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Analysis of Students 'Mathematic and Self-Efficacy Communication Ability in The Thinking Aloud Pair Problem Solving Learning Model

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ABSTRACT
This study aims to describe: (1) the level of students 'mathematical communication abilities using the Thinking Aloud Pair Problem Solving learning model, (2) the level of students' self-efficacy using the Thinking Aloud Pair Problem Solving learning model, (3) the difficulties in mathematical communication abilities experienced by students in solving problems in the Thinking Aloud Pair Problem Solving learning model. This research is a qualitative research with a descriptive approach. From the results of the study, it was found that: (1) the level of mathematical communication abilities of students using the Thinking Aloud Pair Problem Solving learning model with medium ability had the highest proportion of 32%, followed by low-ability students at 20% and finally students with very high, high, and and very low respectively 16%, (2) the level of self-efficacy of students using the Thinking Aloud Pair Problem Solving learning model with medium ability has the highest proportion of 28% then high-ability students have a second proportion of 24% then followed by students very high ability is 20%, then low ability students are 16% and finally very low ability students are 12%, (3) students have difficulty in mathematical communication abilities, where 32% of students have no difficulty, 32% of students experience a little difficulty, 36% experience trouble.
Keywords: *Mathematical communication abilities, Self-Efficacy, Thinking Aloud Pair Problem Solving.*

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I. INTRODUCTION

The development of science and technology plays a very important role in life. The development of science and technology cannot be separated from the contribution of the field of mathematics, because mathematics is a universal science that underlies the development of modern technology. As part of education, learning is a process of interaction between students and educators and learning resources in a learning environment. Learning is the assistance provided by educators so that the process of acquiring knowledge and knowledge can occur, mastery of skills and character, and the formation of attitudes and beliefs of students.

Mathematics has an important role in everyday life. It should be noted that mathematics is not only an activity of addition, subtraction, division, and multiplication because mathematics today must be applicable and in accordance with the needs of modern life. One of the changes in the learning paradigm is the orientation from being teacher-centered to being student-centered, the methodology which was previously predominantly expository changed to participatory and the approach that was originally more textual has turned into contextual. All these changes are intended to improve the quality of education, both in terms of educational processes and outcomes (Trianto, 2009: 8).

Mathematical communication is an important part of learning mathematics because through communication students are able to organize and consolidate their mathematical thinking, and are able to explore mathematical ideas. This is in line with the objectives of mathematics as stated in Appendix III of Permendikbud No. 58 of 2014, namely communicating ideas, reasoning and being able to compile mathematical evidence by using complete sentences, symbols, tables, diagrams or other media to clarify a situation or problem. In addition, mathematics communication is important because it is a language of symbols that is depicted in the process of symbolization and formulation, namely converting statements into formulas, symbols or pictures.

According to Kartono and Sunarmi (2015: 128), without mathematical communication skills, students will not be able to convey their mathematical ideas / ideas to others. Therefore, in learning mathematics mathematical communication skills are very important for students to have, in order to convey their mathematical ideas to others according to their wishes.

The reality in the field shows that students do not have good mathematical communication skills. According to the results of the Trend in Mathematics and Science Study (TIMSS) in 2011, it shows that students in Indonesia who have mathematical communication skills are only 57% compared to other countries where 80% of their students already have mathematical communication skills, which causes Indonesia to rank number one. 45 out of 49 countries with averages set by TIMSS. Based on TIMSS data, it shows that the emphasis of mathematics learning in Indonesia is more on mastering basic skills, there is very little emphasis on applying mathematics in the context of everyday life, communicating mathematically, and reasoning mathematically, besides the research results of the Center for Mathematics Teacher Upgrading Development Team as well. revealed that in several different regions of Indonesia, most students have difficulty solving problem solving problems and translating daily life problems into a mathematical model (Maudi, 2016: 39).

According to Darkasyi, et al (2014: 22), the low ability of mathematical communication in Junior High Schools (SMP) is due to the fact that teachers still tend to be active, with a lecture approach delivering material to students so that students in communicating mathematically are still lacking. In addition to equipping students with good mathematical communication skills, students also need to develop self-efficacy. According to Simanungkalit (2016: 44) says that: self-efficacy is a psychological aspect that has a significant influence on student success in completing tasks and solving problems well. The ability to assess himself accurately is very important in carrying out the tasks and questions asked by the teacher, with self-efficacy it can make it easier for students to do assignments and improve their performance.

A person with low self-efficacy gives up easily in facing problems, tends to become stressed, depressed, and has a narrow vision of what is best to solve the problem. Meanwhile, high self-efficacy will help a person in creating a feeling of calm in facing problems or difficult activities. Self-efficacy helps people make choices, their efforts to progress, the persistence and persistence they display in the face of adversity, and the degree of anxiety or calm they experience when they maintain their life-spanning tasks. According to Sunaryo (2017: 94) mathematics self-efficacy has a positive contribution and a very important role in mathematics learning achievement that can be achieved by students.

However, facts in the field show that students' self-efficacy is still low. Azwar, Surya and Saragih (2017: 188) in their research found that based on interviews with SMA Negeri 1 Peureulak teachers, it showed that high school math teachers rarely paid proportional attention to increasing students' self-confidence. When the researcher asked some of the XI grade students of SMA Negeri Peureulak, when the learning took place the students still felt less confident about expressing their opinions and generally only answered questions when appointed by the teacher. When given a problem, students are generally still passive by waiting for answers from friends or from the teacher. And the information obtained from the teacher at the time of the initial research that the self-efficacy of students at SMP Wiraswasta Bt quizzes was still low because students did not believe in their own abilities, were still hesitant in solving problems in the questions, sometimes still seeing the results of the answers from other students.

In an effort to improve students' mathematical communication skills and self-efficacy is to use the Thinking Aloud Pair Problem Solving (TAPPS) model. At the time of the initial research, the researcher obtained from interviews with class VII-A maetamtika teachers at SMP Wiraswasta Bt Kuis stated that the teacher had never used the TAPPS model in previous learning, only that students always focused on the teacher and the learning process tended to be one-way. According to Maula in Ulfa (2020: 352) which concludes that the average problem solving ability of students in the TAPPS model is higher than the average problem solving ability of students in the expository learning model and the percentage of student learning completeness of TAPPS is higher than the percentage of student learning completeness in expository learning.

This TAPPS model is a development of the cooperative learning model. This model was first introduced by Claparede and later used by Bloom and Broader in their study of the problem-solving process in college students. This TAPPS learning model emphasizes students to think aloud and logically. The learning focus of TAPPS depends on the selected problem, so that students learn not only concepts related to problems, but also scientific methods to solve problems. This causes TAPPS to be in accordance with the scientific approach because learning will include activities. In other words, using the TAPPS model can improve students' mathematical communication skills and self-efficacy because the indicator of mathematical communication skills is that students are able to explain ideas, situations and mathematical relationships, orally or in writing using real objects, graphic images and algebra. And coupled with self-efficacy so that students can have the confidence or confidence they have in carrying out and completing the tasks faced in certain situations so that they are able to overcome obstacles and achieve predetermined goals.

II. METHODS

Research Pattern

This type of research used in this research is descriptive qualitative research. Qualitative research means research that describes what it is about a variable, symptom, or about a situation in Arikunto (2015: 315). This type of qualitative means that this type of research aims to describe mathematical communication skills and self-efficacy by applying the Thinking Aloud Pair Problem Solving learning model.

Participants

The subjects in this study involved students of class VII-A SMP Wiraswasta Batang Kuis in the odd semester of the 2020/2021 school year.

Data Collection Technique

Sugiyono (2016: 222) explains "in qualitative research, the research instrument or tool is the researcher himself". The main instrument in this study is the researcher himself, which means that the position of the researcher is the key (determinant) in filtering and analyzing data. In addition to researchers as the main instrument in research, simple instruments were developed to sharpen and complement the research data. These instruments include: tests of mathematical communication skills, self-efficacy questionnaires, and interview guides.

Data Analysis Technique

The data analysis used in this research is qualitative data analysis. Qualitative analysis is used to analyze data on students' mathematical communication skills and self-efficacy through the application of the Thinking Aloud Pair Problem Solving learning model. As for the qualitative approach used in this study, following the concept given by Mile and Huberman, it consists of three interactivated activity streams that take place continuously to completion. Activities in data analysis are: data reduction, data display, and conclusion.

III. RESULT

1) Descriptions of Students' Mathematical Communication Ability Levels

The level of students' mathematical communication skills can be seen in Table 3.1 below.

Table 3.1 Results of Students' Mathematical Communication Ability Levels

No	Level	Total Students	Percentage	Criteria
1.	$90{,}00 \leq P \leq 100$	4	16%	Very high
2.	$80{,}00 \leq P < 90{,}00$	4	16%	High
3.	$65{,}00 \leq P < 80{,}00$	8	32%	Medium
4.	$55{,}00 \leq P < 65{,}00$	5	20%	Low
5.	$P < 55{,}00$	4	16%	Very low

Based on table 3.1, it shows the results of the students' mathematical communication skills test as many as 25 students. In table 3.1, the results of mathematical communication skills are categorized into five categories, namely very high, high, medium, low, and very low. From the test results, it was found that students with very high categories were 4 students, students with high categories were 4 students, students with moderate categories were 8 students, students with low categories were 5 students, and students with very low categories were 4 students.

2) Description of Student Self-Efficacy Level

The level of student Self-Efficacy can be seen in Table 3.2 below.

Table 3.2 Results of Students' Self-Efficacy Level

No	Level of Self Efficacy	Total Students	Percentage	Criteria
1.	$80 \leq SE \leq 100$	5	20%	Very high
2.	$60 \leq SE < 80$	6	24%	High
3.	$40 \leq SE < 60$	7	28%	Medium
4.	$20 \leq SE < 40$	4	16%	Low
5.	$0 \leq SE < 20$	3	12%	Very low

Based on table 3.2 shows the results of Self-Efficacy of 25 students. In table 3.2, the students' Self-Efficacy results are categorized into five categories, namely very high, high, medium, low, and very low. From the results of Self-Efficacy, it was obtained students with very high categories were 5 students, students with high categories were 6 students, students with moderate categories were 7 students, students with low categories were 4 students, and students with very low categories were 3 students.

3) Relation of Mathematical Communication Ability Level, Mathematical Communication Indicators and Mathematical Communication Ability Difficulties

Mathematical Communication Ability Level	Mathematical Communication Indicators	Difficulty in Mathematical Communication Skills
Very high	Express a mathematical idea or situation from a picture equipped with its own words and write mathematical symbols (notations) in writing.	Students have no difficulties
	Stating a situation in the form of a picture or graphic.	
	Able to state or explain situations in the form of mathematical notations or symbols or mathematical models.	
high	Expressing a mathematical idea or situation from a picture equipped with its own words and writing mathematical symbols (notations) in writing.	Students are not conscientious
	Stating a situation in the form of a picture or graphic.	Students have no difficulties
	Able to state or explain situations in the form of mathematical notations or symbols or mathematical models.	Students have no difficulties
Medium	Expressing a mathematical idea or situation from a picture equipped with its own words and writing mathematical symbols (notations) in writing.	Students have no difficulty just being less conscientious.
	Stating a situation in the form of a picture or graphic.	Students have no difficulties
	Able to state or explain situations in the form of mathematical notations or symbols or mathematical models.	Students do not believe in solving problems so they experience a little difficulty.
Low	Expressing a mathematical idea or situation from a picture equipped with its own words and writing mathematical symbols (notations) in writing.	Students have difficulty writing the information contained in the picture into their own language.
	Stating a situation in the form of a picture or graphic.	Students have difficulty linking the pictures into a mathematical model but do not lead to right or wrong answers.
	Able to state or explain situations in the form of mathematical notations or symbols or mathematical models.	Students have difficulty understanding the problems contained in the questions and can only enter a small part of the problem into symbols or mathematical language.
Very Low	Expressing a mathematical idea or situation from a picture equipped with its own words and writing mathematical symbols (notations) in writing.	Students have difficulty working on questions because of the problems they usually do routine problems or just like that, so that they get different questions, they are immediately unable or the same way to solve the problem.
	Stating a situation in the form of a picture or graphic.	Students have difficulty making mathematical notations that link the pictures.
	Able to state or explain situations in the form of mathematical notations or symbols or mathematical models.	Students cannot state the problem into mathematical symbols or students write down the answer but it does not lead to the correct answer.

IV. DISCUSSION

Based on the results of the analysis of the level of mathematical communication skills of students, the results of the "very high" ability level were 16% with 4 students, the "high" ability level results were 16% with 4 students, the "moderate" ability level results were 32% with The number of students was 8 people, the results for the "low" ability level were 20% with 5 students, and the "very low" ability level results were 16% with 4 students. In the results of this study, the level of students' mathematical communication skills is said to be moderate, meaning that the level of mathematical communication skills of students is able to express or write down a small portion of information and ideas from statements into mathematical language, students are able to a small part can connect images into mathematical models, and students already capable of a fraction of the problem into symbols or mathematical language.

This is supported by the results of research by Werdiningsih, et al. (2019) which states that from the research he has done, the mathematical communication model of students with moderate groups is students who are able to explain ideas and situations in written language appropriately. A student who can express ideas and

situations facing problems into a mathematical model appropriately and correctly. Students who are unable to use formulas to deal with problems. But different things in the research results of Sriwahyuni, et al. (2019) state that the mathematical communication skills of junior high school students in the material of Quadrilateral and Triangles are still in the very low category. This can be seen from the results of the conversion of the ability scores of class VIII D students as many as 20 students are in the very low category with a percentage of 65%, 7 students with moderate ability with a percentage of 23%, 3 students with low ability with a percentage of 10%, who have high abilities. only as many as 1 person, namely equal to 3%, and very high ability students 0 people with a percentage of 0%.

Furthermore, the results of the Self-Efficacy level analysis showed that the results of the "very high" level of ability were 20% with 5 students, the results of the "high" level of ability were 24% with 6 students, the results of the "moderate" level of ability were 28% with the number of students. 7 students, the result of "low" ability level is 16% with 4 students, and the "very low" ability level is 12% with 3 students. In the results of this study, the level of self-efficacy of students is said to be moderate, meaning that the level of self-efficacy of students has gained confidence in their own abilities, ability to face challenges, the ability to solve and understand several different problems.

This is supported by the results of research by Prismana, et al. (2018) which states that from the research they have done, it can be concluded that students with high and moderate Self-Efficacy are generally able to remember conceptually, remember procedurally, understand conceptually, understand procedurally, apply the conceptually, apply procedurally, analyze conceptually, and analyze procedurally in problem solving questions.

V. CONCLUSION

1. The level of mathematical communication abilities of students with moderate and low ability has the highest proportion, followed by students with very low abilities and finally students with very high and high abilities.
2. The level of Self-Efficacy of students with moderate abilities has the highest proportion, then high-ability students have the second proportion, followed by very high-ability students, then low-ability students and finally students with very low abilities.
3. The difficulties of students' mathematical communication abilities in learning the TAPPS model are as follows:

a. In the very high category, students have no difficulty.
b. In the high category, students do not experience difficulties, it's just that students are less careful.
c. In the medium category, students do not believe in solving the questions so they experience a little difficulty.
d. In the low category, students have difficulty writing down and it is difficult to express the information contained in the questions into their own language, students have difficulty connecting the images into a mathematical model but do not lead to right or wrong answers and students have difficulty understanding the problems contained in the questions and can only enter fraction of the problem into symbols or mathematical language.
e. In the very low category, students have difficulty working on problems because of the problems they usually do routine problems or problems that just like that, so they get different questions they are immediately unable to or equate how to solve the problem, students have difficulty making mathematical notations that connect to pictures and students have not been fluent in understanding the problem into mathematical symbols properly so that when solving the problem students have not been able to follow the steps of the solution method so that the problem solving is not correct.

REFERENCES

[1]. Arikunto, S. (2015). *Dasar-dasar Evaluasi Pendidikan*. Jakarta : Bumi Aksara
[2]. Azwar, Surya, E & Saragih, S. 2017. *Development of Learning Devices Based on Contextual Teaching and Learning Model Based on The Context of Aceh Cultural to Improve Mathematical Representation and Self-efficacy Ability og SMAN 1 Peureulak Students*. Journal of Education and Practice. Vol.8, No.27, 186-195.
[3]. Darkasyi, Johar, & Ahmad . 2014. Peningkatan Kemampuan Komunikasi Matematis Dan Motivasi Siswa Dengan Pembelajaran Pendekatan Quantum Learning Pada Siswa SMP Negeri 5 Lhokseumawe. *Jurnal Didaktik Matematika*. ISSN : 2355-4185.
[4]. Kartono, and Sunarmi. 2015. Analisis Kemampuan Komunikasi Matematis Siswa Kelas VIII SMP Pada Model Pembelajaran TSTS Dengan Pendekatan Scientific. *Unnes Journal of Mathematics Education*. Semarang.
[5]. Maudi, N. 2016. Implementasi Model Project Based Learning Untuk Meningkatkan Kemampuan Komunikasi Matematis Siswa. *Jurnal Pendidikan Matematika Indonesia Volum 1 Nomor 1 Halaman 39-43. p-ISSN: 2477-5967 e-ISSN: 2477-844*.
[6]. Simanungkalit, R. H. 2016. Pengembangan Perangkat Pembelajaran untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa SMP Negeri 12 Pematangsiantar. MUST. *Journal of Mathematics Education, Science and Technology. Vol.1. No.1*.
[7]. Sugiyono. 2016. *Metode Penelitian Pendidikan Pendekatan Kuantitatif, kualitatif, dan R&D*. Bandung: Alfabeta

[8]. Sunaryo, Y. 2017. Pengukuran Self-Efficacy Dalam Pembelajaran Matematika di MTS N 2 Ciamis. *Jurnal Teori dan Riset Matematika (TEOREMA). 1(2): 39-44.*
[9]. Trianto. 2009. *Mendesain Model Pembelajaran Inovatif Progresif*. Surabaya:Kencana.

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