Comparison of Mathematics Learning Outcomes Using the Think Pair Share (TPS) Cooperative Learning Model and the Numbered Heads Together (NHT) Cooperative Learning Model for Class VIII Students of SMP Negeri 2 Galesong Selatan, Takalar Regency

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ABSTRACT

The purpose of this study was to determine differences in student learning outcomes in the Cartesian coordinate system with Think Pair Share (TPS) type cooperative learning model and Numbered Heads Together (NHT) type of cooperative learning model for VIII grade students of SMP Negeri 2 Galesong Selatan, Takalar Regency. This type of research is a true experimental research. The research design used was pretest-posttest control group design, with samples taken through the cluster random sampling technique were students of class VIII'A consisting of 30 students as experimental class I and students of class VIII'B consisting of 30 students as experimental class II. The experimental group I was treated using the TPS type cooperative learning model, while the experimental class II was treated with the NHT type cooperative learning model. The results showed that: (1) the average mathematics learning outcomes of students in the experimental class I before being treated (pretest) was 40 and after being treated (posttest) was 88 while the experimental class II before being treated (pretest) was 43 and after being treated (posttest) was 82. (2) From the results of the inferential analysis shows that the score of students' mathematics learning outcomes after mathematics learning through TPS type cooperative learning models looks p value (sig. (2-tailed)) is 0.003 <0.05 which means that H0 is rejected and H1 is accepted, which means that the average score of mathematics learning outcomes for VIII grade students of SMPN 2 Galesong Selatan for TPS type cooperative learning models is different from the NHT type cooperative learning models. Based on the results of the study, there are differences in the type of TPS cooperative learning model with the NHT type cooperative learning model towards the mathematics learning outcomes of VIII grade students of SMPN 2 Galesong Selatan. Where the type of TPS cooperative learning model is better than the NHT type cooperative learning model of mathematics learning outcomes for students of class VIII SMPN 2 Galesong Selatan.

Keywords: mathematics learning outcomes; TPS type cooperative learning model; cooperative type NHT.

INTRODUCTION

Education is the foundation for developing human resources for nation building. Therefore, improving human resources requires improving the quality of education. In Indonesia, the quality of education is still not very good.

The issue of education in Indonesia has been regulated in Law (UU) No. 20 of 2003 concerning the National Education System, Article 3 clearly states that "National education functions to develop abilities and shape the character and civilization of a dignified nation in order to enlighten the life of the nation, aiming to develop the potential of students to become people who believe in and fear God Almighty, have noble morals, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens."

Based on the aforementioned law, the teaching and learning process requires qualified educators who are expected to guide students into the generation we envision, in line with the nation's goals and ideals. Therefore, teachers must not only deliver lesson material but also create a positive learning environment and consider the use of teaching models that are appropriate to the subject matter and the students' circumstances. One of the challenges teachers face in conducting lessons is how to foster activity and engagement in students so they can learn effectively.

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Mathematics is a fundamental and essential subject at every level of education. This is because mathematics is a tool for logical, analytical, and systematic thinking, enabling it to support other subjects. Given its crucial role, mathematics instruction at every level is expected to yield optimal results.

In reality, the majority of Indonesians, and students in particular, consider mathematics to be a challenging subject. The facts show that mathematics is a daunting and stressful subject, leading many students to view it as a school nightmare. This perception leads some students to lose interest in learning mathematics, which ultimately leads to poor math performance.

To address the aforementioned issues, various efforts have been made to improve the quality of education. The success of improving the quality of education, particularly in Mathematics, depends on several factors, including the students themselves, the subject matter, teachers and parents, and the teaching and learning strategies prepared by the teachers. At the very least, teachers must master the material being taught and be skilled in teaching it. From preparing the subject matter to its implementation, teachers must be selective in determining the teaching and learning strategies to be implemented. This depends on the method approach used in the teaching and learning process. Therefore, the approach that needs to be developed as an alternative that is appropriate to the characteristics of the material being taught so that the teaching and learning process is more effective and efficient is a method that truly involves students throughout the learning process. (Rosiana, 2015: 2).

During the learning process, students are less active in mathematics. One reason for this lack of engagement is that teachers still use conventional learning methods, where the teacher is the center of learning and students simply receive information, which can be boring and uninteresting. Consequently, students' understanding of concepts is very weak, leading many to struggle with mathematics learning.

Based on the results of observations at SMP Negeri 2 Galesong Selatan, Takalar Regency, students have difficulty understanding learning, especially mathematics because the students are not active in the learning process. Thus, student interest in learning mathematics is very low and less interesting for students, even the teachers often complain because there are still many students who do not understand mathematics learning, especially in the problem of memorizing multiplication. Problems that arise in the teaching and learning process are caused by a lack of communication between teachers and students and students with other students so that the interaction process in the learning process is not active. However, during the exam, many students still scored well below the Minimum Completion Criteria (KKM). Consequently, the mathematics learning outcomes of students at SMP Negeri 2 Galesong Selatan, Takalar Regency, were generally less than satisfactory, with an average score of 60, well below the school's Minimum Completion Criteria (KKM) of 75.

The purpose of this study was to determine the differences in learning outcomes of the Cartesian coordinate system of students with the Think Pair Share (TPS) type cooperative learning model and the Numbered Heads Together (NHT) type cooperative learning model in class VIII students of SMP Negeri 2 Galesong Selatan, Takalar Regency.

The results of Sitti Ramlah's (2014) research stated that there was a significant difference between the mathematics learning outcomes of students taught using NHT type cooperative learning and those taught using TPS type cooperative learning. The average score of learning outcomes after being treated with the NHT type cooperative model was 66.25, while

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the average score of learning outcomes after being treated with the TPS type cooperative model was 74.20.

The results of Amriani's research (2011) stated that there was no significant difference between the mathematics learning outcomes of students taught using NHT type cooperative learning and those taught using TPS type cooperative learning in grade VII students of SMP Negeri 7 Makassar. With an average score of learning outcomes after being treated with the NHT type cooperative model, namely 71.30, while the average score of learning outcomes after being treated with the TPS type cooperative model was 79.33.

Based on the results of research conducted by Abdul Rais J (2018) in class X of SMA Negeri 8 Gowa, namely research by applying the cooperative model of the Think Pair Share (TPS) type, it achieved effective criteria with the findings that students achieved an average of 81.75 learning outcome scores, activities reached 78.91% and student responses to the application of the learning model were above 75%, namely 79.06% and the implementation of learning was categorized as very good.

RESEARCH METHODS

This type of research is true experiment research., which involves two classes, namely one class as experimental class I and one class as experimental class II.The research design used is pretest-posttest control group design, This research design uses a "pretest posttest only control design", with samples taken through cluster random sampling techniques are students of class VIII'A consisting of 30 students as experimental class I and students of class VIII'B consisting of 30 students as experimental class II. Experimental group I was given treatment using the TPS type cooperative learning model, while experimental class II was given treatment with the NHT type cooperative learning model. The instrument used in this study was a mathematics learning outcome test made by the researcher in the form of an essay or description (pretest and posttest) with a predetermined number of questions. The technique of collecting research data was collected using a research instrument in the form of a mathematics learning outcome test that had been made and developed by the author. Furthermore, the data obtained were analyzed using descriptive and inferential statistics using normality tests, homogeneity tests and hypothesis tests.

RESEARCH RESULT

From the results of the descriptive analysis as attached in appendix D, the statistics of the mathematics learning outcomes scores of class VIII A students before being given treatment (pretest) and after being given treatment (posttest) on the topic of the Cartesian Coordinate System are presented in Table 4.1 below.

Table 1 Statistics of Students' Cartesian Coordinate System Learning Outcome Scores Before and After the TPS Model was Implemented

Statistics	Statistical Value	
	Pretest	*Posttest*
Research unit	30	30
Ideal Score	100	100

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Maximum Score	44	96
Minimum Score	32	80
Score Range	12	16
Average Score	40	88
Standard Deviation	3,377	4,386
Variance	11,402	19,241

Based on Table 1, it shows that the average score of students' mathematics learning outcomes on the Cartesian Coordinate System topic before being given treatment (pretest) is 40 out of an ideal score of 100 that may be achieved by students, while the average score of students' mathematics learning outcomes after being given treatment (posttest) is 88 out of an ideal score of 100 that may be achieved by students. This shows that in class VIII by using the TPS Type Cooperative Learning model there was an increase of 48.

Furthermore, if the students' mathematics learning outcomes scores before and after learning by applying the TPS Type Cooperative Learning model are grouped into five categories, a frequency distribution table and percentage of scores are obtained which can be seen in Table 4.2 and Table 4.3 below.

Table 2 Frequency Distribution and Percentage of Learning Outcome Scores for the Cartesian Coordinate System Before the TPS Model was Implemented

No	Score	Category	Frequency	Percentage (%)
1	$0 < 65$	Very low	30	100
2	$65 < 75$	Low	0	0
3	$75 < 85$	Currently	0	0
4	$85 < 95$	Tall	0	0
5	$95 \leq 100$	Very high	0	0
Amount			**30**	**100**

Table 3 Frequency Distribution and Percentage of Learning Outcome Scores for the Cartesian Coordinate System After the TPS Model was Implemented

No	Score	Category	Frequency	Percentage (%)
1	$0 < 65$	Very low	0	0
2	$65 < 75$	Low	0	0
3	$75 < 85$	Currently	9	30
4	$85 < 95$	Tall	20	66.7

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5	$95 \leq 100$	Very high	1	3.3
	Amount		**30**	**100**

Based on table 2 shows that of the 30 eighth grade students who took the pretest, there were 30 students or 100% of students included in the very low category. Meanwhile, in Table 3 shows that of the 30 eighth grade students who took the posttest there were five categories, namely, there were no students who obtained the very low category or around 0%, in the low category there were no students or around 0%, in the medium category there were 9 students or around 30%, in the high category there were 20 students or around 66.7% and there was 1 student who obtained the very high category or around 3.33%.

Furthermore, data on students' mathematics learning outcomes before and after the TPS learning model was implemented, categorized based on completion criteria, can be seen in Table 4.4 and Table 4.5.

Table 4 Description of Learning Outcomes for the Cartesian Coordinate System Before the TPS Model was Implemented

Score	Category	Frequency	Percentage (%)
$0 < 75$	Not Completed	30	100
$75 < 100$	Completed	0	0
Amount		**30**	**100**

Table 5 Description of Learning Outcomes of the Cartesian Coordinate System After Implementing the TPS Model

Score	Category	Frequency	Percentage (%)
$0 < 75$	Not Completed	0	0
$75 < 100$	Completed	30	100
Amount		**30**	**100**

The criteria for a student to be considered to have completed their studies is if they have a score of at least 75. From Table 4 above, it can be seen that the number of students who did not meet the individual completion criteria was 30 or 100% of the total number of students. Based on the description above, it can be concluded that the learning outcomes of class VIII students before the TPS model was implemented were classified as very low. From Table 4.4, it can be seen that there were 0 students who did not complete or 0%, while there were no students who had individual completion or 0%. Meanwhile, after the TPS model was implemented, the results were classified as very high. From Table 5, it can be seen that there were 30 students who completed or 100%, while 30 students had individual completion or 100%. When associated with the indicators of student learning outcome completion, it can be

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concluded that the learning outcomes of class VIII after the TPS model was implemented have met the classical indicators of student learning outcome completion, namely≥70%.

From the results of the descriptive analysis as attached in appendix D, the statistics of the mathematics learning outcomes scores of class VIII B students before being given treatment (pretest) and after being given treatment (posttest) on the topic of the Cartesian Coordinate System are presented in Table 4.6 below.

Table 6 Statistics of Learning Outcome Scores for the Cartesian Coordinate System Before and After the NHT Model was Implemented

Statistics	Statistical Value	
	Pretest	*Posttest*
Research unit	30	30
Ideal Score	100	100
Maximum Score	54	94
Minimum Score	22	76
Score Range	32	18
Average Score	43	82
Standard Deviation	8,357	5,452
Variance	69,834	29,724

Based on Table 6, it shows that the average score of students' mathematics learning outcomes on the Cartesian Coordinate System topic before being given treatment (pretest) was 43 out of an ideal score of 100 that could be achieved by students, while the average score of students' mathematics learning outcomes after being given treatment (posttest) was 82 out of an ideal score of 100 that could be achieved by students. This shows that in class VIII using the NHT model there was an increase of 39.

Furthermore, if the students' mathematics learning outcomes scores before and after learning by applying the NHT model are grouped into five categories, a frequency distribution table and percentage of scores are obtained which can be seen in Table 4.7 and Table 4.8 below.

Table 7 Frequency Distribution and Percentage of Learning Outcome Scores for the Cartesian Coordinate System Before the NHT Model was Implemented

No	Score	Category	Frequency	Percentage (%)
1	$0 < 65$	Very low	30	100
2	$65 < 75$	Low	0	0
3	$75 < 85$	Currently	0	0
4	$85 < 95$	Tall	0	0
5	$95 \leq 100$	Very high	0	0
Amount			**30**	**100**

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Table 8 Frequency Distribution and Percentage of Learning Outcome Scores for the Cartesian Coordinate System After the NHT Model was Implemented

No	Score	Category	Frequency	Percentage (%)
1	$0 < 65$	Very low	0	0
2	$65 < 75$	Low	0	0
3	$75 < 85$	Currently	20	66.7
4	$85 < 95$	Tall	10	33.3
5	$95 \leq 100$	Very high	0	0
	Amount		**30**	**100**

Based on table 8 shows that of the 30 students of class VIII who took the pretest there were 30 students or 100% of students included in the very low category. Meanwhile, in Table 4.8 shows that of the 30 students of class VIII who took the posttest there were five categories namely, there were no students who obtained the very low category or around 0%, in the low category there were no students or around 0%, in the medium category there were 20 students or around 66.7%, in the high category there were 10 students or around 33.3% and there were no students who obtained the very high category.

Furthermore, data on students' mathematics learning outcomes before and after the NHT learning model was implemented, categorized based on completion criteria, can be seen in Table 9 and Table 10.

Table 9 Description of Learning Outcomes for the Cartesian Coordinate System Before the NHT Model was Implemented

Score	Category	Frequency	Percentage (%)
$0 < 75$	Not Completed	30	100
$75 < 100$	Completed	0	0
Amount		**30**	**100**

Table 10 Description of Learning Outcomes for the Cartesian Coordinate System After Applying the NHT Model

Score	Category	Frequency	Percentage (%)
$0 < 75$	Not Completed	0	0
$75 < 100$	Completed	30	100
Amount		**30**	**100**

The criteria for a student to be considered to have completed their studies is if they have a score of at least 75. From Table 9 above, it can be seen that the number of students who did not meet the individual completion criteria was 30 or 100% of the total number of students.

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Based on the description above, it can be concluded that the learning outcomes of class VIII students before the implementation of the NHT learning model were classified as very low. From Table 4.10, it can be seen that there were no students who did not complete or 0%, while students who had individual completion were 30 students or 100%. When linked to the indicators of student learning outcome completion, it can be concluded that the learning outcomes of class VIII after the implementation of the NHT model have met the classical indicators of student learning outcome completion, namely ≥70%.

Prior to hypothesis testing, prerequisite tests, namely normality and homogeneity tests, were performed on the data obtained. These prerequisite tests were conducted to determine whether the sample data came from a normally distributed population and had homogeneous variance. The normality test in this study used the One Sample Kolmogorov-Smirnov test with a significance level of 5% or 0.05, with the following conditions:

If Pvalue ≥0.05 then H0 is accepted and H1 is rejected

If Pvalue <0.05 then H0 is rejected and H1 is accepted

By using the help of a computer program with the Statistical product and Service Solutions (SPSS) Version 23 program with the Kolmogrove-Smirnov test, the results of the analysis of the average scores for the pretest and posttest in experimental class I and experimental class II can be seen from the results of the normality test in table 11.

Table 11. Normality Test Results

	Class	Significance	A	Results
Pretest score	Experiment I	0.109	0.05	Normal
	Experiment II	0.133	0.05	Normal
Posttest score	Experiment I	0.141	0.05	Normal
	Experiment II	0.125	0.05	Normal

Based on the table above, it is known that the P-value (sig) > α = 0.05, which means H0 is accepted. This indicates that the pretest and posttest scores in Experimental Class I and Experimental Class II are normally distributed. The results of the normality test calculation using SPSS can be seen in the appendix.

A homogeneity test is performed to determine whether the variances of the two samples are equal. The test used is Levane's Test for Equality of Variances. This test is performed as a prerequisite for t-test analysis. If the samples have the same variance, then they are said to be homogeneous. In Levane's Test for Equality of Variances, a significance level of 5% or 0.05 is used, with the following conditions:

If Pvalue ≥0.05 then H0 is accepted and H1 is rejected

If Pvalue <0.05 then H0 is rejected and H1 is accepted

By using the help of a computer program with the Statistical Product and Service Solutions (SPSS) Version 23 program with a test *Levane' Test for Equality of Variances*, the results of the homogeneity test analysis can be seen in table 4.12.

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Table 12 Homogeneity Test

Levene Statistics	df1	df2	Sig.
1,828	1	58	.182

Based on the table above, the sig. value of Levene's test for Equality of Variances is known to be 0.182 > 0.05, it can be concluded that the variance of learning outcome data between classes A and B is the same or homogeneous. It is known that P-value (sig) > α = 0.05, which means H0 is accepted. This indicates that the pretest and posttest scores for both classes have the same variance or can be declared homogeneous. The results of the normality test calculation using SPSS can be seen in the appendix.

Based on the results of the data analysis prerequisite test, it can be seen that experimental class I and experimental class II have normally distributed populations and have the same variance. This indicates that the groups are homogeneous, allowing hypothesis testing using an independent samples t-test. The test results can be seen in Table 13.

Table 4.13. Hypothesis Test Results

Students' mathematics learning outcomes		Levane's Test For Equality of Variances		t-test for Equality of Means		
		F	Sig.	T	df	Sig. (2-tailed)
Score	Equal variances assumed	,1,828	,182	3.131	58	,003
	Equal variances not assumed			3.131	55,458	,003

From the table above, the Pvalue for Levane's Test is 0.182, because this value is greater than α = 0.05, then the variance of both data is homogeneous. Because the results of the Levane's Test state that both variances are homogeneous, the calculated t value used is based on the t test in the Equal variances assumed row, which is 3.131 with a Pvalue of 0.003.

The P value obtained is smaller than α = 0.05, so H0 is rejected and H1 is accepted, which means that there is a difference in the average mathematics learning outcomes using the TPS model with the average mathematics learning outcomes using the NHT model in class VIII South Takalar Regency. The results of the hypothesis test calculations using SPSS can be seen in the appendix.

DISCUSSION

The results of the analysis of students' mathematics learning data in experimental class I or learning that applies the TPS model show that the average score of students' mathematics learning outcomes on the subject of the Cartesian Coordinate System before being given

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treatment (pretest) is 39.33 (very low category) because students' initial abilities are still low and students' lack of understanding of the material even though almost all students are always active which causes students' pretest scores to be low, while the average score of students' mathematics learning outcomes after being given treatment (posttest) is 87 (high category) due to several factors, namely during the learning process students are active, good group cooperation, improving students' ability to communicate and express their opinions and more optimal student participation during learning so as to improve learning outcomes and increase students' posttest scores. Meanwhile, in the experimental class II or learning that applies the NHT model, it shows that the average score of students' mathematics learning outcomes before being given treatment (pretest) is 42.60 (very low category) due to the low initial ability of students which results in low pretest scores and students' unpreparedness to learn during learning because it is necessary to know that initial ability is also one of the factors that influence student learning achievement, while the average score of students' mathematics learning outcomes after being given treatment (posttest) is 83 (moderate category) because there are several factors, namely: during the learning process, student activity increases even though not all students are active because many students are absent and many students whose understanding is still minimal even though it increases at meeting 4. So in this study there are differences in mathematics learning outcomes using the TPS model and the NHT model in class VIII of SMPN 2 Galesong Selatan in the Cartesian Coordinate System learning process. Where the TPS model is better than the NHT model.

The results of the inferential analysis show that the score of students' mathematics learning outcomes after learning mathematics through the application of the TPS model shows that the p-value (sig.(2-tailed)) is $0.003 < 0.05$, which means that H0 is rejected and H1 is accepted, which means that the average score of students' mathematics learning outcomes in class VIII for TPS is better than the NHT model.

The results of the descriptive and inferential analyses provide sufficient support for the theory presented in the literature review. This research is relevant to several previous studies.

CONCLUSION

Based on the results of data analysis obtained during research on class VIII students of SMPN 2 Galesong Selatan regarding students' mathematics learning outcomes.The average mathematics learning outcomes of students in experimental class I after being taught using the Think Pair Share (TPS) type cooperative learning model were 88. Meanwhile, the average mathematics learning outcomes of students in experimental class II after being taught using the Think Pair Share (TPS) type cooperative learning model were 88.*Numbered Heads Together*(NHT)82. The learning outcomes of students in experimental class I who were taught using the Think Pair Share (TPS) type cooperative learning model were higher than the learning outcomes of those who were taught using the Think Pair Share (TPS) type cooperative learning model.*Numbered Heads Together*(NHT). From the results of the inferential analysis, it shows that the score of students' mathematics learning outcomes after learning mathematics through the application after being taught using the cooperative learning model of the Think Pair Share (TPS) type, the p value (sig. (2-tailed)) is $0.003 < 0.05$, which means that H0 is rejected and H1 is accepted.

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