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Difference of Mathematical Problem Solving Ability Student between Model of Cooperative Type Learning Stad, Tps and Tai at Smp Negeri 1 Labuhan Deli

Syafrida Hanum Hutasuhut[1], Zul Amry[2]
[1](Postgraduate, State University of Medan (UNIMED), Indonesia)
[2](Doctor, State University of Medan (UNIMED), Indonesia)

Abstract: *This study aims to determine : (1) Differences in mathematical problem-solving abilities between students taught by STAD type cooperative model, TPS type cooperative model and TAI type cooperative model, (2) Level of student activity on STAD, TPS and TAI cooperative model with students mathematical problem solving ability, and (3) The process of completion of answers made by students in solving problems withthe model of cooperative type STAD, TPS and TAI. This research is semi experimental research. The population of this study is the seventh grade students of SMP Negeri 1 Labuhan Deli. And the sample of this research is class VII-1, VII-3 and VII-4. Data analysis was done by analysis of variance (ANAVA) One way. The results showed that (1) There is a difference of problem solving ability of math between students taught by model of cooperative type STAD, TPS and TAI. This is evident from the one-way ANAVA results from Fcount = 3.418 greater than Ftable = 3.08. (2) Student activity on TPS type cooperative model is more effective than student activity on cooperative model of STAD and TAI type, (3) The process of solving students' answers to mathematical problem-solving ability given the TPS type cooperative model is better than the cooperative model of TPS type is better than the cooperative model of STAD and TAI type.*

Keywords: *STAD (Student Teams Achievement Divisions) TPS (Think Pair Square), TAI (Team Assisted Individualization), and mathematical problem solving ability*

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I. Introduction

In the world of education, mathematics plays an important role as one of science. Much has been contributed by mathematics to the advancement of human civilization. Mathematics as one of science has developed rapidly, both the content of material and its usefulness. This can be seen from the many mathematical concepts that can be applied both in science, technology and in everyday life. As one of the underlying sciences of modern technological development, mathematics plays an important role in various disciplines and develops the human mind. Therefore it is undeniable that to support the development of knowledge and technology the role of mathematics is very important.

According to NCTM (National Council of Teachers of Mathematics, 2000: 29) some of the standard processes that learners must master in learning mathematics include: (1) learning to solve mathematical problem solving (2) learning to communicate mathematically communication; (3) learning for mathematical reasoning; (4) learning to relate mathematical connections; (5) learning to represent mathematical representation (mathematical representation).

Among the students' mathematical ability that are very important to be developed among students is the ability to solve problems. In accordance with the opinion of NCTM (2000) problem-solving ability is the focus on mathematics learning. Not only is the ability to solve problems to be the reason for learning mathematics, but because problem-solving abilities provide a context where concepts and ability can be learned. The same thing also suggested Sagala (2009) that implementing problem solving in important learning process, because in addition to the students trying to answer questions or solve their problems, they are also motivated to work hard.

Hudojo (2003) explains that teaching mathematics to solve problems enables students to be more analytical in making decisions in life, in other words, when students are trained to solve problems then the student will be able to make decisions because the student has ability how to gather relevant information, analyze information and realize how it is necessary to re-examine the results it has gained. Hudojo's opinion is reinforced by Jihad (2006) which states that problem-solving ability is one part of the standard of competence or mathematical ability expected after student learning is required to demonstrate the ability of a strategy to create or formulate, interpret and solve mathematical models in problem solving.

Once the importance of students 'mathematical problem solving ability in mathematics, but the facts encountered in the field show that the low ability of students' math problem solving. This is in accordance with the fact that the results of observations at SMP Negeri 1 Labuhan Deli on October 03, 2016, mathematics learning outcomes of students SMP Negeri 1 Labuhan Deli is still relatively low because it is still below the limit value of the Minimum Exhaustiveness Criteria (KKM) in school that is 75.

The low ability of problem solving of student mathematics also revealed from the research of Risna (2011), also concluded that the ability to understand the problem of 0.28 with the low category, the ability to plan the completion of 0.33 with the category moderate, the ability to calculate 0.28 with category low, re-checking ability of 0.22 with low category, so overall problem solving aspect is 0.28 with low category.

Low math problem solving ability of students are caused by many factors, including how to teach a teacher in the learning process. Teachers tend to transfer the knowledge they have to the minds of the students, attach importance of the outcome rather than the process, teaching sequentially page after page without discussing the interrelationship between concepts or problems. Yuwono (2001: 56), argues in general teachers teaches only to deliver what is in the book package and less accommodate the ability of students. The same thing also conveyed by Haryati (2013) which states that the cause of low mathematical ability of students is a model of learning used by teachers. In other words, the teacher does not give students the opportunity to construct mathematical knowledge that will belong to the students. With such conditions, students' math problem solving ability is less developed, so the process of completion of student answers to the problems posed by teachers did not vary.

This is in accordance with the results of interviews for researchers with the mother Endang who is one of the math teacher at SMP Negeri 1 Labuhan Deli on October 03, 2016 which says that in the process of teaching and learning teachers dominate so that students are less active in learning, it is because the teacher wants to finish learning materials on time. Generally students are accustomed to learning activities in the form of memorizing formulas and problem-solving steps that have been done by teachers or existing in textbooks without accompanied by the development of students' math problem solving ability. As a result students are less able to solve mathematical problems of learning in the classroom. Furthermore, the learning model used by the teacher is less varied and interesting, causing the students less interested in receiving the material submitted by the teacher. Or in other words has not applied active and interesting learning such as STAD type cooperative learning, TPS type and TAI type.

In practice, in these three learning models, students will be grouped to discuss with their friends in solving problems. Students will exchange opinions, accept and refute the arguments with their friends, make plans, to agree in making the final decision as a result of group work. One of the learning steps of the STAD type cooperative model is that the learning activities in the team can fulfill one of the characteristics of students' mathematical problem solving abilities, that is, to plan the completion. In one of the learning steps of the TPS type cooperative model, where the two couples meet again in a group of four can fulfill one of the characteristics of students' mathematical problem solving abilities, which is to solve the problem according to plan. Furthermore, in step of individual learning students in TAI type cooperative model can meet one of the characteristics of students' mathematical problem solving abilities, that is understanding the problem.

From the above explanation it can be seen that STAD types cooperative model, TPS type and TAI type have different learning steps. In the model of cooperative learning type STAD students are organized into several groups and given problems of the form of LAS. Problem solving is done in group discussions. In the TPS learning model students are organized in several groups consisting of 4 people, then subdivided into 2 pairs. Each pair of students solves the problem the teacher gives and returns to the original group to discuss the unresolved issues. While on the model of cooperative learning type TAI students are given problems individually, then students are organized into several groups to discuss the results of individual work.

The learning steps of the three models are different, but they all point to the characteristics of students' mathematical problem-solving abilities. So that the process of learning like this can foster students' mathematical problem solving abilities. Then it can be concluded that the three models meet the characteristics of students' mathematical problem solving abilities and can be applied to fractional materials.

To support the research that will be done, the difference in problem solving ability of students mathematics has also been studied by previous research, as conducted by Kuswoyo (2009) in his research on students of SMP Negeri 4 Semarang stated that effectiveness in learning seen from the test of problem solving ability individually who are able to solve test questions with a minimum score of 65 in the classical reaches at least 80% of 42 students, who are treated with STAD type cooperative learning model.

Michelin (2012) in his research on grade VII students SMPN 1 Pulau Pinjung stated that student learning outcomes using model Cooperative Learning type Thing Pair Square higher than the student learning outcomes that use conventional learning.

Ernawati (2015) in his research on the students of SMP Negeri 2 Gamping stated that the problem solving ability of students with class average in pre cycles of 38.84 with a completeness of 3.23%, increased to

59.72 with a completeness of 48.39% in the first cycle, and increased to 84.68 with a mastery of 87.88% in cycle II with cooperative learning model type TAI.

Based on the above explanation, the three learning models can improve the problem solving ability of junior high school students so the researcher needs to study the comparison between cooperative model type STAD, TPS and TAI, which model is better used in improving students problem solving abilities of mathematics. So the title of this research is "Difference of mathematical problem solving ability student between model of cooperative type learning STAD, TPS and TAI at SMP Negeri 1 Labuhan Deli."

II. Research Methods

This study aims to determine the differences in students' mathematical problem solving ability between STAD Type Cooperative Learning Model, TPS type and TAI Type in class VII of SMP Negeri 1 Labuhan Deli.

The population of this study were all students of SMP Negeri 1 Labuhan Deli which amounted to 937 students, consisting of 27 classes, class division is not based on achievement or rank so there is no superior class ofdifferent student characteristics

The sampling technique in this research is done by random sampling technique. Based on class division, researcher takes sample of class VII-1, VII-3 and VII-4 which consist of 33 people each. Classes are taken based on agreement with the school and the researchers, it is done so as not to interfere with many activities in school and considered all classes VII is homogeneous means its ability is relatively the same, it can be seen from the results of daily test. Data onto the form of scores obtained from the math problem solving test. Technique Data analysis is done by analysis of variance (ANAVA) One Direction.

III. Results And Discussion Of Research

MATHEMATICAL PROBLEM SOLVING ABILITY

To get an idea of the difference in the ability of students' mathematical problem-solving ability between STAD Model Cooperative Learning Model, TPS type and TAI Type descriptively by looking at the difference of average problem solving ability of each student's mathematical problem. The calculation results can be seen in the following table:

Table 1. Average Value of Mathematical Problem Solving Ability for Each Indicator

Indicator	Cooperative Type STAD	Cooperative Type TPS	Cooperative Type TAI
	Post test	*Post test*	*Post test*
Understand the problem	1.62	1.88	1.82
Create a troubleshooting plan	2.76	3.1	2.54
Do the calculations	1.4	1.42	1.62
Re-check the results	1.3	1.18	1.22

Based on Table 1 above can be seen that the average score of post test of each indicator of learning clearly visible difference. This indicates that the students' ability in each class after being given treatment is different. In cooperative type TPS indicator understand the problem given to get higher average score that is 1.88 compared to cooperative type STAD that is 1.62 and cooperative type TAI that is 1.82. While the indicators make the problem-solving plan obtained the average score of cooperative type of TPS are higher that is 3.1 compared with cooperative type STAD 2.76 and cooperative type TAI is 2.54. then on the indicator perform calculations obtained scores average cooperative type TAI is higher that is 1.62 compared with cooperative type STAD is 1.4 and cooperative type TPS that is 1.42. And on the indicator to re-examine the results obtained the score of cooperative type of STAD type higher is 1.3 compared with cooperative type TPS is 1.18 and cooperative type TAI is 1.22. It is clear that students' mathematical problem solving abilities in the three classes is different. The difference in mean scores is due to differences in learning process of STAD Type Cooperative, TPS type and TAI type.

Significant difference tests by using ANOVA One Direction statistical test, before used ANAVA One Direction statistic must meet normality test, homogeneity test.

Normality test

Testing of posttest normality test result of problem solving ability of student mathematics in experiment class 1, experiment 2 classes and experiment 3 class aims to know whether the sample data obtained come from normally distributed population or not. The results of normality test for students' mathematical problem solving abilities in both classes were analyzed using Kolmogorov Smirnov test with the help of SPSS 16 presented in Table 2 below:

Table 2. Test Result Normality Test Mathematical Problem Solving Ability in All Three Classes

One-Sample Kolmogorov-Smirnov Test				
		Eksperimen1	Eksperimen2	Eksperimen3
N		33	33	35
Normal Parameters[a]	Mean	70.6061	76.9697	72.5714
	Std. Deviation	11.70988	8.45756	9.98318
Most Extreme Differences	Absolute	.284	.333	.349
	Positive	.203	.209	.251
	Negative	-.284	-.333	-.349
Kolmogorov-Smirnov Z		1.629	1.914	2.063
Asymp. Sig. (2-tailed)		.010	.001	.000
a. Test distribution is Normal.				

Homogeneity Test

The homogeneity test of the posttest scores of the students' mathematical problem solving tests for the experimental 1, experimental 2 and experiment 3 classes aims to find out whether the sampled data came from a homogeneously distributed population or not. The homogeneity test results of students' mathematical problem solving abilities in both classes were analyzed using Levene test with the help of SPSS 16 presented in Table 3 below:

Table 3. Homogeneity Test Results Mathematics Problem Solving Test in Third Class

Test of Homogeneity of Variances			
Score			
Levene Statistic	df1	df2	Sig.
3.085	2	98	.365

Based on table 3 above shows that significant pre test of math problem solving ability in both experiment class is 0,365 where 0,365>: 0.05. So H_o accepted H_a rejected. Thus the variance between pre test scores of students' mathematical problem solving abilities in experimental 1, experiment 2 and experiment 3 derived from populations of equal variance.

Hypothesis testing that has been formulated used one-way variance analysis using statistic F with the formula and criteria set. The results of hypothesis test analysis analysis with the help of SPSS 16 program can be seen in Table 4 below:

Tabel 4. Analisis Varians Satu Arah Kemampuan Pemecahan Masalah Matematika

ANOVA					
Skor					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	702.026	2	351.013	3.418	.037
Within Groups	10065.420	98	102.708		
Total	10767.446	100			

Based on the results of variance analysis for the model obtained a significance value of 0.037. because the significant level is smaller than 0.05, then Ho is rejected and Ha accepted. So it can be concluded there are differences in problem solving ability of mathematics between students that were treated with STAD type cooperative model with cooperative model of TPS type and with TAI type cooperative model. To solve the problem of mathematics, the value of pretest less than 0.05, it can be concluded that from 95% confidence level, the result of mathematical solving ability is influenced by the pre test of the students before the cooperative learning model of STAD, TPS and TAI type is applied. It can be concluded that there is a difference between improvement in problem solving ability of mathematics between students that are given STAD type cooperative learning model with students that are given cooperative learning model of TPS type, and TAI type cooperative learning model on fractional material.

STUDENT ACTIVITIES

The percentage of the average student activity in STAD type cooperative learning, TPS type, and TAI type for each category of student activity for five meetings is summarized in Table 5 below:

Category of Student Activity Component Observation	Average STAD type cooperative learning	Average TPS type cooperative learning	Average TAI type cooperative learning	PWI Tolerance Interval 5%
1. Listening to teacher explanations	22.95	26.21	22.50	20% ≤ PWI ≤ 30%
2. Discussion of students	23.99	23.65	20.07	20% ≤ PWI ≤ 30%
3. Discussion of students and teachers	27.08	27.91	27.40	20% ≤ PWI ≤ 30%
4. Solving Problems on LAS	22.95	23.68	23.47	20% ≤ PWI ≤ 30%
5. Not things that are relevant to Teaching and Learning Activities (KBM)	9.38	9.45	9.48	5% ≤ PWI ≤ 15%
6. Make conclusions of problem solving in LAS	9.45	9.55	9.55	5% ≤ PWI ≤ 15%
7. Student behavior that is not relevant to KBM	2.91	2.71	2.5	0% ≤ PWI ≤ 5%

From the above results can be concluded that the student activity has reached the ideal percentage of achievers, from the seven indicators above shows that the percentage of student activity is still on the threshold of the percentage of achievement of the ideal time or time tolerance interval of the predefined category. With reference to the established criteria of learning management is said to be effective if the four categories of tolerance criteria to achieve the effectiveness of the time used on seven points are met. This indicates that STAD types cooperative model, TPS type, and TAI type are effectively applied.

ANSWER PROCESS

Student response process is seen based on indicators of each math problem solving ability. Here are examples of student processes and errors based on the mathematical troubleshooting indicators for each class:

a. Understanding the Problem

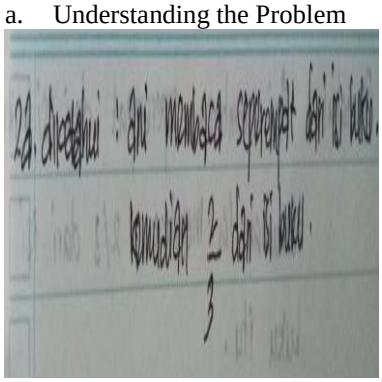

Figure 1 The process of student answers on STAD Type Cooperative Class

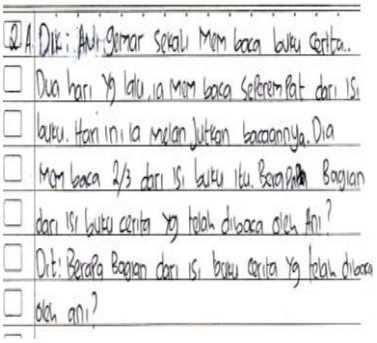

Figure 2 The process of student answers on TPS Type Cooperative Class

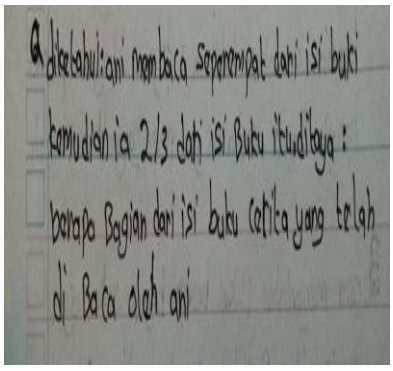

Figure 3 The process of student answers on TAI Type Cooperative Class

b. Create a problem-solving plan

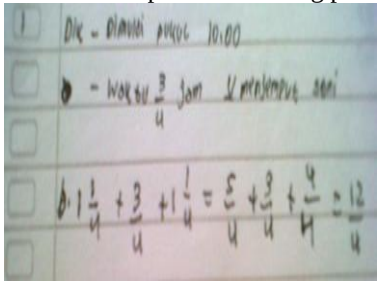

Figure 1 The process of student answers on STAD Type Cooperative Class

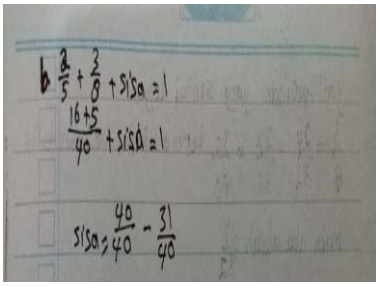

Figure 2 The process of student answers on TPS Type Cooperative Class

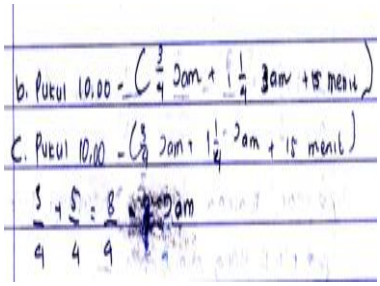

Figure 3 The process of student answers on TAI Type Cooperative Class

c. Doing Calculations

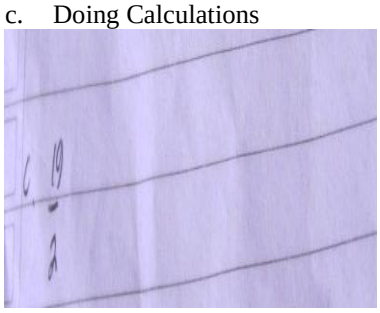

Figure 1 The process of student answers on STAD Type Cooperative Class

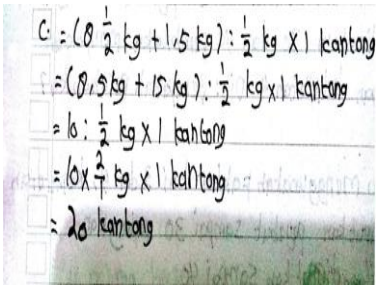

Figure 2 The process of student answers on TPS Type Cooperative Class

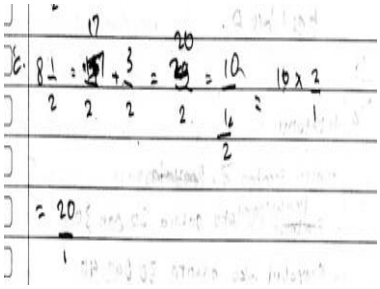

Figure 3 The process of student answers on TAI Type Cooperative Class

d. Re-Checking the Results Obtained

Figure 1 The process of student answers on STAD Type Cooperative Class

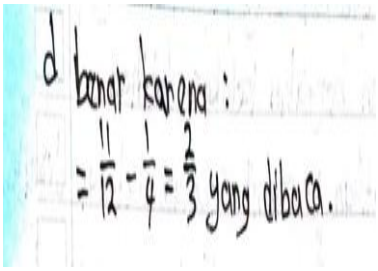

Figure 2 The process of student answers on TPS Type Cooperative Class

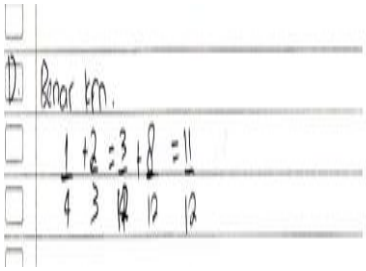

Figure 3 The process of student answers on TAI Type Cooperative Class

Based on the results of the student's answer process analysis obtained that, the process of student answers on cooperative learning TPS type more get the criteria of "good" assessment. The process of student answers on cooperative learning type TPS structured, systematic and in accordance with indicators of mathematical problem solving ability when compared with the process of student answers on STAD type cooperative and cooperative type TAI.

IV. Conclusion

Based on the results of data analysis and research findings during the study with STAD type cooperative model, cooperative model of TPS type and TAI type cooperative model with emphasis on problem solving ability, the researcher got the following conclusion:

1. There is a difference between problem solving ability of mathematics between students that are given STAD type cooperative learning model with students that are given cooperative learning model of TPS type and students who are given cooperative learning model of TAI type. Descriptively the average group of STAD type cooperative models on the indicators understand the problem is 1.62, the indicator makes a problem-solving plan that is 2.76, the indicator performs the calculation is 1.4 and the indicator re-examine the result is 1.3. whereas in the model group of cooperative type of TPS on the indicators understand the problem that is 1.88, the indicators make a problem-solving plan that is 3.1, the indicator performs the calculation is 1.42 and the indicator re-check the result that is 1.18. and on the TAI model type of cooperative model on the indicators understand the problem is 1.82, the indicator makes a problem-solving plan that is 2.54, the indicator performs the calculation is 1.62 and re-checking indicator is 1.22. in this al take the average problem solving mathematical problem using cooperative learning model of TPS type better than the model of cooperative type STAD and TAI type
2. Student activity on STAD type cooperative learning, cooperative model of TPS types and cooperative model of TAI type all aspects of category have fulfilled ideal time criteria specified. This means that student activity on the three lessons has been effective because the tolerance criteria for achieving time effectiveness used in seven categories are met.
3. The process of solving the students' answers in solving the problem of mathematical problem solving ability in the TPS type cooperative model is better than the student's answer in the STAD and TAI model of cooperative model, and the level of student's answer errors in solving the problem of mathematical problem solving ability in more TPS type cooperative model slightly more than the STAD type cooperative model and the TAI type cooperative model. This can be seen from the students' work on STAD type cooperative model, cooperative model of TPS type and cooperative model of TAI type.

V. Suggestion

Based on the research result, STAD type cooperative model, cooperative model of TPS type and TAI type cooperative model applied to the learning activities provide important things for improvement. For that researchers suggest some of the following:

1. In the STAD type cooperative model, TPS type and TAI type of teacher role is as a facilitator in the learning process, then the teacher should be able to create a fun learning atmosphere for students, giving the students the opportunity to generate ideas or ideas in their own way, students should also be given the opportunity to assess the answers of friends so that in learning students become more daring to express the right reasons for something, more confident and creative in solving a problem.
2. Student activity on STAD type cooperative model, cooperative model of TPS type and TAI type cooperative model is effective. It is expected that mathematics teachers provide opportunities for students to express their ideas in their own language and manner, so that students are more confident and creative in solving problems and daring to argue. Thus mathematics is no longer a scary and troublesome thing for students.
3. For other researchers using STAD type cooperative model, cooperative model of TPS type and TAI type cooperative model to be able to improve other mathematical ability such as metaphysical communication ability, mathematical reasoning, mathematical connection, mathematical representation and the like.
4. In this study, the comparison is STAD type cooperative learning model, cooperative model of TPS type and cooperative model of TAI type. The researcher suggests to the reader or subsequent researcher to be able to compare the equivalent learning model like TPS type cooperative model compared with modified TPS type cooperative model, such as ICT.

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