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Difficulty Analysis of Mathematic Problem Solving and Mathematic Communication with the Application of Learning Models Tapps (Thinking Aloud Pair Problem Solving)

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ABSTRACT
This study aims to analyze and determine: (1) the level of students' mathematical problem solving abilities in TAPPS learning; (2) the level of students' mathematical communication skills in TAPPS learning; (3) Difficulty in the process of solving students' mathematical problems in TAPPS learning; (4) Difficulty in the mathematical communication process of students in TAPPS learning. This research is a descriptive qualitative research. The subjects of this study were 32 students of SMA Ar Radhiyyah Class XI-A, then the interview subjects were appointed based on the level of problem solving and mathematical communication skills, student response processes based on indicators and aspects of errors. The results of the research are as follows: (1) The results of research on problem-solving abilities with high-level interpretation of the indicators of understanding the problem are 59%, the indicators of planning problems are 44%, the indicators of implementing problems are 19% and. At a moderate level of interpretation, the indicator of understanding the problem is 28%, the indicator of planning problems is 34%, the indicator of recognizing and implementing the problem is 50%. At a low level of interpretation, the indicator of understanding the problem was 13%, the indicator of planning a problem was 22%, the indicator of carrying out the problem was 31%. (2) The results of the study on mathematical communication skills with a high level of interpretation on the writing indicator were 41%, the drawing indicators were 22%, and the mathematical expression indicators were 19%. In moderate interpretation the writing indicator is 47%, the drawing indicator is 50%, and the mathematical expression indicator is 34%. In the low interpretation the writing indicator is 13%, the drawing indicator is 28%, and the mathematical expression indicator is 47%. (3) Difficulty in problem solving (a) in the high category students do not experience difficulties; (b) in the medium category students have difficulty understanding concepts and operating mathematical linear inequalities; (c) in the low category students have difficulty synthesizing ideas, students have difficulty understanding concepts and students have difficulty in problem solving principles. (4) Difficulty in mathematical communication (a) In the high category students do not experience difficulties; (b) in the medium category students have difficulty operating and students have difficulty understanding the principles of mathematical algorithms; (b) in the low category students have difficulty operating problems and difficulty understanding principles

KEYWORDS: *Mathematical Problem Solving, Mathematical Communication, Learning Thinking Pair Problem Solving.*

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I. INTRODUCTION

Mathematics is one of the subjects that plays an important role in helping develop students' potential. The importance of mathematics, based on the students' ability to do mathematics, is the foundation and main vehicle which is an absolute requirement that must be mastered in order to be able to train students to think clearly, logically, systematically, and to have the personality and skills to solve problems in everyday life. In addition, mathematics is also full of values that can shape the personality and character needed to face the challenges of a competitive and professional era. [1]

Mathematics is one of the subjects that must be followed by students in school. Given the importance of mathematics to human life. However, students' perceptions of mathematics are not as important as the

benefits of mathematics itself on human life. Many students think that mathematics is the most frightening specter for them, as stated by Turmudi [2] that not many students like mathematics from any class. . In line with Holmes, Cooney in Hudojo [3] argues that teaching students to solve problems will allow students to be more analytical in making decisions in life. This means that students who are trained in solving problems will be able to make decisions, because they have skills on how to collect relevant information, analyze information, and realize how much it is necessary to reexamine the results they have obtained.

From the results of the 2015 PISA tests and evaluations, the performance of Indonesian students in mathematics is still low. The average achievement score of Indonesian students for mathematics is ranked 63 out of 69 evaluated countries (OECD, 2015). The average score of the OECD countries is 490, while Indonesia's score is 386. Indonesia's ranking and average score is not much different from the results of previous PISA tests and surveys in 2012, which is ranked 64 out of 65 evaluated countries (OECD, 2013). This shows that Indonesia's mathematics achievement is still low.

From the unsatisfactory fact above, one of the contributing factors is due to the students' low mathematical problem solving and communication abilities. Even though solving problems is a basic activity for humans. Most of life is dealing with problems. Then it is necessary to solve it. In learning at school students are often faced with problems, especially in mathematics. In addition to problem solving abilities, students' mathematical communication skills also need to be mastered because in the world of education it is inseparable from the role of communication. Mathematical communication skills are the ability to express mathematical ideas through speech, writing, demonstration, and visual painting in different types, understand, interpret, and assess ideas presented in writing, orally or in visual form, construct and connect various kinds of representations. ideas and relationships.

The National Council of Teachers of Mathematics (NCTM, 2000) [3] said that in implementing mathematics learning in schools, teachers must pay attention to five mathematical abilities, namely: connections, reasoning, communications, problem solving. solving), and representations (representations).

Saragih and Winmery [4] stated, “In the problem-solving is often found that students are only concerned with the final answer without understanding how the process if the answer is correct or not. This often results in the students' incorrect answers “. This means that in problem solving, it is often found that students only focus on the final answer without understanding how to process the answer is correct or not. Furthermore, Yuwono revealed "the importance of problem solving in human life which underlies why problem solving is central to learning mathematics at any level". Thus the ability of students in problem solving is the most important thing.

Saragih added that communication skills in learning mathematics need to be considered, this is because mathematics communication can organize and consolidate students' mathematical thinking both orally and in writing. If students have communication skills, it will certainly lead students to understand mathematics to the mathematical concepts being learned.

Based on the results of field observations, it was found that the teacher while teaching still uses direct learning during the learning process. Students also seem less active during learning. When given exercises with different forms of questions, with the example questions described by the teacher, most of them were less able to work on these questions. Then from the results of interviews with mathematics teachers stated that mathematics is still one of the difficult subjects for students. After that the researcher also conducted a problem-solving ability test and a mathematical communication ability test to the students. The test of problem-solving abilities that students have is also low, as is the test of mathematical communication skills. This is based on a test given to class X SMA Swasta Ar radhiiyah Langkat for material on two-variable linear equation systems.

Mathematical problem solving and communication skills are one of the goals in learning mathematics in schools because it trains thinking and reasoning in drawing conclusions, develops problem-solving skills, and develops the ability to convey information or communicate ideas through oral, written, pictures, graphics, maps. , diagrams, and so on

Efforts to improve the quality of learning that takes place in class are continuously socialized. One of the efforts made is to use the right learning approach. Murtiyasa [5] emphasized that "the right approach to learning mathematics can encourage students to gain a better understanding of mathematics so that they can be successful in learning mathematics". Through the right learning approach, it will create a combination of teaching activities carried out by teachers and learning activities carried out by students. Banjarnahor, H and Hutabarat [6] stated that "Educational institutions should be considered as the center of excellence in the overall discourse of human resource development".

There are many learning models that we can use in an effort to develop these two abilities, one of the learning models that is thought to be in line with the characteristics of mathematics and the expectations of the current curriculum is the Thinking Aloud Pair Problem Solving learning model. The application of a variety of learning models is one of the factors that influence student learning activities and outcomes.

The cooperative learning model is a learning strategy that has recently become a concern and is recommended by educational experts to be used. First, several research results prove that the use of cooperative learning models can improve student achievement as well as improve social relationship skills, foster an attitude of accepting self-deprivation and others, and can increase self-esteem. Second, the cooperative learning model can realize students' needs in learning to think, solve problems, and integrate knowledge with skills. From these two reasons, cooperative learning is a form of learning that can improve learning systems that have had weaknesses (Trianto,) [7].

Thinking Aloud Pair Problem Solving (TAPPS) Learning Model is a renewal to improve mathematical problem solving skills. Through the Thinking Aloud Pair Problem Solving (TAPPS) Learning Method, students are directed by the teacher through problem solving questions that require students to use their cognitive structures optimally, so that students can ask themselves what is related to the material and questions, and understand where lies his strengths and weaknesses in solving these problems.

This is consistent with what Barkley [8] explains that: The thinking aloud pair problem solving (TAPPS) model involves students working in pairs with different tasks for each student, one student is the problem solver, which is tasked with solving the problems given and explaining them to listeners and one other student party as listeners and when they become a problem solver, students must be able to find ideas, understand the mathematical concepts that are learned to be able to solve the problem, understand the sequence of steps that underlie their thinking, and be able to identify mistakes made. So that when students become problem solvers, students can practice their math problem solving skills.

II. METHODS

This type of research is qualitative research, research that describes what it is about a variable, symptom, or about a situation (Arikunto) [9]. This research has been conducted at SMA Ar Radhiyah with the subject, namely students of class XI-IPA, amounting to 32 students. Subject taking criteria based on indicators of student ability, answer errors. In terms of indicators, student answer sheets are grouped into three answer categories, namely (1) student answer sheets with high abilities; (2) student's answer sheet with medium ability; (3) student's answer sheet with low ability. The three sheet categories Then based on the dominant pattern of student answers, students will be selected as the interviewed subject. The object of this research is the students' mathematical problem solving ability and mathematical communication through the application of TAPPS learning. The research instrument was the students' mathematical problem solving test and the mathematical communication test and interview guide. Data analysis was performed using the Miles and Huberman model.

The results of student answers can be analyzed by referring to the scoring guidelines for solving mathematical problems and mathematical communication which can be seen in Table. 1 and Table 2.

Table 1. Students' Mathematical Problem Solving Indicators

Rated aspect	Score	Information
Understanding the Problem	0	Do not write down what was known and asked
	1	Incorrectly write down known and asked questions
	2	Write down known and asked correctly but not completely
	3	Write down what is known and asked correctly and completely
Problem Solving Planning	0	Does not formulate a problem-solving plan
	1	Formulating problem-solving plans inappropriately
	2	Formulate a problem-solving plan appropriately but incompletely
	3	Formulate a problem-solving plan appropriately and completely
Troubleshooting	0	No answer
	1	Write down completion procedures that lead to wrong answers
	2	Writes correct but incomplete completion procedures
	3	Writes the completion procedure correctly but there is a calculation error
	4	Write down correct completion procedures and correct results

Table 2. Students' Mathematical Communication Indicators

Communication Aspect	Indicator	Score
Expressing a mathematical idea or situation from a picture equipped with its own words and writing mathematical symbols (notations) in writing.	➢ Write down the information from the statement into mathematical language completely and correctly.	3
	➢ Incorrectly writing information from statements into the language of mathematics.	2
	➢ Write the information from the statement into the language of mathematics but it does not lead to a right or wrong answer..	1
	➢ No answer / empty answer.	0
Stating a situation in the form of a picture or graphic.	➢ Connect the image into the mathematical model completely and correctly.	3

Communication Aspect	Indicator	Score
	➢ Connect the image into the mathematical model completely and correctly.	2
	➢ Linking the image into a mathematical model but not leading to the right or wrong answer.	1
	➢ Not answering.	0
Able to state or explain situations in the form of mathematical notations or symbols or mathematical models.	➢ Can state the problem into symbols or mathematical language completely and correctly.	4
	➢ Can express almost any problem into symbols or mathematical language correctly	3
	➢ Only a small part of the problem into symbols or mathematical language.	2
	➢ Student answers are blank.	0

After analyzing students 'problem solving and mathematical communication, it will be continued to analyze students' difficulties in solving mathematical problems after implementing learning through TAPPS learning.

III. RESULT AND DISCUSSIONS

In the learning process that has been carried out for four meetings in class XI-IPA at SMA Ar Radhiyyah that in this study, students will be given problem-solving tests and mathematical communication tests. In the test there are 4 questions each with 3 indicators to be achieved in accordance with the provisions. Subjects are selected based on the test results of students' problem solving and mathematical communication abilities. The problem solving ability is divided into high, medium, and low categories. Meanwhile, communication skills are divided into high, medium and low abilities. obtained the results of problem solving tests and students' mathematical communication tests as shown in Table. 3 and Table. 4 below.

Table. 3 Mathematical Problem Solving Test Results

No	Interval Value	Number of Students	Percentage	Rating Category
1	80 ≤ MPS≤ 100	15	47%	High
2	65 ≤ MPS < 80	9	28%	Moderate
3	0 ≤ MPS < 65	8	25%	Low
Highest score		88		
Lowest score		55		
Average		73,98		
Standard deviation		10,017		

Table 3 shows the test results of the problem-solving abilities of 32 students. In table 3, the results of problem ability are categorized into three categories, namely low, medium, high. There were 15 mathematical problem solving students (47%), 9 students (28%) with moderate ability, and 8 (25%) low-ability students with a standard deviation of 10.017 and an average 73.98.

Table. 4 Mathematical Communication Test Results

No	Interval Value	Number of Students	Percentage	Rating Category
1	80 ≤ MPS ≤ 100	7	22%	High
2	65 ≤ MPS < 80	14	44%	Moderate
3	0 ≤ MPS < 65	11	34%	Low
Highest score		90		
Lowest score		55		
Average		69,84		
Standard deviation		9,979		

Table. 4 shows the results of the mathematical communication skills test of 32 students. In Table. 4, the results of mathematical communication skills are categorized into three categories, namely low, medium, high. There are 11 high-ability students (34%) low-ability students, 14 (44%) medium-ability students, and 7 high-ability students (22%). The average score of students' ability in the three indicators on the problem-solving ability test was 69.84 with a percentage of 70% with a standard deviation of 9.979.

IV. CONCLUSION

Based on the results of the analysis and discussion in the study, the following conclusions were made.

1. The level of problem solving ability of students in the high category. There are 15 students high ability level or 47%. There are 9 students or 28% of the ability level. There are 8 students or 25% of low proficiency level. Meanwhile, the level of mathematical communication skills is in the medium category. There are 7 students high proficiency level or 22%. There are 14 students or 44% of the ability level. There are 11 students or 34% of low proficiency level.
2. The level of problem-solving ability at the indicator stage of seeing and writing what is known and asked is 59%. At the planning stage indicator, namely reaching 44%. While the indicator for the stage of carrying out the completion is up to 19%. Based on the percentage results obtained at the level of students' mathematical problem solving abilities, each indicator can be seen that the lowest percentage is at the stage of carrying out the completion. Meanwhile, at the level of mathematical communication, the indicator for the mathematical expression stage reached 41%. At the drawing stage indicator 22%. While the indicator for the written text stage reaches 19%. Based on the percentage results obtained at the level of students' mathematical communication skills for each indicator, it can be seen that the lowest percentage is at the written text stage.

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