Comparison of Cooperative Learning Model Think Pair Share and Think Pair Square Toward Students’ Mathematical Communication Ability

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Abstract

This study discusses the improvement of students’ mathematical communication ability using cooperative models of Think Pair Share and Think Pair Square types. This study is a quasi-experiment with One Group Pretest-Posttest Design. The population in this study were all students of class XI of SMA Negeri 6 Palopo in the 2018/2019 school year and the sample was class XIA and XIB selected using random sampling. With purposive sampling technique with consideration of the class chosen with heterogeneous (varied) student abilities. Data obtained in this study came from test instruments. Data analysis techniques used descriptive statistical analysis and inferential statistical analysis. Based on the results of the normalized Gain calculation, the application of Think Pair Share cooperative learning models as well as the application of Think Pair Square cooperative learning models are equally dependent on the medium category. Hypothesis test results concluded that there was no significant difference between students’ mathematical communication skills taught through the application of Think Pair Share cooperative learning models with Think Pair Square types.

Keywords: Think Pair Share, Think Pair Square, Mathematical Communication

1. Background

Trianto in his quote that according to Ki Hajar Dewantara education is an effort to advance character (inner strength), mind (intellect) and the physical body of children in harmony with nature and society. This means that education aims to guide all the power that is in students, so that later as humans and as members of society they can achieve the highest success and happiness. There are many educational units in each education channel that are ready to educate the life of the nation in accordance with the opening of the 1945 Constitution. All education providers in educational units have a great responsibility in educating students to master the knowledge provided. Teachers in this case play an important role in the education process. Education is a vehicle to improve and develop the quality of human resources. One of them is the education of mathematics learning.

BSNP (in Marlina, et al, 2014) states the Education Unit Level Curriculum (SBC) explained the objectives given mathematics learning in high school are: (1) Understanding mathematical concepts, explaining the interrelationships between concepts and applying concepts and algorithms flexibly, accurately, efficiently, and right in problem solving; (2) Using reasoning on patterns and traits, carrying out mathematical manipulations in making generalizations, compiling evidence or explaining mathematical ideas and questions; (3) Solve problems that include the ability to understand problems, design mathematical
models, solve mathematical models, and interpret the solutions obtained; (4) Communicating ideas with symbols, tables, diagrams or other media to clarify the situation or problem; (5) Having an attitude of appreciating the usefulness of mathematics in life that is having curiosity, attention, and interest in learning mathematics, as well as being tenacious and confident in problem solving.

As one of the general objectives of mathematics, mathematical communication skills are very important possessed by students. Baroody (in Shafridla, 2012) mentioned at least two important reasons mathematical communication skills need to be developed in students. First, mathematics as language, means that mathematics is not just a tool to help thinking, a tool for finding patterns, solving problems or drawing conclusions, but mathematics is also a valuable tool for communicating ideas clearly, precisely, and carefully. Second, mathematics learning as social activity, which means that as a social activity in learning mathematics, mathematics is also a vehicle for interaction between students and also communication between teacher and students.

From the results of observations made by researchers at Palopo 6 Public High School, it was seen that students' mathematical communication received less attention. The obstacle of students in learning mathematics is that students lack confidence in answering questions, even though examples have been given previously. When students are confronted with various questions, some students actually understand the questions given, but the lack of understanding and lack of student curiosity, causes students to prefer cheating on their other friends. This is in line with the results of interviews conducted by researchers with mathematics teachers in the class to be studied, revealing the possible obstacles faced by students is the lack of students' understanding of learning, even though many students have been able to answer the questions given. Besides the lack of initial ability of students to mathematical operations in particular, so students are sometimes mistaken in solving math problems. As a result, the teacher becomes a learning center where the teacher must explain in detail the teaching material.

This relates to students' mathematical communication skills. First, because there are students who do not ask the subject teacher about the obstacles they have encountered while working on the problems, causing students to just cheat on other students to cover their ignorance. Second, students are less able to communicate mathematical ideas that are thought to be related to solving given problems, causing students who have been able to answer questions give answers to their friends, without explaining how to solve these problems. But in the implementation of this 2013 curriculum, indirectly mathematical communication of students became better because, the implementation of learning became student-centered.

In addition, efforts that can be made by teachers so that student-centered learning is designing learning, namely through the application of appropriate cooperative learning models especially to improve students' mathematical communication skills. The same thing was expressed by Artzt as quoted by Umar (2012), showing that through cooperative learning that is carried out effectively and making careful assessments of every communication that occurs in every student activity both individually and in groups, can develop communication skills in solving problems faced. The cooperative learning model is a learning model that requires students to group with classmates. As a result there will be discussion and students jointly solve the given problem. So this will affect the atmosphere of student learning, and can improve students' ability to interact with group peers, and indirectly improve student communication skills, especially in learning mathematics.

Among the many cooperative learning models, researchers chose to apply the cooperative learning model Think Pair Share type and Think Pair Square type. These two types of cooperative learning models the researcher chooses because group learning in pairs will be more effective and useful. Students will become more focused in doing the assignments.
given by the teacher. This cooperative learning model is indirectly expected to improve students’ mathematical communication.

According to Marlina, et al (2014) one of the virtues of the Think Pair Share type of cooperative learning model is that it can foster student involvement and participation by providing open opportunities for students to speak and express their own ideas and motivate students to engage in conversation in class. Thus the use of Think Pair Share cooperative learning models can help students communicate mathematically to convey information, such as expressing ideas, asking questions and responding to questions from others. This is in line with research conducted by Husna, et al (2013) states that mathematical communication of students who obtain cooperative learning Think Think Share type is better than students who obtain conventional learning.

Meanwhile, the Think Pair Square cooperative model is a model that gives students the opportunity to discuss their ideas and provide an understanding for them to see other ways to solve problems. In this type of learning model, if a pair of students cannot solve the problem, then another pair of students can explain how to answer it. After that, if the problem raised does not have a correct answer, then the two pairs can combine their results and form a more unified answer.

2. Methods

This study was a quasi-experimental study with independent variables, namely the treatment given to students and the dependent variable, namely students’ mathematical communication skills. This study involves two groups or experimental classes namely experimental class I which in the learning process applies the Think Pair Share cooperative learning model and the experimental class II by applying the Think Pair Square cooperative learning model.

The study design used in this study is Two Group Pretest-Posttest Design. In this design the sample group is given a pretest before being given treatment. The study design is as follows:

<table>
<thead>
<tr>
<th>O₁</th>
<th>X₁</th>
<th>O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₁</td>
<td>X₂</td>
<td>O₂</td>
</tr>
</tbody>
</table>

Note:
O₁ : Pretest
O₂ : Posttest
X₁ : Cooperative Learning Model TPS
X₂ : Cooperative Learning Model TPS TPSq

The population in this study were all students of class XI SMA Negeri 6 Palopo consisting of four classes. Samples were selected as many as two classes selected by purposive sampling technique with the consideration that the selected class heterogeneous (varied) student abilities. Data obtained in this study came from test instruments. The form of the test used to see students’ mathematical communication skills is the description. According to Suherman (2003, 110) the description test is a test (a set of questions in the form of assignments or questions) that requires students to organize and state their answers according to their own words (sentences).

The test is arranged based on indicators of mathematical communication skills. Mathematical communication ability test results students were scored according to scoring criteria. Scoring criteria are prepared based on the reference rubric of mathematical communication skills scoring according to Nari (2015).
Data analysis techniques used descriptive statistical analysis and inferential statistical analysis. Descriptive statistics are used to describe how the students describe mathematical communication skills after applying the cooperative type TPS and TPSq type models. Furthermore, inferential statistics are used to test hypotheses. Before conducting the hypothesis test, the prerequisite test is normality test and homogeneity test. Normality testing uses the Chi-square test while the homogeneity test uses the F-test. Then testing hypotheses using hypotheses using t-test at a rate of $\alpha = 0.05$.

### 3. Results and Discussion

The results of descriptive statistical analysis of students' mathematical communication skills through the application of the TPS and TPSq cooperative models can be presented in the following table:
The amount of improvement in students' mathematical communication skills after the application of cooperative learning models Think Pair Share type and Think Pair Square type is presented in the normalized Gain classification table as follows:

<table>
<thead>
<tr>
<th>Group</th>
<th>Coefficient of gain normalized</th>
<th>Total</th>
<th>Percentage (%)</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g &lt; 0,3$</td>
<td>1</td>
<td>4,35</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>$0,3 \leq g &lt; 0,7$</td>
<td>16</td>
<td>69,57</td>
<td>Midle</td>
<td></td>
</tr>
<tr>
<td>$g \geq 0,7$</td>
<td>6</td>
<td>26,09</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>0,63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g &lt; 0,3$</td>
<td>1</td>
<td>4,35</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>$0,3 \leq g &lt; 0,7$</td>
<td>18</td>
<td>78,26</td>
<td>Midle</td>
<td></td>
</tr>
<tr>
<td>$g \geq 0,7$</td>
<td>4</td>
<td>17,39</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>0,58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on the analysis of the average score of normalized Gain values above, the application of Think Pair Share cooperative learning models and the application of Think Pair Square cooperative learning models are in the medium category. The results of students' mathematical communication skills in the two experimental classes are based on indicators of mathematical communication skills, namely:

**The ability to express mathematical ideas through oral, written, and demonstrate and visualize them**

Indicators of the ability to express mathematical ideas through oral, written, and demonstrate and describe them visually, can be seen from students able to solve mathematical problems and able to write mathematical ideas in written form. Based on the results of the pretest (initial test) students' mathematical communication skills before applying cooperative learning models Think Pair Share type as a whole students have not been able to solve mathematical problems and are able to write mathematical ideas. After being given a posttest (final test) overall students are able to solve mathematical problems. In the experimental class II, when given a pretest (initial test) some students were able to solve existing mathematical problems. After being given a posttest (final test) as a whole students are able to solve mathematical problems while there are still unable to write mathematical ideas in written form.

**The ability to understand, interpret, and evaluate mathematical ideas both verbally and in other visual forms**

Indicators of the ability to understand, interpret, and evaluate mathematical ideas both verbally and in other visual forms can be seen from students being able to interpret mathematical problems in the form of images. When given a pretest (initial test) in the experimental class I, overall students do not understand how to interpret the problem given in the form of images. After being given a posttest (final test) through the application of a Think Pair Share type cooperative model some students are able to interpret mathematical problems in the form of images. In the experimental class II, when given a pretest there were students who were able to interpret mathematical problems in the form of images. After being given a posttest (final test), some students are able to interpret mathematical problems in the form of images.

**The ability to use terms, mathematical notations, and structures to present ideas, describe relationships, and model situations**

Indicators of the ability to use terms, mathematical notations, and structures to present ideas, describe relationships, and models of this situation can be seen from students being able to write the appropriate formula. Overall, the results of students' mathematical communication pretest in experimental class I, before applying Think Pair Share type
cooperative learning models students have not been able to write a formula that fits the problem. Tests after applying Think Pair Share cooperative learning models or posttest, students as a whole are able to write formulas in accordance with the problem. Meanwhile in class II experiment, some students were able to write a formula that was appropriate to the problem when given a pretest (initial test). After being given a posttest (final test) which through the application of the Think Pair Square type cooperative model the student as a whole is able to write the formula in accordance with the questions.

From the results of the independent test, it can be concluded that there is no significant difference in the increase in mathematical communication skills of students of class XI in SMA Negeri 6 Palopo who are taught using the Cooperative model of the Think Pair Share type and the Think Pair Square type. One reason is because in the two learning models there are some similarities in the implementation process. The similarity of Think Pair Share cooperative learning models and Think Pair Square cooperative types can be seen in the following table.

<table>
<thead>
<tr>
<th>Cooperative Model</th>
<th>Think Pair Share</th>
<th>Cooperative Model</th>
<th>Think Pair Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>The teacher introductory phase explains the rules of the game and informs the time limits for each activity</td>
<td>The teacher also explains the rules of the game and informs the time limits for each activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Thinking Stage students are given worksheets and given a time limit to think individually about the questions given</td>
<td>The teacher distributes the worksheets and asks students to think independently about the given problem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair stage Students pair up to discuss the answers to the problems that existed in the previous stage</td>
<td>Students pair up exchanging ideas and discussing their answers with each other in the previous stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>Presentation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on the table above, it can be seen that the Think Pair Share type of cooperative learning models and Think Pair Square type cooperatives in the preliminary stage the teacher together explain the rules of the game and inform the time limits for each activity to be carried out. At the Think stage in the experimental class II which applied the Think Pair Share type cooperative model students were distributed LKS and were given a time limit to think independently of the problem given, as well as in the experimental class II who applied the Think Pair Square cooperative model. At the Pair stage through the application of the Think Pair Share type of cooperative model students pair up discussing the answers of the problems that existed in the previous stage, as well as through the application of the Think Pair Square type cooperative learning model students exchange ideas and discuss about the answers obtained in the previous stage. In the experimental class I who applied the Think Pair Share type of cooperative learning model the results of the discussion were presented in front of the class, and in the experimental class II which applied the Think Pair Square type cooperative model the results of the discussion were also presented throughout the group in the class and a class discussion ensued.

4. Conclusion

Based on the data analysis that has been done, it can be concluded that there is an increase in students' mathematical communication skills after the application of cooperative learning types of TPS and TPSq. However, the results of the hypothesis test concluded that there was no significant difference in the mathematical communication ability of students taught through the application of Think Pair Share cooperative learning models with Think
Pair Square types. Through the application of Think Pair Share cooperative learning models, the average score of normalized Gain is in the medium classification. Meanwhile, the normalized Gain score of students' mathematical communication abilities normalized through the application of Think Pair Square cooperative learning models is also in the medium category.

Based on the conclusions from the results of the study, there are several things that researchers need to suggest that both through the Cooperative learning model Think Pair Share type and Think Pair Square type can both improve students' mathematical communication skills.

For the next researcher, students' mathematical communication skills can be examined more deeply, given the communication skills of students who are still in the medium category, so they can be increased to high classification.

5. Citation and References


