the low achievement of learning mathematics students are often used as indicators of the quality of learning. The students' mathematics learning outcomes before being treated and taught using the Numbered Head Together (NHT) cooperative learning model and the Think Pair Share (TPS) type, the average values were 31.96 and 45.31. These results indicate that 93.75% of students did not complete the minimum mastery criteria, which means that there were 30 students out of a total of 32 students who did not achieve individual mastery (scores below the minimum mastery criteria). While the results of students' mathematics learning after being treated with cooperative learning models of Numbered Head Together (NHT) and Think Pair Share (TPS) types, the average values of each experimental class I (NHT model) and experiment II (TPS model) were 80, 25 and 78.12. These results indicate that students' mathematics learning outcomes are passed on minimum mastery criteria, which is 75 and classically passed, namely 85% of students who reach≥ 75, where the results of classical mastery in the experimental class I with the NHT type are 87.5%

and the experimental class II with the type TPS 90.62%.

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