THE EFFECTIVENESS OF THE USE OF COOPERATIVE LEARNING MODEL TYPE THINK PAIR SHARE (TPS) ON THE MATHEMATICS PROBLEM SOLVING ABILITY

Diah Candra Wulandari[a], Sunaryo[b]
Program Studi Pendidikan Matematika Universitas Ahmad Dahlan
Jalan Ring Road Selatan, Tamanan, Banguntapan, Bantul, Yogyakarta
[a]wulanchandra14@gmail.com, [b]sunaryo.bener@yahoo.ac.id

ABSTRACT

The learning process centered on teachers has resulted in a lack of mathematical problem-solving ability. This study aims to determine (1) To know the differences of student's ability to solve mathematics problems by using a cooperative learning model of TPS type and students taught using the Direct learning model, (2) Effectiveness of TPS type cooperative learning model compared to Direct learning model. This type of research uses quantitative research methods. This study's population is the students of class VII Semester II Muhammadiyah Junior High School 1 Yogyakarta (SMP Muhammadiyah 1 Yogyakarta) academic year 2016/2017. Sampling was done by random sampling to class, selected class VII F as experiment class, and VII G as control class. The technique of collecting data by a test method. This research instrument is a math problem-solving test in the form of a description problem. Data analysis used was a t-test, normality test using the Chi-Square formula, and homogeneity test using the Bartlet test with a 5% significant level. Hypothesis test in this research uses two parties, t-test and one party t-test with a 5% significant level. Based on the results of this study at a significant level of 5% and degrees of freedom 62, then obtained: (1) $t_{count} = 4{,}9963$ and $t_{table} = 2{,}0193$, obtained $t_{count} > t_{table}$, so H_0 rejected. Then there are differences in the problem-solving skills of students whom mathematics using the cooperative learning model of TPS type with students who are using the Direct learning model. (2) $t_{count} = 4{,}9963$ and $t_{table} = 1{,}6797$, obtained $t_{count} > t_{table}$ so H_0 rejected. So it can be concluded that the model of cooperative learning TPS type is more effective than the direct learning model to the problem-solving ability of mathematics.

Keywords: effectiveness, Think Pair Share (TPS), math problem-solving ability.

INTRODUCTION

Education is one of the important things in determining the progress of a nation. The progress of a nation is achieved if it has high quality and dedicated human resources obtained through education. Educational activities, among others, are carried out in schools. Law Number 20 of 2003 article 1 paragraph 20 states that: Learning is the process of interaction of students with educators and resources in a learning environment. Learning is an effort of educators to help students carry out learning activities. The success of the learning process is the goal to be achieved in implementing education in schools. For the learning process to succeed, the teacher must guide students and optimize the interesting learning media. Also, an appropriate learning model is needed because it is a means of interaction between the teacher and students in teaching and learning activities. According to Ahmad Susanto (2013: 183) states that: Mathematics is one of the disciplines that can improve the ability to think and reason, contribute to solving everyday problems.

Until now, mathematics was one of the lessons that were abstract because mathematical objects in the form of mind-objects, to understand it needed problem-solving abilities. By having the ability to solve problems, it will get optimal results. The purpose of learning mathematics is not just to make students master mathematics in theory. However, students must be able to apply mathematical concepts to solve various problems in everyday life. According to Ahmad Susanto (2013: 195) states that Problem-solving is the process of applying knowledge (knowledge) that has been obtained by previous students into a new situation.

Udin S. Winataputra et al. (1992: 253) states that: Problems in mathematics for students are problems or problems of mathematics. Mathematical problem-solving can be done individually or in groups. Getting used to students in problem-solving activities can improve students' ability to do math

problems using concepts. Indicators of problem-solving, according to George Polya in Uba Umbara (2017), are as follows:

1. Understanding the Problem
2. Devising a Plan
3. Carrying out the Plan
4. Looking Back

Based on an interview with one of the seventh-grade mathematics teachers of SMP Muhammadiyah Yogyakarta 1 named Ibu Yunita Sari on November 8, 2016. According to Ms. Yunita Sari, the ability to solve math problems of grade VII students at SMP Muhammadiyah 1 Yogyakarta is still low. Students still have difficulty in solving mathematical problems. This is reinforced by seeing the Mid-Semester Assessment mathematics subjects of VII grade students of Even Semester SMP Muhammadiyah 1 Yogyakarta 2016/2017 Academic Year is still below the minimum expected completeness criteria. It is set at 76.00, as shown in Table 1.

Table 1. Results of Middle Semester Subjects for Mathematics Subjects for Class VII Even Semester SMP Muhammadiyah 1 Yogyakarta in 2016/2017 Academic Year

Class	Total students		Percentage	
	Complete	No Complete	Complete	No Complete
VII A	11	11	50 %	50 %
VII B	0	24	0 %	100 %
VII C	3	32	8,57 %	91,43 %
VII D	8	23	25,81 %	74,19 %
VII E	0	32	0 %	100 %
VII F	4	32	11,11 %	88,89 %
VII G	6	23	20,69 %	79,31 %

(source: SMP Muhammadiyah 1 Yogyakarta)

From the above table, it can be seen that there are still many results of PTS mathematics students who have not yet reached the Minimum Completeness Criteria (MCC). This shows that the students' mathematical problem-solving ability is still low. The average student is unable to answer the problem description in the TPS problem by using the concepts he learned. The provision of material in class VII usually uses the Direct learning model. According to Abdul Majid (2013: 73), the main weakness of the Direct learning model is developing the abilities, processes, and attitudes needed for critical thinking and interpersonal relationships and group learning.

Direct learning models cannot serve each individual's differences, so it is challenging to develop students' abilities, so they have not been able to encourage students to develop problem-solving abilities by using concepts optimally. For this reason, it is necessary to use other methods, strategies, and learning models. It is intended that learning is expected to be able to increase the potential possessed to be able to work together in solving various forms of mathematical problems. One of the cooperative learning models is using the Think Pair Share (TPS) type of cooperative learning model. In his book, Agus Suprijono (2009: 91) states that thinking this learning begins with the teacher asking questions or issues related to the lesson for students to think about. Pairing the next stage, the teacher asks students to pair up, and it is expected that students discuss so that they can deepen the meaning of the answers they have thought through intersubjective with their partners. Sharing the results of intersubjective discussions in each pair, the results are discussed with pairs throughout the class. In this activity, it is expected that questions and answers will occur, which will encourage the construction of knowledge in an integrative manner. Students can find the structure of the knowledge they learn.

Using the TPS learning method, students will feel together to solve a problem and build student activity and collaboration in groups so that students can improve their mathematical problem-solving abilities in the class. Because the purpose of cooperative learning models TPS is to develop student participation in class through discussion, both with their partners and class.

Based on the background of the problem, then the problem can be formulated to be investigated, namely:

1. Is there a difference in the ability to solve mathematical problems of students who use the cooperative learning model TPS type and students who are taught using the Direct learning model in class VII Semester II SMP Muhammadiyah 1 Yogyakarta Academic Year 2016/2017?
2. Is the TPS type of cooperative learning model more effective than the Direct learning model of the ability to solve math problems in class VII Semester II SMP Muhammadiyah 1 Yogyakarta Academic Year 2016/2017?

The objectives to be achieved from this research are

1. To determine whether there is a difference in the mathematical problem-solving ability of students who are taught using cooperative learning models of the TPS type and students who use Direct learning models in class VII Semester II SMP Muhammadiyah 1 Yogyakarta Academic Year 2016/2017.
2. The effectiveness of the TPS type of cooperative learning model compared to the Direct learning model of the ability to solve mathematical problems in class VII Semester II SMP Muhammadiyah 1 Yogyakarta Academic Year 2016/2017.

METHODS

This research is classified as experimental research. The research site was conducted at SMP Muhammadiyah 1 Yogyakarta. At the same time, the research was conducted in the second semester of the 2016/2017 school year consisting of 7 classes. There are two excellent IT classes, one excellent mathematics, one excellent English, and three regulars. In this study, sample selection was carried out random sampling by lottery against the class. After the draw of the population consisting of 3 regular classes obtained class VII F as an experimental class and class VII G as a control class. This design research is illustrated in Table 2.

Table 2. Research Design

Class	Initial Ability	Treatment	Posttest (Final Test)
Experiment	O_1	X_1	Y_1
Control	O_2	X_2	Y_2

Information :

O_1: The initial ability of the Experiment class

O_2: The initial ability of the Control class

X_1: Treatment using the TPS type of cooperative learning model

X_2: Treatment using the Direct learning model

Y_1: Experiment class posttest results

Y_2: Control class posttest results

This study's variables are the type of TPS cooperative learning model towards the ability to solve math problems and the Direct learning model towards the ability to solve mathematics in class VII Semester II of SMP Muhammadiyah 1 Yogyakarta 2016/2017 Academic Year. The stages are done when the teacher uses the first type of TPS cooperative learning model Thinking is the teacher asking questions related to the subject matter individually then students think and work on the questions, the second Pairing is the teacher asks students to pair up with other students to discuss the answers given to the first stage then students pair up with classmates then discuss the answers submitted by the teacher, the third is Sharing, the teacher asks the partner to share with the whole class about what they have done then students present the answers to the results of the discussion in front of the class and give responses to the results which are presented.

The stages when the teacher uses the direct learning model are first the teacher explains the learning objectives and prepares students, the second teacher demonstrates correct knowledge, the third teacher plans and provides initial training, the fourth teacher checks to understand and provides feedback

and the fifth the teacher provides opportunities for training advanced and application. The data collection technique used in this study is the method of test item description with scoring criteria problem-solving ability is 0, 1, 2, and 3. The scoring indicator is understanding the problem, formulating a solution plan, implementing the plan, and checking again. Data analysis used analysis prerequisite test consisting of normality test with Chi-Square test and homogeneity test with Bartlett test. The formula used in the normality test is as follows:

$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

Suparman (2013:70)

The formula used in the homogeneity test uses the Bartlett test, namely:

$$\chi^2 = (ln\,10)\left[B - \sum_{i=1}^{k}(n_i - 1)\,log\,{S_i}^2\right]$$

with,

$$B = (log\,S^2)\sum_{i=1}^{k}(n_i - 1)$$

$$S^2 = \frac{\sum_{i=1}^{k}(n_i - 1){S_i}^2}{\sum_{i=1}^{k}(n_i - 1)}$$

Sudjana (2002:263)

Hypothesis test uses two-party t-test and one-party t-test with the following formula:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

with,

$$S^2 = \frac{(n_1 - 1){S_1}^2 + (n_2 - 1){S_2}^2}{n_1 + n_2 - 2}$$

Sudjana (2002:239)

The null hypothesis pair (H_0) and its counterpart (H_1) tested on the two-party t-test are:

$$H_0: \mu_1 = \mu_2$$
$$H_1: \mu_1 \neq \mu_2$$

Sudjana (2002:242)

The null hypothesis pair (H_0) and its counterpart (H_1) tested on a one-party t-test are:

$$H_0: \mu_1 \leq \mu_2$$
$$H_1: \mu_1 > \mu_2$$

Sudjana (2002:243)

RESULTS AND DISCUSSION

Based on research that has been carried out, data was obtained in the form of initial ability and ability to solve mathematical problems.

The summary of the results of the initial ability normality test can be seen in Table 3

Table 3. Summary of Initial Ability Normality Test Results

Class	χ^2_{count}	χ^2_{table}
Experiment	2,2742	7,8147
Control	0,4302	5,9915

From the table above it can be seen that $\chi^2_{count} > \chi^2_{table}$, this shows that the initial mathematical ability of students in each sample is normally distributed data.

The summary of the results of the initial ability homogeneity test can be seen in Table 4

Table 4. Summary of Initial Ability Homogeneity Test Results

χ^2_{count}	χ^2_{table}
0,4034	5,0239

From the table above that has been done in class VII E, VII F, VII G with degrees of freedom three and a significant level of 5%, it can be seen that $\chi^2_{count} > \chi^2_{table}$This table shows that all three classes have the same initial ability.

The summary of the results of the initial two-party hypothesis test capabilities can be seen in Table 5

Table 5. Summary of Hypothesis Test Results for Two Parties Initial Capabilities

t_{count}	t_{table}
0,1927	2,019

From the table above, it can be seen that $t_{count} < t_{table}$ so that it is said the hypothesis H_0 is accepted and concluded that there is no difference in the initial ability of the experimental class students with the control class students.

The summary of normality tests of mathematical problem-solving abilities can be seen in Table 6.

Table 6. Summary of Test Results for Normality in Mathematical Problem-solving Ability

Class	χ^2_{count}	χ^2_{table}
Experiment	3,0546	5,9915
Control	0,7893	5,9915

From the table above, the $\chi^2_{\text{count}} > \chi^2_{\text{table}}$ shows that the students' mathematical problem-solving abilities in the experimental class and the control class are normally distributed.

The summary of the homogeneity test results on the ability to solve mathematical problems can be seen in Table 7

Table 7. Summary of Homogeneity Test Results in Mathematical Problem-solving Ability

χ^2_{count}	χ^2_{table}
3,7869	3,8415

From the table above, it can be seen that $\chi^2_{\text{count}} > \chi^2_{\text{table}}$ so that H_0 is accepted, this shows that both classes have the same mathematical problem-solving ability (homogeneous).

The summary of the two-party hypothesis test mathematical problem-solving ability can be seen in Table 8.

Table 8. Summary of Results of Two-Party Hypothesis Test Ability to Solve Mathematical Problems

t_{count}	t_{table}
4,9963	2,0193

From the table above it can be seen that $t_{\text{count}} < t_{\text{table}}$ so that H_0 is rejected, so there is a difference between students' mathematical problem-solving abilities using TPS type cooperative learning models and students who use Direct learning models in class VII Semester II students of SMP Muhammadiyah 1 Yogyakarta 2016/2017 Academic Year.

The summary of the two-party hypothesis test mathematical problem-solving ability can be seen in Table 9

Table 9. Summary of Results of One-Party Hypothesis Test Ability to Solve Mathematical Problems

t_{count}	t_{table}
4,9963	1,6797

From the table above it can be seen that $t_{count} < t_{table}$ so that H_0 is rejected, so the cooperative learning model of the TPS type is more effective than the Direct learning model of the mathematical problem-solving ability of students of class VII Semester II of SMP Muhammadiyah 1 Yogyakarta 2016/2017 Academic Year.

CONCLUSION

Based on the results of research and discussion as described above, the following research conclusions can be drawn:

1. There is a difference in students' mathematical problem-solving abilities using the TPS type of cooperative learning model with students who are taught using the Direct learning model class VII Semester II of SMP Muhammadiyah 1 Yogyakarta 2016/2017 Academic Year.
2. The TPS type of cooperative learning model is more effective than the Direct learning model of the ability to solve math problems in seventh-grade students of SMP Muhammadiyah 1 Yogyakarta 2016/2017 Academic Year.

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