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Application of Think Pair Share and Numbered Head Together Model on Mathematics Learning Outcomes

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Abstract

Based on events in the field, learning mathematics is still carried out conventionally so that students feel bored and less interested in learning mathematics; one solution is to apply a cooperative learning model, namely think pair share and numbered heads together. This study aims to compare mathematics learning outcomes among students whose learning is through the application of the type cooperative model Think Pair Share (TPS) and Numbered Head Together (NHT) type in class VII of an Islamic Junior High School in Central Java, Indonesia, with the selection of class VII B as experimental class 1 with 31 students and VII E as experimental class 2 with 31 students. This type of research was experimental research. Data collection techniques in the study were through observation, documentation, and test techniques. Data analysis in this study used descriptive and inferential analysis, including a normality test, homogeneity test, and Independent Sample *t*-Test with a significant level of 5%. Calculation of the independent sample t-test obtained a significance value (2-tailed) of 0.000 < 0.005, and the calculation of the gain score received a value of 0.7009. The result of this study indicates that the Think Pair Share (TPS) learning model is better than the application of learning outcomes using the Numbered Head Together (NHT) learning model on the mathematics learning outcomes with the category of “High” improvement.

Keywords: Think Pair Share (TPS), Numbered Head Together (NHT), Independent Sample *t*-Test

INTRODUCTION

Mathematics is a science that relates or examines abstract forms or structures and the relationships between them. An understanding of the concepts contained in mathematics is needed Hudojo (2013). Thus, learning mathematics means learning about the concepts and structures in the studied subject. Until now, mathematics is still a scourge among students and is often perceived as a complex subject to understand and is not liked by most students (Widiyaningsih, 2013). Based on the results of interviews with the school conducted by researchers in February 2022 with the mathematics teacher, one of the Islamic junior high school in Bojonegoro Regency stated that students only actively took notes according to what was assigned or written by the teacher on the blackboard, so that only students who have a high level of understanding can receive lessons well, while other students only follow the teacher's directions, the impact of student learning outcomes is not as expected, namely not reaching the KKM (Minimum Completeness Criteria). Dimyati (2013) said that given the importance of the learning process in the learning experienced by students, a competent teacher would be better able to teach students because "knowing" is not as crucial as "acquiring" own knowledge or learning to learn" The role of the teacher in the teaching and learning process is no longer to impart knowledge but to foster expertise and guide students to learn on their own because the success of students largely depends on their ability to learn independently and monitor their learning (Felder, 1998). Therefore,

mathematics teachers need to find new strategies to improve the learning process to optimizes students' mathematics learning outcomes. According to Hidayat (2013), students who play an active role and are placed as learning subjects and teachers as learning managers will be better in the learning process. Thus, the activeness of students in learning activities aims to build their knowledge. Students are active in building abilities on problems or everything they face in learning activities (Hidayat, 2013; Lie, 2012).

The learning model that is expected to overcome the above problems is cooperative learning, which can provide opportunities for students to actively learn in a democratic atmosphere so that the atmosphere in the classroom becomes fun and students can operate their brains optimally to absorb the knowledge conveyed by their learning environment (Abdul, 2014). Therefore, the authors want to research using these two learning models to know the effect of applying the TPS (Think Pair Share) and NHT (Numbered Head Together) learning models so that mathematics seems more interesting, fun and not difficult for them.

The TPS method is one of the learning models that can increase student activity. With this learning model, students are expected not to feel bored with the material presented because, with this learning model, students are invited to think through 3 stages, namely think, which means thinking, pairing means discussing what is obtained in the thinking stage, and share means to share with friends (Nurlaila & Buditjahjanto, 2013). With this learning model, students can be more active in the learning process and solve problems by discussing with their group. Meanwhile, the teacher in this learning model acts as a facilitator and guide (Putri & Muchlis, 2019).

The NHT learning model is a fun learning model, because students will be more active and creative in groups to achieve the desired learning goals (Hadiyanti, Kusni, & Suhito, 2012). Learning using the NHT method begins with "Numbering", dividing the class into small groups. After the group is formed, the teacher asks several questions that must be answered by each group (Trianto, 2012). Give each group a chance to find answers. On this occasion, each group put their heads together, "Head Together", discussing and thinking about solutions to questions from the teacher. Then the teacher calls the students with the same number from each group. They allowed to give answers to questions they have received from the teacher (Suprijono, 2014).

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Based on what has been explained above, the focus of the problem in this study is "How does the application of the TPS and NHT cooperative learning models affect the mathematics learning outcomes of seventh-grade students". The purpose of this study was "To find out how the effect of the application of the TPS and NHT cooperative learning

models on the mathematics learning outcomes of seventh-grade students." Based on several studies that are relevant to this research, they show different results, such as research conducted by Rahayu, Ernawati, & Rahim (2020). This study aims to determine differences in student learning outcomes from applying the NHT and TPS cooperative learning models to Whatsapp media-based student learning outcomes. The similarities between previous research and research by researchers are that they use the same learning model to see differences in its application to learning outcomes, but previous research was based on Whatsapp media. This study, showed differences in student learning outcomes from applying the NHT and TPS cooperative learning models to Whatsapp media-based student learning outcomes. Then research was conducted by Pribadi and Sugiarti (2018), this study examines the differences in the NHT and TPS cooperative learning models in increasing high school students' self-confidence. It was concluded from the results of this study that the students' self-confidence in class with the learning model. Think pair share cooperative type is higher than student confidence in the class with the Numbered Head Together cooperative learning model.

METHODE

This research method is quantitative. A quasi-experimental group involves two groups, one group as the experimental group I and the other as the experimental group II (Sugiyono, 2017). The experimental group I received the TPS learning model treatment, and the experimental group II received the NHT type learning model treatment. Table 1 is shown the research design.

Tabel 1. Research Design

Team	*Pretest*	*Treatment*	*Post-test*
TPS	O_1	X_1	O_3
NHT	O_2	X_2	O_4

The initial learning step begins with students being given pretest questions to see their initial abilities. After being treated with the TPS and NHT learning models, students were given post-test questions to know the impact of using the TPS and NHT learning models. The effect of the TPS and NHT learning models is seen from the difference in the average results of the pretest and post-test (Emzir, 2013).

The subjects of this study were students of classes VII B and VII C of an Islamic junior high school in Bojonegoro, with 31 students in each class. To obtain the data needed in the research, the researcher gave tests in the form of questions to students. The instrument that has been applied has gone through a validity test. The validation test of the test instrument is carried out by a mathematician lecturer. A pretest was carried out to see the students' initial ability to learn mathematics, and a posttest was given to see the improvement in student learning outcomes. Suppose the average student learning outcomes increase above the minimum completeness criteria (KKM), which is 70. In that case, it can be seen which learning model is more influential in improving students' mathematics learning outcomes.

The hypothesis test used in this study is a parametric statistical test, namely the Independent Sample t-test. This test is used to decide whether the hypothesis is accepted or rejected. The basis for decision-making is if it is accepted, while if it is rejected. *t* is necessary to do the N-Gain test to see how much improvement in students' mathematics learning outcomes is with applying the two learning models. The category of value acquisition or the effect of increasing the N-Gain score can be seen in Table 2.

Table 2. N-Gain test categories

Nilai N-Gain	Categories
$g > 0.7$	High
$0.3 \leq g < 0.7$	Medium
$g < 0.3$	Low

RESULT AND DISCUSSION

After the data obtained from the pretest and post-test learning outcomes of students from experimental class 1 and experimental class 2, it was continued by testing the hypothesis. The hypothesis in this study reads: the null hypothesis is the result of students' learning mathematics with the application of the TPS learning model is not better than the application of the NHT learning model. In contrast, applying the TPS learning model is better than using the NHT learning model. The following are student learning outcomes with the application of the TPS cooperative learning model.

Application of Think Pair Share (TPS) Learning Model

Table 3. Results of TPS Implementation

Statistic	Value	
	Pretest	Post-test
Samples	31	31
Lowest value	19	69
High score	40	95
Mean	29.45	79.96

Application of Numbered Head Together (NHT) Learning Model

Table 4. Results of NHT Implementation

Statistic	Value	
	Pretest	Post-test
Samples	31	31
Lowest value	20	52
High score	40	77
Mean	29.25	62.29

Based on Table 3 and Table 4, there was an increase in the value of learning outcomes in both classes based on the scores obtained during the pretest and post-test. After receiving the pretest and post-test data, it is necessary to test the hypothesis. Before testing the hypothesis, it is required to test for normality and homogeneity.

Tabel 5. Normality Pretest

Test of Normality				
		Shapiro-whilk		
Pretest	Class	Statistic	df	Sig
	Exp 1	0.967	31	0.439
	Exp 2	0.950	31	0.161

The results of the sig value are in accordance with the basis for making normality test decisions (see Table 5), which if the significance value is greater than 0.05 then the two classes are declared normally distributed.

Tabel 6. Normality Postest

Test of Normality				
				Shapiro-wilk
posttest	Class	Statistic	df	Sig.
	Ex 1	0.928	31	0.39
	Ex 2	0.959	31	0.27

The results of the sig value are in accordance with the basis for making normality test decisions, which, if the significance value is greater than 0.05 (see Table 6), the two classes are declared normally distributed. can be seen that the average value of students' initial learning outcomes there is no difference between experimental classes 1 and 2.

Tabel 7. Homogeneity *Pretest*

Test of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
Pre-test	Based on Mean	0.081	1	60	0.777

Seeing the significance value in the Table 7, which is 0.777, which is greater than 0.05, the two data are said to be homogeneous.

Tabel 8. Homogeneity *Post-test*

Test of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
Post-test	Based on Mean	0.057	1	60	0.813

Seeing the significance value in Table 8, which is 0.813, which is greater than 0.05, the two data are said to be homogeneous.

The next test is the Independent Sample *t*-Test test with to determine the difference in the average pretest results in the two classes. There is no difference, but there is a difference in the average posttest learning outcomes in the two classes. It can be seen that the average value of students' initial learning outcomes there is no difference between experimental classes 1 and 2.

Table 9. Independent Test Sample *t*-Test Initial Students

Independent sampel *t*-test				
		F	*t*	Sig. (2-
Pre-test	Equal variance ımed	0.081	0.134	0.894

Table 9 uses calculations using the SPSS version 26 statistical program, it is known that in the Equal Variances Assumed section, a significance value (2-tailed) is greater than 0.05 so it can be interpreted that H0 is rejected and Ha is accepted. Aims to find out how much influence the two learning models have on students' mathematics learning outcomes and to find out which learning model has a high influence on students' mathematics learning outcomes. This test was carried out using the SPSS version 26 program.

Table 10. N-Gain Test Results

Experiment 1		Experiment 2	
Mean N-Gain	0.7099	Mean N-Gain	0.4676
Min value	0.59	Min value	0.40
Max value	0.92	Max value	0.52

Based on the results of the N-Gain test in the Table 10, it can be seen that the average n-gain for experimental class1 is 0.7099, and if it is rounded up to 0.71 > 0.70, it means that the TPS learning model has a high influence on critical thinking skills students and the average N-Gain score of experimental class 2 are equal, meaning the NHT learning model has a moderate influence on students' mathematics learning outcomes.

The research aims to determine the differences in applying the TPS and NHT cooperative learning models to the mathematics learning outcomes of class VII in the academic year 2021/2022. The sample in this research is class VIIB as experimental class 1, totaling 31 students and class VIIE as experimental class 2 totaling 31 students. Experimental class 1 received treatment with TPS learning model increased learning outcomes from 29.45 to 79.96. While the experimental class 2, which received the NHT learning model treatment, also increased learning outcomes from 29.25 to 62.29. From that, it is known that the difference between the pretest and post-test of experiment 1 is 50.51, while the difference between the pretest and post-test of experiment 2 is 33.04.

Through the normality test of the student's initial learning outcomes data, the significant results for the experimental class 1 and the experimental class 2 are more than 0.05, so it can be concluded that the two data are normally distributed. Then after the normality test, a homogeneity test will be carried out, which aims to determine whether the sample comes from a population with the same or homogeneous variance. Through the homogeneity test, the researcher obtained a significance value greater than 0.05, which means it can be concluded that the two samples come from populations that have the same variance or are homogeneous.

The class that was given treatment using TPS cooperative learning had an average increase in learning outcomes that were higher than the class that was taught with the NHT cooperative learning model treatment. The TPS class has an average initial learning outcome and an average final learning outcome. In contrast, the NHT class has an average early learning outcome and an average

final learning outcome improves learning outcomes. This is because TPS learning provides more opportunities for students to study understanding individually compared to NHT. Students who are taught with the TPS learning model are more enthusiastic in receiving learning materials, because students are directed to be directly involved in the learning process, so that the material delivered becomes more memorable and interesting so that it can improve student learning outcomes, especially in learning mathematics. The effect of implementing the TPS and NHT learning models on students' mathematics learning outcomes is measured by 5 questions in the form of essays and can be seen from the students' pretest and posttest data.

Based on previous calculations, it is known that the average pretest of the experimental group 1, with the TPS learning model is 29.45 with the lowest score of 19 and the highest score of 40. Then the experimental class 1 was given learning treatment using the TPS learning model for three meetings. Then the students' mathematics learning outcomes were re-tested by providing the same questions, which then the average on the post- test increased to 79.96 with the lowest score of 69 and the highest score obtained by students was 95. Meanwhile, the average group pretest Experiment 2 with the NHT learning model was 29.95, with the lowest score of 20 and the highest score of 40. Then the experimental class 2 was given learning treatment using the NHT learning model for three meetings, and then the students' mathematics learning outcomes returned. Then tested by providing the same questions, which were then averaged on post-test increased to 62.29, with the lowest score being 52 and the highest score obtained by students was 77. Based on the results of the calculation of N Gain, the average score of student learning outcomes with the treatment of the TPS cooperative learning model increased by 0.7099, which means it is in the "High" category position.

In comparison, the results of increasing the average ability of students' mathematics learning outcomes with the treatment of the NHT learning model increased by 0.4676, which was in the "Medium" category position. From the calculation results of the increase in learning outcomes with the N Gain Score, it can be concluded that the TPS learning model is better to be applied in the learning process in order to improve student learning outcomes. The output results of the SPSS statistical program version 26 on hypothesis testing using the Independent sample *t*-test test on the results of the Gain scores of experimental class 1 and experiment 2 showed a significant value (2-tailed) < i.e. 0.000 <0.05 so it can be concluded that there is a significant difference between the experimental class 1 and experiment 2 after being given different treatments. Based on the learning observation sheet, all the steps of the learning activities have been carried out well. The implementation of this research was observed by one observer at each meeting. So, this shows that the implementation of the research is as expected.

Fauzi, Erna, & Linda (2021), in her journal entitled The Effectiveness of Collaborative Learning Through techniques on Group Investigation and Think Pair Share Students' Critical Thinking Ability on Chemical Equilibrium Material, stated that the TPS learning model is more effectively used in improving students' critical thinking skills in chemical balance material. Abdul (2014) noted that the TPS method is an effective method for changing discussion patterns in the classroom. The method TPS has a procedure for giving students time to think more, answer and help each other with other students (Azlina, 2010; Machfud, 2018). The TPS method has a particular characteristic that can distinguish it from other cooperative learning methods, pairing, namely discussing in pairs. This is supported by Surayya, Subagia, & Tika (2014), which states that at the pair stage, students will pair up to discuss the results of their previous thinking. This discussion requires thinking skills, including identifying problems, gathering information needed to

analyze data and making conclusions. These skills are the foundation for critical thinking. Meanwhile, the numbered head together. This learning model emphasizes a unique structure designed to influence student interaction patterns and aims to increase academic mastery (Trianto, 2012; Muliandari, 2019).

In both the experimental class 1 and the experimental class 2, the two techniques have something in common, namely that they can improve student mathematics learning outcomes. But the increase in student learning outcomes using the TPS learning model is higher than the increase in student mathematics learning outcomes with the NHT learning model. Rahayu, Ernawati, & Rahim (2020) has also done the same thing, where there is a significant difference between the application of the TPS and NHT learning models in improving student mathematics learning outcomes.

CONCLUSION

This study shows that Mathematics learning outcomes using the Think TPS cooperative learning model are significantly higher than the NHT learning model. This conclusion is based on the findings of the ANOVA test probability of 0.000 < 0.05, which means the hypothesis is accepted. This is also supported by the average post-test results of the two samples with the TPS learning model of 79.96 and NHT of 62.29. In data analysis using a *t*-test, a significance value (2 -taled) of 0.000 < 0.05 so it can be concluded that it is rejected and accepted, or students' mathematics learning outcomes by applying the TPS learning model are better than the application of learning outcomes using the NHT learning model. And also, based on the results of the gain, the average score of mathematics learning outcomes for students in experimental class 1 (TPS) is 0.7099 and experimental class 2 (NHT) is 0.4676. This means that the effect of applying the TPS cooperative learning model has a high-influences and the NHT learning model has a moderate influence on students' mathematics learning outcomes.

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