

**EFFECTIVENESS OF JIGSAW TYPE COOPERATIVE LEARNING MODEL
AND NUMBERED HEAD TOGETHER LEARNING MODEL ON
MATHEMATICS LEARNING OUTCOMES IN CLASS VII MTs
MUHAMMADIYAH KARANGKAJEN**

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ABSTRACT

This research was conducted with the reasons student low mathematic result learning, are less active in learning, rare and shy to ask. Math as a difficult subject and learning model used by teachers less varied. This study aims to determine the effectiveness of cooperative learning model NHT, learning models jigsaw and the result learning mathematic in second grade MTs Muhammadiyah Karangkajen in first semester academic year 2016/2017. The population in this study were all students of class VII MTs Muhammadiyah Karangkajen in first semester of academic year 2016/2017 is divided into five classes totaling 150. Samples were taken 3 classes using random sampling techniques, derived class VII D as an experimental class I, VII C class as the experimental class II, and VII A class as the control class. Data analysis techniques used for the prerequisite test including normality test with chi-square formula, bartlett homogeneity test by test, and test hypotheses include F test and significant raced different (LSD). Results of research on the significant level of 5% and db (2,87) show (1) there are differences in result learning of mathematics that uses model jigsaw, NHT learning model and conventional learning model. It is indicated with $F_{count} = 9,7078 > F_{table} = 3,115$ and (2) Cooperative learning NHT, jigsaw and more effective than conventional towards mathematics learning result. These results indicated by result of hypothesis testing 1-SD where the significant level of 5% and 87 degrees of freedom is obtained in one case because of $|\bar{y}_1 - \bar{y}_2| = 1,19 < LSD = 6,76$ then H_0 accepted means $\mu_1 = \mu_2$. In case II $|\bar{y}_1 - \bar{y}_3| = 6,36 > LSD = 6,05$ then H_0 is rejected and $\bar{y}_1 = 80,208 > \bar{y}_3 = 73,851$ means $\mu_1 > \mu_3$, while in the case III $|\bar{y}_2 - \bar{y}_3| = 7,5488 > LSD = 6,95$ then H_0 is rejected and $\bar{y}_2 = 81,400 > \bar{y}_3 = 73,851$ means $\mu_2 > \mu_3$.

Keyword : effectiveness, cooperative learning jigsaw model, cooperative learning NHT (*Numbered Head Together*) model, cooperative learning conventional

INTRODUCTION

The world of education in Indonesia still has many obstacles regarding the quality of education including limited access to education, the number of teachers who have not been evenly distributed, as well as the quality of the teachers themselves are considered to be lacking. Limited access to education in Indonesia, especially in remote areas thereby increasing the flow of urbanization to get better knowledge in the city.

Jigsaw type cooperative learning model is one type of cooperative learning that can develop creativity, the relationship between teachers and students runs in balance and the learning atmosphere becomes very familiar so as to allow harmony. The NHT learning model is one type of students' cooperative learning to be better prepared to deal with lessons in groups, students who already understand the lessons can teach students who do not understand, therefore students take responsibility in their groups that the teacher has agreed to present the results of discussions to students and help weak students in each group to achieve success.

Based on information on August 3, 2016 from the mathematics teacher at MTs Muhammadiyah Karangkajen, Mrs. Vika Rosana Alpha S.Pd that in the learning process the teacher uses conventional learning models. Conventional learning is generally referred to is learning by using the model that is usually done by the teacher that is giving material through lectures, exercises and then giving assignments. However, the implementation of the learning model is still centered on the teacher, so students are less actively involved in learning mathematics, students rarely ask the teacher during direct

learning, most students that mathematics is a difficult subject because it is full of calculations and formulas. Teachers also do not provide a variety of learning models to overcome the boredom and boredom of students in learning. In addition, based on the results of classroom observations conducted at MTs Muhammadiyah Karangkajen on August 5, 2016 during the teaching and learning process students only listen, take notes, do what is told by the teacher, do not dare to ask difficulties in understanding the material. Therefore most of the students' mathematics learning outcomes are low. Based on the elementary school UN scores in mathematics subject for grade VII students of MTs Muhammadiyah Karangkajen, the 2016/2017 school year shows that it is still relatively low. This can be seen in Table 1 below.

Table 1. Elementary National Exam scores in Mathematics Subjects for Class VII Mts Muhammadiyah Karangkajen Academic Year 2016/2017

No	Class	The number of students	Average Value	The highest score	The Lowest Value
1.	A	27	61,30	72,50	42,50
2.	B	32	59,61	77,50	45,00
3.	C	32	60,94	75,00	45,00
4.	D	30	59,83	75,00	42,50
5.	E	29	60,67	82,00	45,00

(source: MTs Muhammadiyah Karangkejan)

Based on the above table, the average SD UN scores are still low. Therefore educators must be able to determine and use suitable learning models to improve student learning outcomes. The varied learning model is an effort for students to be actively involved in the learning process. From the results of observations and information on teachers and students it can be concluded that students are less actively involved in learning mathematics and lack of improving student learning outcomes

Identification of the problems in this study are (1) Most students have low mathematics learning outcomes (2) Most students are less active in learning mathematics (3) Students are rarely and ashamed to ask the teacher when direct learning (4) Most students that mathematics lessons is a difficult subject so it is full of calculations and formulas (5) The learning model used by the teacher in the class is less varied so that students feel bored and bored in learning.

The objectives of this study are (1) To find out whether there is a difference between mathematics learning outcomes using the Jigsaw cooperative learning model, the NHT (Numbered Head Together) learning model and conventional learning models in class VII students of Mts Muhammadiyah Karangkajen odd semester 2016/2017 academic year , 2) To find out which one is more effective between Jigsaw learning model, NHT (Numbered Head Together) learning model and conventional learning model in improving mathematics learning outcomes in grade VII students of MTs Muhammadiyah Karangkajen odd semester 2016/2017 academic year.

THEORY

According to some experts in Suherman, Erman et al (2003: 17) that mathematics is a science of logic about the form, composition, magnitude and concepts obtained by reasoning about patterns and relationships, a path or mindset, an art, a tool in the form of symbolic language to help humans understand and master social, economic and natural problems.

According to Isjoni (2013: 14) cooperative learning model is one form of learning that is based on constructivist ideology. The learning is carried out a small group learning with the number of students 4-6 people to cooperate with each other in solving or discussing a problem and help each other in understanding the material in order to achieve a maximum learning objectives.

According to Huda, Miftahul (2014: 149), the steps in implementing learning with Jigsaw are as follows (1) The teacher divides the topic of the lesson into four parts / subtopics, (2) Before the subtopics are given, the teacher gives an introduction to the topic discussed at the meeting that day. The

teacher can write this topic on the board and ask students what they know about the topic. This brainstorming activity is intended to activate the ability of students to be better prepared to face new learning material, (3) Students are divided into groups of four, (4) The first part / subtopic is given to student 1, while student 2 receives the second / subtopic part and so on, (5) Then students are asked to read / work on parts / subtopics that are read / worked each with fellow members. In this activity, students can complement each other and interact with one another, (6) Specifically for reading activities, the teacher can share parts of a story that are not yet intact to each student. Students read the sections to predict what is told in the story, (7) Every member who gets the same subtopic gathers with members of other groups who also get the subtopic, this group is called the "expert group", (8) These groups then work together to study the subtopic, (9) Each member of the "expert group" returns to the original group and then explains what has just been learned from the "expert group"

According to Huda, Miftahul (2014: 138), the steps in implementing learning with the NHT are as follows (1) Students are divided into groups, (2) Each student in the group is numbered, (3) The teacher gives an assignment / questions in each group to work on, (4) Each group starts a discussion to find the answer that is most appropriate and ensures that all group members know the answer, (5) The teacher calls one number at random, (6) Students with a number that is called to present answers from the results of their group discussions

METHODS

This type of research is an experimental research design in this study using the design of the True Experimental Design with the type of Posttest-Only Control Design (Sugiyono, 2012: 112). The population in this study were all students of class VII MTs Muhammadiyah Karangajen 2016/2017 school year. While the sample in this study is class VII D, VII C, and VII A. Sampling in this study is by random sampling technique by lottery, with random sampling technique sampling can be done objectively. Data collection techniques used are documentation and test techniques in the form of objective questions in the form of multiple choice. The instrument testing uses validity test, reliability test and different power test. The analysis prerequisite test is normality test with Chi-squared formula and homogeneity test with Bartlett test. Research hypothesis testing using the f-test and LSD advanced test.

RESULTS

1. Early Mathematical Ability

Description of the initial mathematical ability values can be seen in Table 1.

Table 1. Description of Initial Ability Values

Class	Parameter		
	\bar{x}	S	S ²
Experiment Class I	59,83	10,1	102
Experiment Class II	60,94	7,71	59,58
Conventional Class	61,30	8,99	80,99

A summary of the results of the normality test can be seen in Table 2.

Table 2. Normality Test Results

Class	X^2_{count}	X^2_{table}	Dk
Experiment Class I	1,893	5,991	2
Experiment Class II	0,6758	5,991	2
Control class	0,906	9,4877	4

From the normality test at a significant level of 5%. So, $X^2_{stat} < X^2_{table}$. This shows that the initial mathematical ability of students in each sample is normally distributed data.

Summary of homogeneity test results can be seen in Table 3.

Table 3. Homogeneity Test Results

X^2_{count}	X^2_{table}	Significant level	df
3,0953	5,991	5%	2

From the homogeneity test obtained $X^2_{stat} < X^2_{table}$, so that H_0 is accepted. This shows that all three classes have the same initial ability.

Summary of the results of hypothesis testing can be seen in Table 4.

Table 4. Summary of ANAVA Initial Ability Values

Source of Variance	Number of Squares	df	F_{count}	F_{table}
Treatment	8604,5613	2	2,617	3,115
Error	979663,6713	87		
Total	15961,423	89		

Dari tabel diatas terlihat bahwa $F_{count} < F_{table}$ so it is said hypothesis H_0 is accepted and concluded that there is no difference in the initial ability of students who use the experimental class I, experiment II and MTs Muhammadiyah Karangajen control class VII odd semester of the 2016/2017 school year.

2. Mathematics Learning Outcomes

A description of the initial capability values can be seen in Table 5.

Table 5. Description of Mathematics Learning Outcomes

Class	Parameter		
	\bar{x}	S	S^2
Experiment Class I	80,21	8,168	66,720
Experiment Class II	81,40	6,316	39,887
Control class	73,85	10,664	113,711

A summary of the results of the normality test can be seen in Table 6.

Table 6. Normality Test Results

Class	X^2_{stat}	X^2_{table}	Dk
Experiment Class I	3,391	5,991	2
Experiment Class II	4,564	5,991	2
Control class	1,549	5,991	2

From the homogeneity test at a significant level of 5%. So, $X^2_{count} < X^2_{table}$. This shows that the value of students' mathematics learning outcomes in each sample is normally distributed data.

Summary of homogeneity test results can be seen in Table 7.

Table 7. Homogeneity Test Results

X^2_{count}	X^2_{table}	Significant level	df
3,011	3,8415	5%	2

From the homogeneity test obtained $X^2_{count} < X^2_{table}$, so that H_0 is accepted. This shows that both classes have the same (homogeneous) learning outcomes in mathematics.

Summary of the results of hypothesis testing can be seen in Table 8.

Table 8. Summary of ANAVA Mathematical Learning Outcomes

Source of Variance	Number of Squares	df	F_{count}	F_{table}
Treatment	3461,097368	2	9,7078	3,115
Error	15330,74998	87		
Total	15961,4226	89		

From the table above it can be seen that $F_{count} > F_{table}$ so it is said that the H_0 hypothesis is rejected and it is concluded that there are differences in mathematics learning outcomes between students who use the jigsaw learning model, NHT and conventional MTs Muhammadiyah Karangkajen class VII odd semester 2016/2017 academic year.

The summary of LSD hypothesis test results can be seen in Table 9.

Table 9. LSD Hypothesis Test

Case	LSD	$ \bar{y}_i - \bar{y}_j $	Results	Conclusion
Case I	6,76	1,19	H0 received	$\mu_1 = \mu_2 > \mu_3$
Case II	6,05	6,36	H0 is rejected	
Case III	6,95	7,55	H0 is rejected	

From the table above it appears that $\mu_1 = \mu_2 > \mu_3$, it means that the Jigsaw learning model is as good as the NHT learning model, whereas the Jigsaw learning model and the NHT learning model are more effective than conventional learning models for mathematics learning outcomes of Grade VII students of MTs Muhammadiyah Karangkajen Yogyakarta 2016/2017 school year

DISCUSSION

Based on data analysis, it can be concluded that learning mathematics using the Jigsaw model is as good as learning mathematics using the NHT (Numbered Head Together) model, but learning mathematics using the Jigsaw or NHT (Numbered Head Together) model is more effective than learning using the model conventional.

The Jigsaw learning model is as good as the NHT model than the conventional learning model because in the Jigsaw and NHT models when learning in class most students have a sense of responsibility in doing assignments, exchanging the results of discussions with group peers. In addition, students also actively ask questions if students still do not understand the material provided. So that it makes the process of teaching and learning activities run smoothly and student mathematics learning outcomes for the better.

Whereas the Jigsaw or NHT model is more effective than conventional learning because in conventional learning models when learning most students are teacher-centered, students are still less active in the learning process. In the end it will affect the process of learning outcomes in mathematics

CONCLUSION

Based on the results of research and discussion, the activity concludes several things as follows.

1. There is a difference in the results of students' mathematics learning taught using Jigsaw, NHT (Numbered Head Together) and conventional learning models in grade VII students of MTs Muhammadiyah Karangkajen for the 2016/2017 school year. This is indicated by a significant level of 5% and degrees of freedom = (2, 87), the value of $f_{count} = 9.7078$ and $f_{0,005}(2,87) = 3.115$ is obtained so that H_0 is rejected and H_1 is accepted.

2. Jigsaw cooperative learning with NHT is more effective than conventional learning on mathematics learning outcomes of Grade VII students of MTs Muhammadiyah Karangajen Academic Year 2016/2017

REFERENCES

- Suherman, Erman, dkk. 2003. *Strategi Pembelajaran Matematika Kontemporer*. Bandung: UPI..
- Huda, Miftahul 2014. *Cooperative Learning*. Yogyakarta : Pustaka Pelajar
- Sugiyono. 2012. *Metode Penelitian Pendidikan*. Bandung: Alfabeta.
- Isjoni. 2013. *Pembelajaran Kooperatif Meningkatkan Kecerdasan Komunikasi Antar Peserta Didik*. Yogyakarta: Pustaka Pelajar.