Comparison effectiveness of cooperative learning type STAD with cooperative learning type TPS in terms of mathematical method of Junior High School students

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Abstract. This research is aimed to find out whether the model of cooperative learning type Student Team Achievement Division (STAD) is more effective than cooperative learning type Think-Pair-Share in SMP Negeri 7 Yogyakarta. This research was a quasi-experimental research, using two experimental groups. The population of research was all students of 7th class in SMP Negeri 7 Yogyakarta that consists of 5 Classes. From the population were taken 2 classes randomly which used as sample. The instrument to collect data was a description test. Measurement of instrument validity use content validity and construct validity, while measuring instrument reliability use Cronbach Alpha formula. To investigate the effectiveness of cooperative learning type STAD and cooperative learning type TPS on the aspect of student's mathematical method, the datas were analyzed by one sample test. Comparing the effectiveness of cooperative learning type STAD and TPS in terms of mathematical communication skills by using t-test. Normality test was not conducted because the sample of research more than 30 students, while homogeneity tested by using Kolmogorov Smirnov test. The analysis was performed at 5% confidence level. The results show as follows:

1) The model of cooperative learning type STAD and TPS are effective in terms of mathematical method of junior high school students. 2). STAD type cooperative learning model is more effective than TPS type cooperative learning model in terms of mathematical methods of junior high school students.

1. Introduction

1.1. Background
Progress of Hermawan so it needs ability to obtain, select and manage information [1]. The abilities must be based on critical, systematic and logical thinking, because they are important for analyzing and evaluating arguments so that can make rational and responsible decision. Therefore, an educational program is needed, that can develop critical, systematic and logical thinking skills. One of the educational programs that can develop the abilities is mathematics.

Seeing the importance of mathematics and its role in facing the progress of science and technology and global competition, the quality improvement of mathematics education in all types and levels of education should always be pursued. Efforts to improve the quality of mathematics have been done by the government, one of them is by perfecting the education curriculum. One of the goals from
Kurikulum Tingkat Satuan Pendidikan (KTSP) through mathematics learning in Junior High School [2] at least there are some competencies are expected from the student after studying mathematics, including : using logical thinking in design and character, performing mathematical manipulations in generalization, compiling evidence and being able to communicate ideas or mathematics ideas. Based on initial observation made by the researcher at 7th class in SMP Negeri 7 Yogyakarta, found some problems in learning process, including: teacher still dominated the learning (teacher center) and gave less opportunities for students to communicate ideas, students were less involved directly in mathematics learning process. Consequently, students only receive teacher’s opinions and tend to be afraid in expressing their ideas; many students tend to wait for the work of their friends to be copied as the answer; the average daily test score is low; teacher has not understood yet what mathematical thinking mean; teacher also has not taught mathematical thinking to the students in any mathematics problem solving; questions from the teacher in each exercise do not stimulate mathematical thinking of the students so that it can be concluded that mathematical thinking of the students has not been well established; teacher only rely on handbooks as learning sources; learning in the classroom has not used cooperative learning; student worksheets (LKS) are rarely used; innovative efforts of teacher in applying the model of learning that can stimulate students to active in the classroom are also still less.

Responding the problem of learning activities in the classroom, that is related to the ability of mathematical communication, it needs improvement efforts and innovation in the learning process. One of the improvement efforts in order to improve student's mathematical communication ability is focused on giving students the opportunity to actively build their knowledge, meaning that knowledge is found, formed and developed by the students themselves either individually or in groups using cooperative learning. Through cooperative learning, students are expected active in the class individually, actively discussed, dared to express and accept ideas from others, creative to find problem solutions, have a high mathematical thinking and confidence in learning mathematics, because cooperative learning can improve student’s mathematical methods. Cooperative learning which is fun and activate the students is Student Teams Achievement Division (STAD) and Think-Pair-Share (TPS) type.

1.2. Problem Formulation
Based on the description of the background, then formulated the problem as follows: Is the cooperative learning type STAD more effective than cooperative learning type TPS in terms of mathematical methods of 7th class students in SMP Negeri 7 Yogyakarta?

1.3. Research Objective
Based on the problem formulation above, the objective of this research is to find out whether cooperative learning type STAD is more effective than cooperative learning type TPS in terms of mathematical methods of 7th class students in SMP Negeri 7 Yogyakarta.

1.4. Research Benefits
Based on the research objective above, from this research, those are hoped that the cooperative learning model which is effectively tried to be used in the learning process so that it can be used as one of innovative learning model. Providing theoretical answers from the results of this research that can be useful for teachers, lecturers or the world of education in general to achieve qualified human resources.

1.5. The Effectiveness of Mathematics Learning
Learning activities require concentration, hard work and good organization. The effectiveness of learning is the objective and expectation of school as institution, communities, parents, teachers and students Kemp say, “Effectiveness answers the equation to what degree did students accomplish the learning objectives prescribed for each unit for the course? Measurement of effectiveness can be
ascertained from the scores, ratings of projects and performance, and records of observations of learner’s behavior” [3].

The effectiveness of learning involves teacher as instructor, who are the center of attention of learners. Related to effective mathematics learning, it is generally described in [4], “effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.” Based on the description above, it can be understood that effective mathematics learning requires an understanding of what students know and need to learn, then challenge and support them to learn it well.

Hewitt Say that “effective learning involves the ability to function well in the network of interdependencies associated with the learner”[5]. Effective learning requires the ability to use something well in the interdependence relationship with the learner. The ability to organize all the elements of learning and create an atmosphere that supports learning activities is the key to effective learning. Teacher professionalism in teaching can be seen from his ability to carry out all the demands above. Fulfilled or not the demands, will be an indicator whether learning process effective or not. Effective teacher has good teaching strategies and supported by adequate skills.

1.6. Mathematical Method
Essentially mathematics is an abstract science. This abstract thing will be an obstacle for someone in understanding it. Therefore, abstract mathematics needs to be manipulated into real form, using commonly problem in daily lives, to assist students in understanding a taught concept. According to Stacey, “The knowledge, skills and mathematical methods are the foundation to achieve the knowledge on science, information and other learning areas where mathematical concepts are central; and apply mathematics in the real-life situations.”[6].

Slavin define mathematical method as follows,“mathematical methods consist of: 1). Specializing (trying special cases, looking at examples), 2). Generalizing (looking for patterns and relationships), 3).conjecturing (predicting relationships and results), and 4).convincing (finding and communicating reason why something is true)”[7]. Efforts to bring out student's mathematical methods on mathematics learning can use contextual issues as introductory materials. Contextual problems are stories thing related to the problems encountered in real life every day.

Katagiri explains in detail that mathematical thinking related to mathematical methods, “Mathematical thinking related to mathematical methods is inductive thinking, analogical thinking, deductive thinking, integrative thinking (including expansive thinking), developmental thinking, abstract thinking (thinking that abstracts, concretizes, idealizes, and thinking that clarifies conditions), thinking that simplifies, thinking that generalizes, thinking that specializes, thinking that symbolize, thinking that express with numbers, quantifies, and figure.”[8].

1.7. Cooperative Learning Type STAD
According to Majoka, Student Team Achievement Division (STAD) is a cooperative-learning strategy in which small groups of learners with different levels of ability work together to accomplish a shared learning goal.” [9].

Next Hermawan explains, “in Student Teams-Achievement Division (STAD), the teacher assigns students to 4- or 5-member learning teams. Each team is as heterogeneous as possible to represent the composition of the entire class (boys/girls, higher performing/lower performing, etc.)”[1]. The opinion above emphasizes that in STAD, specifically students work in heterogeneous groups, smart students act as tutors for low-ability students, they are share and gather information each other, helping each other to learn and responsible on the lessons of other group members as towards himself. Slavin explains that “STAD consists of five major components-class presentations, teams, quizzes, individual improvement scores, and recognition” [7].
1.8. **Cooperative Learning Type TPS**

Related to the implementation of Think-Pair-Share, Slavin explains that, *“when the teacher presents a lesson to the class, student sit in pairs within their teams. The teacher poses questions to the class. Students are instructed to think of an answer on their own, then to pair with their partner to reach consensus on an answer. Finally, the teacher asks students to share their agreed-upon answer with the rest of the class.”* [7]. According to Borich, *“in Think–Pair–Share, the teacher poses a question, individual students think about (and record) their answer. Individuals then pair with another student to share their answer. The teacher calls on individuals or pairs to share with the large group”*[10].

Vui explains that, “Think-Pair-Share allows the teacher to pose questions to the students sitting in pairs. Students silently think of a response individually for a given period of time, then pair with their partners to discuss the question and reach consensus [11]. The teacher then asks students to share their agreed-upon answers with the rest of the class”. Based on the statement above we can understand that in Think-Pair-Share, the teacher gives a question, then each student thinks (and remembers) about the answer. Each student paired up with other student to share answers. Next, the teacher mentions one student or spouse to share with the larger group. This method provides an opportunity for students to think alone first before working with their partner and share ideas. The purpose of sharing ideas is each student gives ideas or information they know about a given problem in order to gain agreement on a problem solving.

1.9. **Hypothesis**

Cooperative learning type STAD is more effective than cooperative learning type TPS in terms of mathematical methods of 7th Class Students in SMP Negeri 7 Yogyakarta.

2. **Research Methods**

This research used a quasi-experimental method with two experimental groups i.e. STAD and TPS groups as control class.

2.1. **Research variable**

The variables involved in this research were two independent variables and dependent variable. In this case, cooperative learning as independent variable while the mathematics method as dependent.

2.2. **Data collection technique**

This research used data collection technique as follows: (a) performing a pretest accompanied by a mathematics teacher before treatment. (B) Provide a posttest accompanied by a mathematics teacher.

2.3. **Research Instruments**

The instrument used in this research was a description test of mathematics method. The test was a modified form of essay in accordance with the study design. Design of mathematical instrument test are as table follows:
Table 1. Design of Student Mathematical Thinking Test

| Indicators                  | Pretest | Posttest |
|-----------------------------|---------|----------|
| Inductive thinking          | 1, 2, 3, 4, 5 | 1, 2, 3, 4, 5 |
| Analogical thinking         | 5       | 5        |
| Deductive thinking          | 1, 2, 3, 4 | 1, 2, 3, 4, 5 |
| Integrative thinking        | 2, 5    | 2, 5     |
| Developmental thinking      | 5       | 5        |
| Abstract thinking           | 1, 2, 5 | 1, 2, 5  |
| Thinking that simplifies    | 2       | 2        |
| Thinking that generalizes   | 6       | 6        |
| Thinking that specializes   | 1, 2, 6 | 1, 2, 6  |
| Thinking that symbolizes    | 1, 2, 3, 4, 5, 6 | 1, 2, 3, 4, 5, 6 |
| Thinking that express with numbers, quantifies, & figure | 1, 2, 3, 4, 5, 6 | 1, 2, 3, 4, 5, 6 |

Katagiri, 2006 [8].

2.4. Population and Sample
The population of this research was all students of 7th class in SMP Negeri 7 Yogyakarta, academic year 2013/2014, consists of 5 parallel classes. While the sample of research was taken randomly 2 classes from 5 classes, that was 7A class treated with cooperative learning type STAD and 7B class treated with cooperative learning type TPS.

2.5. Data Processing Techniques and Analysis
Data processing technique was done by scoring the results of achievement test. Testing the effectiveness of mathematics learning was used one sample t test analysis. The difference in the effectiveness of the mathematics learning between two learning models is analyzed by using the $T^2$Hotelling test and t test to determine which learning model is more effective. The analysis was performed by using of SPSS 21 for windows software at a significant level of 5%.

3. Results and Discussion

3.1. Data Test of Student’s Mathematical Method
Data test of mathematical method consists of pretest and posttest data. In summary, the test results of the student’s mathematical Method in both groups are presented in Table 2.

Table 2. Data Test of Student’s Mathematical Method

| Descriptions                  | STAD Class | TPS Class |
|------------------------------|------------|-----------|
|                              | Pretest    | Posttest  | Pretest | Posttest |
| Average                      | 46.24      | 85.26     | 44.86   | 80.4     |
| Theoretical maximum score    | 100        | 100       | 100     | 100      |
| Theoretical minimum score    | 0          | 0         | 0       | 0        |
| Maximum score                | 64         | 100       | 69.33   | 93.75    |
| Minimum score                | 29.33      | 67.5      | 32      | 52.5     |
| Deviation standard           | 6.98       | 7.42      | 8.27    | 8.61     |
| Variance                     | 48.67      | 55.09     | 68.4    | 74.12    |
Based on the results of descriptive statistical data analysis, as shown in Table 2, overall the highest score achieved by students is 100.00 and the lowest score is 29.33. The descriptive analysis result of pretest and posttest can be seen in the attachment.

3.2. Hypothesis Test Results
Before the hypothesis test conducted on the data of student’s mathematical methods to the learning process of mathematics, whether for STAD class or for TPS class, the data was tested by the assumption test. The assumption test included normality test and homogeneity test. Normality test was not conducted on the data obtained because the sample of research more than 30 students so that the data declared normal distribution.

Homogeneity test conducted on all data obtained in this research was homogeneity test (using Kolmogorov Smirnov Test).

3.2.1. Cooperative learning type STAD
After mathematical communication ability data of STAD class calculated by SPSS 21, obtained t value as in Table 3.

| Aspects                | t   | Sig. |
|------------------------|-----|------|
| Mathematical Method    | 4.469 | 0    |

Based on Table 3 above, it is found that the significance value - t for all aspects is less than 0.05. It means, Ho is rejected, or in other words, cooperative learning type STAD effective in terms of aspects of mathematical methods.

3.2.2. Cooperative learning type TPS.
After communication ability data of TPS class calculated by SPSS 21, obtained t value as in Table 4.

| Aspects                | t   | Sig. |
|------------------------|-----|------|
| Communication ability  | 6.622 | 0    |

Based on Table 4 above, it is found that the significance value t for all aspects is less than 0.05. It means, Ho is rejected, or in other words, cooperative learning type TPS is effective in terms of mathematical methods.

3.3. Testing Which One Cooperative Learning More Effective
After calculated by SPSS 21, obtained results as in Table 5.

| Aspects                | F   | Sig.  |
|------------------------|-----|-------|
| Class (Before Treatment)| 0.265 | 0.850 |
| Class (After Treatment) | 4.532 | 0.006 |

Based on Table 5 above, it is found that the significance value F is greater than 0.05 for the data before treatment and less than 0.05 for the data after treatment. That is, for before the treatment, there is no difference in the initial ability between STAD class with TPS class in terms of mathematical methods.
After the treatment, there are differences in the effectiveness of cooperative learning (STAD type with TPS type) in terms of aspects of mathematical methods.

The result of t test shows that cooperative learning type STAD is more effective than cooperative learning type TPS in terms of mathematics method of junior high school students. This is due to cooperative learning type STAD, is a model of cooperative learning that involves team recognition and group responsibility for individual learning members. Each member of the group is obliged to work together in solving a problem. In cooperative learning type STAD, teacher creates an atmosphere that encourages students to feel they need each other. This mutual relationship is what positive interdependence means. In cooperative learning class, students are expected to help each other, discuss each other and argue, to hone their current knowledge and close the gaps in their respective understandings.

4. Conclusion
Based on the results of data analysis and discussion, concluded several things as follows:
- Cooperative learning type STAD (Student Teams Achievement Divisions) and type TPS (Think-Pair-Share) is effective TPS in terms of mathematical methods of 7th Class Students in SMP Negeri 7 Yogyakarta, academic year 2013/2014.
- Cooperative learning type STAD (Student Teams Achievement Divisions) is more effective than the cooperative learning type TPS (Think-Pair-Share) in terms of the ability of mathematics method students SMP Negeri 7 Yogyakarta, academic year 2013/2014.

5. References
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