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The Effect of Think-Pair-Share Type of Cooperative Learning Model Associated With Autograph Software Media on Mathematic Problem Solving Ability of Students in Unggul Subulussalam State Senior High School

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ABSTRACT
This study aims to analyze: (1) The effect of the Think-Pair-Share Cooperative learning model assisted by Autograph Software on students' mathematical problem solving abilities, (2) The interaction between KAM and the Think-Pair-Share Cooperative learning model assisted by Autograph Software on students' abilities. students' mathematical problem solving. This research is a quantitative research with quasi-experimental method. The population in this study were the entire 11th grade of the Subulussalam State Senior High School for the 2020/2021 Academic Year which consists of 3 classes. Sampling was done by means of Cluster Sampling. The research sample was selected from two classes, namely class XI-1 was used as an experimental class with the TPS learning model assisted by Autograph and class XI-2 was used as a control class and was not given treatment. The research instrument used a Mathematical Initial Ability test, mathematical problem solving ability and self-efficacy ability. The statistical test of the data used a two-way ANOVA test. The results showed that: (1) There was an effect of mathematical problem solving ability between students who were given Think Pair Share learning assisted by Autograph Software and students who were given Ordinary learning, (2) There was no interaction between learning models and early mathematical abilities on mathematical problem solving abilities. student
KEYWORDS: *Think-Pair-Share Type Cooperative Learning Model, Problem Solving Ability, Early Mathematical Ability*

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I. INTRODUCTION

Today Information and Communication Technology (ICT) or Information Communications Technology (ICT) has developed rapidly in all aspects of human life. In the world of education, technology can be used not only in administrative matters but it is possible to use it as an alternative in the selection of learning media. Information and Communication Technology (ICT) needs to be integrated in the world of education. This is stated in Permendiknas No. 22 of 2006 in the background is explained as follows: "to increase the effectiveness of learning, schools are expected to use Information and Communication Technology (ICT) such as computers, teaching aids, or other media".

Mathematics is one of the basic knowledge that can develop the self-potential of students. Mathematics is studied by all students from elementary to junior high school and even to university. Mathematics is one of the branches of science that is considered to be able to make a positive contribution in spurring science and technology. This is in line with the opinion of Hudojo (1988) that mathematics has a very essential role for other sciences, especially science and technology. So that mathematics becomes very important in efforts to improve the quality of education and the potential of students. This is in line with Coockroft (in Abdurrahman, 2009) who stated that: Mathematics needs to be taught to students because (1) it is always used in all life, (2) all fields of study require appropriate mathematical skills, (3) require a strong means of communication, short and clear, (4) can be used to present information in various ways, (5) improve the ability to think logically, thoroughness, and room awareness and (6) give satisfaction to problem solving efforts.

Based on the analysis of the results of the 2012 Program for International Student Assessment (PISA) which measures the literacy, math and science literacy skills of 15-year-old students in SMP/MTs/SMA/MA/SMK, Indonesia is at the second level after Peru, where the highest level of ability is formulated in the PISA study, 75% of Indonesian students are at a level below 2 (two), and only 0.3% of Indonesian students are able to master subjects up to level 5 or 6. From the international average score of 494, Indonesian students only obtained an average of 379. This result shows that the mathematical ability of Indonesian students is still below international standards (Result in Focus, OECD, 2013).

One of the doing math that is closely related to the characteristics of mathematics is problem solving ability, in solving problems there are certainly problems to be solved. Problems can be interpreted as a situation, where someone is asked to solve a problem that has never been done, and does not understand the solution. A math problem or statement will be a problem if there are no certain rules or methods used to answer or solve it. For example, the subjects of arithmetic and algebra, if the answer procedure to solve the problem is not appropriate, it will become a problem.

Problem solving ability is a very important ability in learning mathematics and is one of the competencies that must be possessed by students. Problem solving is a process used to solve problems, students are said to have good mathematical problem solving skills if they are able to: (1) identify known and asked elements; (2) formulating problems or compiling mathematical models; (3) selecting and implementing strategies to solve problems.

Furthermore, Yuwono (2016) revealed "the importance of problem solving in human life which underlies why problem solving is central in learning mathematics at any level". This is also reinforced by the NCTM statement (in Yuwono, 2016) that "Problem solving has a special importance in the study of mathematics. A primary goal of mathematics teaching and learning is the development of the ability to solve a wide variety of complex mathematics problems". The meaning of this paper is that problem solving has an important meaning in learning mathematics. The main purpose of learning mathematics is to develop the ability to solve complex mathematical problems, thus students' ability to solve problems is the most important thing. So that problem solving skills in mathematics need to be trained and accustomed to students as early as possible to develop students' intellectual potential.

Polya (1973) said that in problem solving there is an element of discovery, so that it can increase students' curiosity, motivation and persistence to engage in mathematics. Bell (1978) also argues that many research results show that problem-solving strategies commonly learned in mathematics, under certain conditions, can be transferred and applied in other problem-solving situations. This means that problem solving that is carried out systematically can help students improve their analytical skills and help students apply these powers in various situations. So, by studying problem solving in mathematics, students will gain ways of thinking, diligent habits and curiosity and confidence in unusual situations (Hasratuddin, 2018: 106). Therefore, it can be concluded that the problem solving ability is very important for students.

According to Rusefendi (2005), each student has different abilities, there are students who are smart, moderate, and less intelligent. Where, these abilities are not merely innate (heredity), but can be influenced by the environment. Therefore, the selection of learning environments, especially learning models, is very important to consider, meaning that the selection of learning models must be able to improve heterogeneous students' mathematical abilities.

Based on the observations, it is known that the mathematics teacher of SMA Negeri Unggul Subulussalam always applies the direct learning model. The learning process tends to be teacher-centered. Where, the teacher plays an active role in explaining the material in front of the class, then gives some examples of questions. At the same time, the students just sat quietly and paid attention to the teacher's explanation. In addition, students very rarely ask questions and rarely get the opportunity to express their ideas. In line with that, Shoimin (2014) stated that most teachers still teach using the traditional way. Where this method is judged to be authoritarian and teacher-centered. In addition, students only listen to the teacher's explanation, so students become bored and find it difficult to accept the subject matter.

Based on the above conditions, it is necessary to improve the teaching and learning process in order to improve students' mathematical problem solving abilities. This improvement can be in the form of the application of a learning model that is active learning. Where teachers are expected to implement a learning that prioritizes student involvement in learning and provides opportunities for them to construct their knowledge. In line with Abdurrahman (2009) suggests that the factors causing the low or lack of students' understanding of mathematical concepts, one of which is the learning method used by the teacher. For example, in learning oriented to the traditional approach that places students in the teaching and learning process as listeners.

Based on the explanation above, the expected learning of mathematics in the classroom is student-centered learning, the learning process in the classroom that involves interaction between students and students, students and teachers, or students with learning media. The selection of the right learning model and media will greatly assist the learning process of mathematics in the classroom.

Cooperative learning model is one of the learning models that requires students to learn together to share ideas, connect thoughts and be responsible for achieving the learning outcomes of a group friend to solve problems, complete a task or complete a common goal. This is stated by Artzt and New Man (in Ahmadi 2009:13) as follows: "Cooperative learning is an approach that involves a small group of learners working together as a team to solve a problem, complete a task or accomplish a common goal".

Think-Pair-Share (TPS) type cooperative learning model is a learning model that has an explicitly defined procedure to give students more time to think, answer and help each other. This is expressed by Ibrahim (in Ahmadi, 2009:16) that: Think-Pair-Share is a more effective way to change the pattern of discussion in the classroom, this strategy has an explicitly defined procedure to give students more time to think, answer and help each other. This happens because the teacher only provides formulas and explains the steps of the process without any learning media that helps students to understand abstract material such as linear programs. This is in line with the opinion of Djamarah and Zain (1996:136) that in teaching and learning activities the ambiguity of the material being conveyed can be helped by presenting the media as an intermediary.

Hasratuddin (2008:25) says that learning difficulties that arise are not only due to difficult material, but can also be caused by the way the teacher delivers subject matter that is difficult for students to accept. This resulted in the need for learning media in the classroom as a tool that can help teachers convey an understanding of the material to students.

Autograph as a learning media is a very versatile and dynamic software for learning and teaching middle-level mathematics. Autograph can change the traditional way of learning with lectures into classroom learning led by students in learning by investigation and exploration. This software can help teachers and students to see the relationship between visual and symbolic representation. Autographs can help teachers and students visualize mathematics using dynamic 'object' relationships.

Autograph can help students in describing and determining the area of the set of solutions. It is expected that by using Autograph students can find their own solving area of the constraint function and be able to find the optimization value of a linear program either by corner point test or by line tracing. By using Autograph, it is expected that there will be interaction between students and computers as learning media, interactions between students and students, and students and teachers. In the end, it is hoped that after the interaction occurs, it can improve students' understanding and students' mathematical communication skills.

Based on the explanation above, the author feels the need to realize these efforts in a study entitled: "The Influence of the Think-Pair-Share Cooperative Learning Model Assisted by Autograph Software on the Problem Solving Ability of Students in Unggul Subulussalam State Senior High School."

II. METHODS

Research Pattern

The type of research used is quasi-experimental or quasi-experimental, namely research that approaches a real experiment where it is impossible to control/manipulate all relevant variables, there must be a compromise in determining internal and external in accordance with existing limitations.

In addition, in grouping research subjects based on pre-formed classes or existing classes. In line with this, Russeffendi (2005) also said that in this quasi-experimental subject, the subjects were not grouped randomly but the researcher accepted the condition of the subject as simple as that.

Subjek

The population in this study were all 11th graders of State Senior High School Subulussalam for the Academic Year 2020/2021 which consisted of 3 classes.

Research Instruments

The research instrument is a tool used to measure the observed natural and social phenomena (Sugiyono, 2010: 119). The data collection instrument used in this study was an initial mathematical ability test, mathematical problem solving ability.

Data Analysis

The data analyzed in this study were data obtained from the initial mathematical ability test and posttest on students' mathematical problem solving abilities through the TPS learning model. The processing of the data obtained will be analyzed in this study carried out by two analyzes, namely descriptive statistical analysis and inferential statistical analysis.

a) Descriptive Statistical Analysis

Descriptive statistics are numbers that provide an overview of the data presented in the form of tables, diagrams, histograms, frequency polygons, ogives, measures of central phenomena (calculated average, standard deviation, variance, and mode), standard deviations that aim to describe learning outcomes in the form of early

mathematical abilities and students' final abilities after learning is carried out in the experimental class and control class.

b) Inferential Statistical Analysis (Hypothesis Test)

Analysis of the data used is two-way Anova to see the interaction of the independent variables on the dependent variable.

The two-way ANOVA linear model is:

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{ijk} \; ; i = 1,2,3; j = 1,2; k = 1,2,3, \dots, n$$

Information:

Y_{ijk} = The score of the kth student's mathematical problem solving ability, at the ith mathematics initial ability, who received j learning.

III. RESULT

Students' Initial Mathematics Ability Test Results

The results of data analysis of early mathematical abilities from both the experimental class and the control class can be seen in Table 3.1 below.

Table 3.1 Data Description of Students' Early Mathematical Ability

Class	Early Mathematics Ability	$\bar{x}$	SD	Min	Max
Experiment	High (7)	36	3,74	7	40
	Medium (21)	20	5,86		
	Low (4)	7	0		
Control	High (11)	34,27	2,83	7	40
	Medium (18)	19,22	5,83		
	Low (3)	7	0		

Based on Table 3.1 above, it shows that the mean and standard deviation of the experimental class for students with KAM in the High category are 36 and 3.74; the Medium category is 20 and 5.86; and the Low category are 7 and 0. While the control class average and standard deviation with the High category KAM are 34.27 and 2.83; the Medium category is 19.22 and 5.83; and Low categories are 7 and 0.

Description of Post-Test Results of Mathematical Problem Solving Ability

Based on the data obtained from the score of mathematical problem solving ability, then analyzed to determine the mathematical problem solving ability of students who are taught with the Think-Pair-Share type cooperative model assisted by Autograph software and students who are taught with ordinary learning. The summary is presented in the following Table 3.2.

Table 3.2 Data Description of Mathematical Problem Solving Ability

Statistic	Learning	
	Experiment	Control
N	32	32
Average	73	68
Standard Deviation	6	6

Hypothesis test

The hypothesis testing formulated was analyzed using two-way analysis of variance using F statistics with a predetermined formula. The results of the calculation of the analysis of hypothesis testing with the help of SPSS can be seen in Table 3.3 below.

Table 3.3 Two Paths Anava Test Results of Mathematical Problem Solving Ability

Tests of Between-Subjects Effects

Dependent Variable:KPM

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.

Corrected Model	2382.582[a]	5	476.516	88.059	.000
Intercept	202452.782	1	202452.782	3.741E4	.000
Model * KAM	25.775	2	12.887	2.382	.101
Model	200.160	1	200.160	36.989	.000
KAM	1928.342	2	964.171	178.177	.000
Error	313.856	58	5.411		
Total	322204.000	64			
Corrected Total	2696.438	63			

a. R Squared = .884 (Adjusted R Squared = .874)

Based on Table 3.4, it can be seen that the learning model is significant = 0.000 <0.05 or H_0 is rejected. This means that there is an influence on the mathematical problem solving ability of students who are taught with TPS learning and students who are taught with ordinary learning. For KAM with a significant value of 0.000 < 0.05, then H_0 is rejected. This means that there is an influence of students' mathematical problem solving abilities between those with high, medium and low initial abilities. To see the large percentage of the influence of the learning model on students' mathematical problem solving abilities, it is presented in Table 3.4 below:

Table 3.4 Determination Method Test Results (R-*square*)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.906[a]	.821	.815	2.781

a. Predictors: (Constant), kam, model_pem

Based on the table above, the R-square or coefficient of determination is 0.821, which means that the effect of the independent variable on the dependent variable is 82.1%.

IV. DISCUSSION

1) The Effect of Think-Pair-Share Learning Model Assisted by Autograph Software on Students' Mathematical Problem Solving Ability

Based on the results of data analysis, the average posttest value for the TPS class was 73.00, while in the PB class the average posttest score was 68.00. This shows that the mathematical problem solving ability of students in the Think-Pair-Share class is better than the PB class. This is because in Think-Pair-Share (TPS) learning, teachers provide more opportunities for students to think, seek information from books and the internet and find their own problem solving, they also exchange roles to solve the problems presented. Then this might happen because Think-Pair-Share learning has several advantages over Ordinary learning. Judging from the ability of the indicator of problem solving ability, then for each indicator of the mathematical problem solving ability of the experimental class students is higher than the control class.

Based on the results of statistical analysis using two-way ANOVA, it can be concluded that there is an effect of mathematical problem solving abilities between students who are taught using TPS learning assisted by Autograph Software and students who are taught using Ordinary learning. This shows that TPS learning has a greater influence in developing problem solving abilities. This effect, according to the researcher, is due to the difference in the learning process between TPS learning assisted by Autograph Software and students taught with ordinary learning. In TPS learning assisted by Autograph Software, students are seen to be more active in solving problems given by the teacher. The problems given are contextual problems related to everyday life, where students solve problems and find mathematical concepts related to the material being studied.

Based on the results of the research described previously, it can be seen that the cooperative learning model has a positive influence on students' mathematical problem solving abilities. Cooperative learning also has a positive influence on students' independent learning attitudes. This strengthens the results of previous studies which also used cooperative learning models to improve mathematical abilities. Among them, the results of the research by Tripena and Elvis (2019) with the results of the study concluded that the mathematical problem solving ability of students taught by the Think-Pair-Share type of learning model was higher than the

mathematical problem solving ability of students who were taught by the Student Teams Achievement Division type of learning model.

Asep and Maskhopipah (2017) in their research concluded that the Think-Pair-Share type model can improve mathematical problem solving abilities. Maslina (2018) the Think-Pair-Share type learning model assisted by Autograph can improve students' ability to understand mathematical concepts in triangle material and their development in class VII-2 SMP Santo Antonius Jakarta.

Ahmadi (2009) conducted a study which concluded that (1) learning with the Autograph software media using the Think-Pair-Share cooperative learning model in learning straight-line equations was effective, (2) students' perceptions of the use of Autograph software media were good. . Based on the relevant research results above, this research will utilize ICT-based media in this case the Autograph software media to assist students in solving problems.

This study shows that the mathematical problem solving ability of students taught by the TPS model with the help of Autograph is better than students who are taught using the Ordinary learning model.

2) Interaction between Learning Model and Early Mathematical Ability on Students' Mathematical Problem Solving Ability

Based on the results of descriptive analysis, the average value of students' mathematical abilities in the TPS class in the category of low early mathematics ability is 63.50, moderate early mathematical ability is 72.00 and high early mathematical ability is 81.71. While the average initial ability in mathematics in the Ordinary class in the category of low early mathematics ability is 63.33, moderate early mathematical ability is 65.89 and early mathematics ability is high category of 73.09. This shows that the mathematical problem solving ability of students for the category of initial mathematical ability in the TPS class is higher than in the PB class.

Based on the results of statistical analysis with two-way ANOVA, the significant value of the interaction between the initial mathematical ability and the model is 0.101 where the significant value is greater than 0.05 so that H_0 is accepted. This means that there is no significant interaction between the learning model and the initial mathematical ability of students' mathematical problem solving abilities. This is in accordance with the results of Marzuki's research (2014) which states that there is no interaction between the learning model and students' initial mathematical abilities (high, medium, and low) on students' problem solving abilities. In accordance with the opinion of Kerlinger (1986:399) that "interaction occurs when an independent variable has different effects on a dependent variable at various levels from another independent variable".

V. CONCLUSION

1. There is an effect of mathematical problem solving ability between students who are given Think-Pair-Share learning assisted by Autograph software and students who are given Ordinary learning.
2. There is no interaction between the learning model and the initial mathematical ability of students' mathematical problem solving abilities.

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