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Differences in the Abilities of Creative Thinking and Problem Solving of Students in Mathematics by Using Cooperative Learning and Learning of Problem Solving

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Abstract

This study aims to determine the differences in the abilities of creative thinking and problem solving of mathematics in students who are taught by cooperative learning with the type of STAD and students who were taught with problem solving in class VII of Madrasah Tsanawiyah of Madinatussalam in Sei Rotan Learning Year 2015/2016. This study is a quantitative study with a quasi experiment design. The population in this study is all students of class VII which amounted to 60. The data in this research is processed by analysis of variance (ANAVA). The results show that: (1) The abilities to think creatively and problem solving of mathematics in students taught by cooperative learning of STAD type is no better than students who are taught with learning of problem solving in the subject matter of the circle. (2) The ability of creative thinking in students who are taught by cooperative learning of STAD type is better than students who are taught with learning of problem solving in the subject matter of circle. (3) Ability ofproblem solving of mathematics in students who are taught by cooperative learning of STAD type is better than students who are taught with learning of problem solving in the subject matter of the circle. (4) There is a significant interaction between the learning model used with the ability to think creatively and the problem solving ability of mathematics in the students.

Keywords: Abilities of Creative Thinking; Learning of Problem Solving; Cooperative Learning of STAD.

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1. Introduction

In the Regulation of the Minister of National Education No. 22 of 2006 on Content Standards it is mentioned that mathematics subjects should be given to all learners, ranging from elementary school to equip them with the ability to think logically, analytically, systematically, critically, creatively, and cooperatively. This indicates that the future challenges will be tighter so that it takes graduates of education who are not only skilled in one field but also creative in developing the field being occupied. This needs to be manifested in every subject at school, including mathematics.

Mathematics is a field of science that is a tool for thinking, communicating, solving practical problems, the elements of which are logic and intuition, analysis and construction, generality and individuality, as well as having branches among others, arithmetic, algebra, geometry and analysis [1]. Based on the Research and Development Agency (2011), Trends in International Mathematics and Science Study (TIMSS) in 2011, attended by 600,000 students from 63 countries, the mathematical achievement level of Indonesian students is ranked 38th out of 42 countries with score 386.This proves that students' math skills are still far from the target. To overcome this an innovation is needed [2].

One of the goals of education is to make children think creatively both to solve problems and to be able to communicate or convey their thoughts. In fact, the implementation of learning does not encourage students to think creatively. The two factors that lead to creative thinking do not develop during education are curricula that are generally designed with broad material targets, So that educators are more focused on completing the material than on the understanding of teaching methods that can improve the ability to think creatively.

In the ability to think creatively, creativity is the path to that ability. If someone has a high creativity then it proves that he has had the ability to think creatively. As stated by Mardianto, creativity is the product of a good and right way of thinking [3]. While Munandar stated that creativity is a common ability to create something new, as the ability to provide new ideas that can be applied to problem solving, or as the ability to know the relationships between pre-existing elements [4].

Creativity builds a new relationship between experience and knowledge, and also proposes new solutions to a problem [5]. Likewise with Semiawan who argued that creativity is the ability to give new ideas and apply them to problem solving [6]. Creative thinking is seen as a process used when an individual brings about or raises a new idea. The new idea is a combination of previous ideas that have never been realized [7]. Creative thinking is a mindset based on a way that encourages people to produce creative products. With this understanding, it appears that the main criterion in creativity is the product.

Problem solving can also encourage students to conduct their own evaluations of both outcomes and processes of their learning. This is certainly the clarity that problem-solving ability is very influential on the process of increasing the intellectual potential of students. In learning mathematics, for example, it is a part that must be owned. Based on what is described above it can be concluded that the problem solving ability in learning mathematics is a very important part in processing the existing data to be made into a useful information. Based

on this it is necessary to know about the difference of the abilities of thinking and problem solving mathematically in students to know the extent of effectiveness in learning.

1.1 The Ability of Creative Thinking in Mathematics

Thinking is the actualization of the way the brain works. According to Torrance creativity is “being sensitive to problems, insufficiencies, shortage of information, nonexistent elements, and noncompatibility; identifying challenges, seeking for solutions, estimation and hypothesizing or modifying hypothesises in relation with insufficiencies, selecting and trying one of the solutions, retrial, and drawing conclusions accordingly [8]. There are three basic ideas about thinking, namely: (1) Thinking is cognitively that happens "internally" in thinking but decisions are made through behavior, (2) Thinking is a process that involves some knowledge manipulation in the cognitive system, (3) thinking it is direct in nature and generating behavior that solves the problem or goes straight to the solution [9].Creative students differ from students who are less creative. Creative students are more inclined to come up with questions that can help them find answers when solving a problem. A student will be easy to have the ability to think creatively in mathematics if when he received a lesson, the way given to him can cultivate thinking and creativity through a strategy used by teachers. As mentioned earlier, creative thinking is a mind-set based on a method that encourages people to produce creative products. This means that creative thinking students will always try to find solutions to problems that are different from the usual and varied. So, what is meant by creative thinking in mathematics is the ability of a person to be able to solve a problem of mathematics by finding solutions that vary and diverse while looking at the quality of solutions. Thus the learning of mathematics is not perceived as monotonous and boring.

1.2 Ability of Problem Solving in Mathematics

Ability is the proficiency or potential possessed by a person in mastering a skill that is innate or the results of exercises done for use in doing something to be achieved. While solving a mathematical problem is an activity to solve a story problem, solve problems that are not routine, apply the math to everyday life or other circumstances. Problem solving is a directional thinking to find directly a solution to/way out of a specific problem [9]. Problem solving is an intellectual activity to find solutions to problems encountered by using the provision of knowledge already owned. The process of developing the ability of problem solving in students seems to be more easily understood by students by providing questions related to daily life problems, which always experienced by students at the beginning of learning.

The ability to solve problems of mathematics is the ability or potential possessed by a person or student in solving story problems, solving problems that are not routine, applying mathematics to everyday life or other circumstances, and proving, creating and testing conjecture. Problem-solving abilities are the abilities that are the learning targets of mathematics that are very useful for students in their lives. It appears that if the existence of problem-solving abilities is indicated by the student, it means that certain learning has been able or successful in helping the students to achieve the objectives to be achieved. Operationally problem solving has the following stages: (1) understanding the problem, (2) planning the solving for that problem, (3) solving the problem according to the plan, (4) re-examining the procedure and its solution [10].

1.3 Cooperative Learning of Student Team Achievement Division (STAD) Type

a. Basic Concepts of Co-operative Learning

There are many teaching methods that can be used as a strategy to solve the problem. One of them is cooperative learning. Cooperative learning is the use of small groups in the learning and teaching process where students work together for mutual benefit. Problem solving can help students to develop new knowledge and be responsible for their learning [11]. In the cooperative learning, students are expected to help, discuss, and debate with each other; Assessing each other's knowledge; and each fill any gaps in the understanding of each. Furthermore it is said that cooperative learning stimulates cognitive activity, improves the level of attainment and retention of higher knowledge [12].

Cooperative learning is a series of learning activities undertaken by students in groups by means of discussion to achieve the objectives of learning that have been determined. The positive effect of cooperative learning situations on students is apparent because students are asked to work together as a cohesive group to achieve their learning goals [13]. In the process, students must take responsibility for their own learning and also for the successful learning of other group members [14]. There are four important things in cooperative learning strategy, namely: (1) the existence of students in groups, (2) the existence of rules of the game, (3) the existence of learning efforts in groups, (4) the existence of competencies to be achieved by the group. With regard to grouping of students, this can be determined based on: (1) interests and talents of students, (2) background of the ability of students, (3) a mixture of interests and talents of students and the background of the ability of students [15].

b. Learning of *Student Team Achievement Division* (STAD) Type

According to Slavin, cooperative learning of STAD type is the most widely studied variation of cooperative learning. In cooperative learning of STAD type, students are divided into groups of four consisting of various abilities, gender and ethnicity. Teachers present a lesson and students in groups ensure that all group members can master the lesson. In the end all the students fill out the individual quiz about the material presented, and at that time they should not help each other. The results of the quiz score of the students were compared with their own average score obtained earlier. This score is then summed to get a group score, and a group that can reach certain criteria will get a reward. In the cooperative learning of STAD type, students are grouped heterogeneously, then clever students give explanations to other members until they understand [16].

In cooperative learning of STAD type, students can work in pairs and exchange answers, discuss disagreements, and help each other. They can discuss approaches to solve a problem. Furthermore, Slavin explains that: "The main idea behind STAD is to urge students to encourage and help each other to master the skills that teachers teach."If students want their group to get a reward, they should help their friends in a group to learn the lesson.

2. Research Method

This study aims to determine the differences in the abilities of creative thinking and problem solving of

mathematics in students who were taught by cooperative learning of STAD type and students who were taught with problem solving in class VII of Madrasah Tsanawiyah of Madinatussalam in Sei Rotan on the subject matter of the circle. Therefore, this study is an experimental study with a quasi experiment design, because the class used has been formed before. This research was conducted in Madrasah Tsanawiyah of Madinatussalam in Sei Rotan which is located Sidomulyo street Gangg. Pipit, Dusun XIII, Sei Rotan Village, Percut Sei Tuan District, Deli Serdang Regency, North Sumatra Province. Research activities are conducted in the second half of Learning Year 2015/2016. Determination of the study schedule is adjusted to the schedule set by the principal. The subject matter chosen in this research is "Circle", precisely the area and circumference of the circle which is the material in the syllabus of class VII that is in progress in that semester.

The population in this study is all students of class VII of Madrasah Tsanawiyah of Madinatussalam in Sei Rotan. With regard to this the researcher is not likely to recruit students randomly to form a new class, therefore the researcher takes the smallest sampling unit that is one class. The author recruits two classes in the Madrasah Tsanawiyah of Madinatussalam in Sei Rotan. Class VII-1 as group of learning of STAD type, and class VII-2 as group of learning of problem solving. The sampling technique is saturated sampling. Students with cooperative learning of STAD type are divided into small groups of four or five. Group members are heterogeneous consisting of students with high, middle and low intelligence. The group determination technique is based on a score in pre-test that previously administered. In the classroom with problem solving learning, the learning takes place individually but does not close the possibility for the implementation of the discussion of one table if the solution to the problem is not found.

2.1 Research Design

The design used in this research is factorial design with degree of 2 ×2. In this design, every independent variable is classified into 2 (two) sides, that is cooperative learning of STAD type (A_1) and learning of problem solving (A_2).Meanwhile, the dependent variable is classified into the ability of creative thinking (B_1) and the ability of problem math problem (B_2).

Table 1: Research Design of Two-Way ANAVA of Degree of 2 × 2

Learning / Ability	Cooperative Learning of STAD Type (A_1)	Learning of Problem Solving (A_2)
Creative Thinking (B_1)	A_1B_1	A_2B_1
Problem Solving of Mathematics (B_2)	A_1B_2	A_2B_2

(Source: Sudjana, 1991)

Remarks:

1) A_1B_1 = The ability of creative thinking of mathematics in students taught by cooperative learning of STAD type

2) A_2B_1 = The ability of creative thinking of mathematics in students taught by learning of problem solving

3) A_1B_2 = The ability of problem solving of mathematics in students taught by cooperative learning of STAD type

4) A_2B_2 = The ability of problem solving of mathematics in students taught by learning of problem solving

This research involves two classes, namely classes with learning of STAD type and class with learning of problem solving which receive the different treatment. The same subject matter is presented to the two classes, namely the circle especially the circumference and area of the circle. To determine the ability of creative thinking and the ability of problem solving of mathematics, the test is held in each group of students after the application of both treatments.

2.2 Data Collection Technique

The proper technique for collecting data on the ability of creative thinking and the ability of problem solving of mathematics is through the test. Therefore, data collection techniques in this study is to use test on the ability of creative thinking and test on the ability of problem solving of mathematics. Both tests are administered on all students in the group of learning of STAD type and group of learning of problem solving. All students fill out or reply according to the guidelines set previously by the researcher at the beginning or on the first sheet of test. Technique of taking data is in the form of questions of description about subject matter of circle as much as 5 items of ability of creative thinking and 5 items of ability o solving problem of mathematics. The stages of data collection techniques are as follows ; (1) Administer post-test to obtain data on the ability of creative thinking and data on the ability of problem solving of mathematics in experimental and control classes, (2) Conducting post-test data analysis, ie normality test and homogeneity test in class of STAD and class of problem solving. (3) Conducting the analysis of post-test data, ie hypothesis test by using Analisa of Variance technique and then Tukey-test.

The instrument used is in the form of test. This is because what researchers want to know is learning outcomes of students, namely the ability of creative thinking and the ability of problem solving of mathematics. Test is a set of stimuli given to someone with the intent to get answers that can be used as a basis for determination score. The main requirements for the test are validity and reliability.

2.3 Data Analysis Technique

To determine the level of ability of creative thinking and ability of problem solving of mathematics in students, descriptive analysis of data is done. Meanwhile, to determine the difference of ability of creative thinking and ability of problem solving of mathematics in student, data is analyzed with inferential statistic that is variance analysis (ANAVA) technique is used and continued with Tukey-test.

3. Results

In summary, the results of research of the ability of creative thinking and the ability of problem solving of mathematics in students taught by cooperative learning of STAD type and students taught by learning of problem solving can be described as follows:

3.1 Data on Results of Ability of Creative Thinking of Mathematics in Students Taught by Cooperative Learning of STAD Type (A_1B_1)

Based on data obtained from results of the post-test of the ability of creative thinking of mathematics in students who were taught by Cooperative Learning of STAD Type the following results are obtained: the counted average value (X) = 65; Variance = 122.483; Standard Deviation (SD) = 11.067; Maximum value = 88; Minimum value = 45 with range = 43.The meaning of the Variance value above is that the ability of creative thinking of mathematics in students who are taught by Cooperative Learning of STAD type is diverse or varies between one student and another, because the value of Variance exceeds the highest value in the data.

3.2 Data on Results of Ability of Creative Thinking of Mathematics in Students Taught by Learning of Problem Solving (A_2B_1)

Based on data obtained from results of the post-test of the ability of creative thinking of mathematics in students who were taught by Learning of Problem Solving in annex 14 and frequency distributions in annex 15 the following results are obtained: the counted average value (X) = 52.7; Variance = 179.459; Standard Deviation (SD) = 13.396; Maximum value = 78; Minimum value = 30 with range = 48.The meaning of the Variance value above is that the ability of creative thinking of mathematics in students who are taught by learning of problem solving is very diverse or varies between one student and another, because the value of Variance exceeds the highest value in the data.

a. Data on Results of Ability of Problem Solving of Mathematics in Students Taught by Cooperative Learning of STAD Type (A_1B_2)

Based on data obtained from results of the post-test of the ability of problem solving of mathematics in students who were taught by Cooperative Learning of STAD Type in annex 13 and frequency distributions in annex 15 the following results are obtained: the counted average value (X) = 51.467; Variance = 101.085; Standard Deviation (SD) = 10.054; Maximum value = 84; Minimum value = 35 with range = 49.The meaning of the Variance value above is that the ability of problem solving of mathematics in students who are taught by Cooperative Learning of STAD type is diverse or varies between one student and another, because the value of Variance exceeds the highest value in the data.

b. Data on Results of Ability of Problem Solving of Mathematics in Students Taught by Learning of Problem Solving (A_2B_2)

Based on data obtained from results of the post-test of the ability of problem solving of mathematics in students who were taught by Learning of Problem Solving in annex 14 and frequency distributions in annex 15 the following results are obtained: the counted average value (X) = 62.800; Variance = 136.585; Standard Deviation (SD) = 111.821; Maximum value = 83; Minimum value = 45 with range = 38.The meaning of the Variance value above is that the ability of problem solving of mathematics in students who are taught by learning of problem solving is very diverse or varies between one student and another, because the value of Variance exceeds the highest value in the data.

c. Data on Results of Abilities of Creative Thinking and Problem Solving of Mathematics in Students Taught by Cooperative Learning of STAD Type (A_1)

Based on data obtained from results of the post-test of the abilities of creative thinking and problem solving of mathematics in students who were taught by Cooperative Learning of STAD Type and frequency distributions in annex 15 the following results are obtained: the counted average value (X) = 58.233; Variance = 111.784; Standard Deviation (SD) = 10.561; Maximum value = 88; Minimum value = 35 with range = 53. The meaning of the Variance value above is that the abilities of creative thinking and problem solving of mathematics in students who are taught by cooperative learning of STAD type is diverse or varies between one student and another, because the value of Variance exceeds the highest value in the data.

d. Data on Results of Abilities of Creative Thinking and Problem Solving of Mathematics in Students Taught by Learning of Problem Solving (A_2)

Based on data obtained from results of the post-test of the abilities of creative thinking and problem solving of mathematics in students who were taught by Learning of Problem Solving and frequency distributions in annex 15 the following results are obtained: the counted average value (X) = 57.750; Variance = 145.640; Standard Deviation (SD) = 62.609; Maximum value = 83; Minimum value = 30 with range = 53.The meaning of the Variance value above is that the abilities of creative thinking and problem solving of mathematics in students who are taught by learning of problem solving is very diverse or varies between one student and another, because the value of Variance exceeds the highest value in the data.

e. Data on Results of Ability of Creative Thinking Mathematics in Students Taught by Cooperative Learning of STAD Type and Learning of Problem Solving (B_1)

Based on data obtained from results of the post-test of the ability of creative thinking of mathematics in students who were taught by Cooperative Learning of STAD Type and Learning of Problem Solving and frequency distributions in annex 15 the following results are obtained: the counted average value (X) = 58.850; Variance = 150.971; Standard Deviation (SD) = 12.232; Maximum value = 88; Minimum value = 30 with range = 58.The meaning of the Variance value above is that the ability of creative thinking of mathematics in students who are taught by cooperative learning of STAD type and learning of problem solving is very diverse or varies between

one student and another, because the value of Variance exceeds the highest value in the data.

f. Data on Results of Ability of Problem Solving of Mathematics in Students Taught by Cooperative Learning of STAD Type and Learning of Problem Solving (B_2)

Based on data obtained from results of the post-test of the ability of problem solving of mathematics in students who were taught by Cooperative Learning of STAD Type and Learning of Problem Solving and frequency distributions in annex 15 the following results are obtained: the counted average value (X) = 55.65; Variance = 139.621; Standard Deviation (SD) = 11.861; Maximum value = 88; Minimum value = 35 with range = 53.The meaning of the Variance value above is that the ability of problem solving of mathematics in students who are taught by cooperative learning of STAD type and learning of problem solving is very diverse or varies between one student and another, because the value of Variance exceeds the highest value in the data.

4. Discussion

Before performing hypothesis test with analysis of variance (ANAVA) on the results of test of student, requirement test need to be done which include: *First*, that the data is derived from a saturated sample. *Second*, the sample comes from a normally distributed population. *Third*, the data set has a homogeneous variance. Furthermore, the analysis requirements test will be performed on the normality and homogeneity of the distribution of data on the results of test that have been collected.

4.1 Normality Test

One of the analysis technique in normality test is Lilliefors analysis, that is an analysis technique of requirement test before hypothesis test done. Based on a random sample, we tested the null hypothesis that the sample came from a normally distributed population and the counter-hypothesis that the population is not normally distributed. Provided that if the L-counted <L-table then the data is normally distributed, but if L-counted> L-table then the data is not normally distributed. The result of normality analysis for each subgroup of data is described as follows:

Table 2: Summary of Normality Test Results with Lilliefors Analysis Technique

Group	**L-counted**	**L-table α = 0,05**	**Conclusion**
A_1B_1	0.098	0.162	Ho: Accepted, Normal
A_1B_2	0.096		Ho: Accepted, Normal
A_2B_1	0.146		Ho: Accepted, Normal
A_2B_2	0.108		Ho: Accepted, Normal
A_1	0.091	0.114	Ho: Accepted, Normal
A_2	0.055		Ho: Accepted, Normal
B_1	0.063		Ho: Accepted, Normal
B_2	0.105		Ho: Accepted, Normal

4.2 Homogeneity Test

The homogeneity test of normal distributed population variance was done by Bartlett test. From the result of calculation of χ^2-counted (chi-square) the value smaller than the value of χ^2-tabel is obtained. The tested statistical hypothesis is expressed as follows:

H_0: $\sigma_1^2 = \sigma_2^2 = \sigma_3^2 = \sigma_4^2 = \sigma_5^2$

H_a: at least one equal sign does not apply

Homogeneity test was performed on each subgroup sample, namely: (A_1B_1), (A_1B_2), (A_2B_1), (A_2B_2). The summary of homogeneity analysis can be seen in the following table:

Table 4: 19 The Summary of Homogeneity Test for Groups of Sample (A_1B_1), (A_1B_2), (A_2B_1), (A_2B_2)

Group	**Df**	**S^2**	**df.S^2i**	**log S^2i**	**df.logS^2i**	**X^2-counted**	**X^2-table**	**Decision**
A_1B_1	29	122.483	3552.007	2.088	60.554	2.886	7.81	Homogen
A_1B_2	29	179.459	5204.311	2.254	65.365			
A_2B_1	29	101.085	2931.465	2.005	58.136			
A_2B_2	29	111.821	3242.809	2.049	59.407			
A_1	63	156.453	9230.727	2.194	129.469	0.089	3.841	Homogen
A_2	63	169.106	9977.254	2.228	131.461			
B_1	63	186.875	11025.625	2.272	134.022	1.396		
B_2	63	137.304	8100.936	2.138	126.123			

4.3 Hypothesis Testing

a. Analysis of Variance and Tukey-Test

The analysis used to test the four hypotheses proposed in this study is two-way analysis of variance and tested by Tukey-test. The results of the data analysis by ANOVA 2 x 2 are summarized in the following table:

Table 3: The Summary of Results of Analysis of Variance

Source of variance	**df**	**JK**	**RJK**	**F-counted**	**F-table**	
					$\alpha = 0.05$	**$\alpha = 0.01$**
Intercolumn (A) (Learning Model)	1	7.008	7.008	0.054*	3.923	6.859
Interrow (B) (Ability of Student)	1	88.408	88.408	0.687*		
Interaction (A × B)	1	4189.008	4189.008	32.546***		
Intergroup	3	4284.425	1428.142	11.096**	2.681	4.132
Intragroup	116	14930.567	128.712			
Reduced Total	119	19214.992				

Remarks:

* = not significant

** = significant

*** = very significant

df = degree of freedom

RJK = the sum of the mean squares

A summary of all the calculations of the F-test and Tukey-test performed in the data analysis to prove the hypothesis can be seen in the following table:

Table 4: Summary of Results of Tukey-Test Analysis

No	**Pair of groups**	**F-counted**	**F-table α=0.05**	**F-table α=0.01**	**Q-counted**	**Q-table 0.05**	**Conclusion**
1	Q_1 (A_1 and A_2)	0.054	3.923	6.859	0.330	2.83	Not significant
2	Q_2 (B_1 dan B_2)	0.687			1.172		Not significant
3	Q_3 (A_1B_1 and A_2B_1)	15.032	4.007	7.093	5.483	2.89	Significant
4	Q_4 (A_1B_2 and A_2B_2)	18.099			6.016		Significant
5	Q_5 (A_1B_1 and A_1B_2)	24.577			7.010		Significant
6	Q_6 (A_2B_1 and A_2B_2)	10.506			4.584		Significant
7	Q_7 (A_1B_1 and A_2B_2)	0.620			1.114		Not significant
8	Q_8 (A_2B_1 and A_1B_2)	0.163			0.570		Not significant

The findings of the first hypothesis resulted in the conclusion that the abilities of creative thinking and problem solving of mathematics in students who were taught by cooperative learning of STAD type was no better than students who were taught with learning of problem solving in the subject matter of circle. This is in line with what Piaget proposes that based on the origin of knowledge Piaget tends to embrace the theory of psychogenesis.

The second hypothesis finding resulted in the conclusion that the ability of creative thinking of mathematics in students who were taught by cooperative learning of STAD type was better than students who were taught by learning of problem solving. This is in accordance with what was proposed by Slavin that cooperative learning encourages students to interact actively and positively in groups.In this learning it is possible to exchange ideas/ideas and inspection of ideas themselves, so it is expected to optimize the activity or creativity of students

in thinking.

The third hypothesis finding resulted in the conclusion that: the ability of problem solving of mathematics in students taught by cooperative learning of STAD type is better than students who were taught with learning of problem solving. As previously described, the main activity in cooperative learning of STAD type is learning in groups. So all the problems to be solved are discussed in discussion to find the solution before each student undergoes the individual quiz. Thus, it is clear that with the existence of cooperative learning of STAD type, students will be trained in solving problems. In addition, with the discussions held, the students' ability to solve problems is raised to the surface. So the ability of solving problems of mathematics in students who are taught by cooperative learning of STAD type is more leverage and get maximum results as well.

The findings of the fourth hypothesis lead to the conclusion that there is an interaction between the learning used with the abilities of creative thinking and problem solving of mathematics in the students. As discussed earlier in the background of the problem, the strategies used in the learning and teaching process are influential to determine student learning outcomes, which in this case is the abilities of creative thinking and problem solving. Creative thinking and the ability of problem solving have a very close relationship. A person who has the ability to think creatively is not only able to solve problems that are non-routine, but also able to see various alternative problem solving. So, basically when a student tries to think creatively in learning math, he automatically has solved the problem he faces. Based on the findings described above, the results of this study illustrate that the ability of creative thinking and problem solving can be developed by using cooperative learning of STAD type where in this study, in accordance with constructivism learning theory, emphasis is placed on the interaction between peers.

This is consistent with research conducted by Iin Septi Jannah Siregar. The results show that students who have the ability of creative thinking and the ability of problem solving of mathematics are better taught by problem-based learning than conventional learning in class VII of Private Madrasah Tsanawiyah (UMN) of Al-Washliyah, Medan [17]. Similarly, research by Elvi Khairani Nasution. Based on the results of the study it is concluded that students who have the ability of creative thinking is more precisely taught by conventional learning while students who have the ability to math communication more precisely taught by learning of jigsaw type in the subject matter of square and rectangle in class VII of Madrasah Tsanawiyah of Al-Ulum, Medan [18].

5. Conslusions

Based on the research results obtained, the researcher can conclude that: (1) The ability of creative thinking and the ability of problem solving of mathematics in students taught by cooperative learning of STAD type is no better than students who are taught with learning of problem (2) The ability of creative thinking of mathematics in students who are taught by cooperative learning of STAD type is better than students who are taught by learning of problem solving (3) The ability of problem solving of mathematics in students who are taught by cooperative learning of STAD type is better than students who are taught by learning of problem solving (4) There is a significant interaction between the learning models used with the ability of critical thinking and the

ability of problem solving of mathematics in students.

6. Suggestions

Based on the above conclusions, the author present the following suggestions: (1) At the time of the learning progress the teacher should try to explore the knowledge that students have such as using Student Activity Sheet and media that support the learning so that students are more active and creative in the learning process. (2) Learning by using cooperative learning of STAD type is better to develop ability of creative thinking and ability of problem solving of mathematics in student, for that this learning can be used by teacher in math lesson. (3) For further researchers, research can be done on other subject matter in order to be used as a comparison in improving the quality of education.

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