THE EFFECTIVENESS OF THE THINKING ALOUD PAIR PROBLEM SOLVING LEARNING MODEL ON STUDENTS' MATHEMATICAL COMMUNICATION SKILLS

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Abstract

The purpose of this study is to describe: (1) The mathematical communication skills of students taught with the Thinking Aloud Pair Problem Solving learning model achieve classical completeness, (2) The mathematical communication skills of students who are taught with the Thinking Aloud Pair Problem Solving learning model are better than those of students who are taught with the conventional learning model. The population in this study is 60 students in grade VIII of the even semester of Muhammadiyah Margasari Junior High School for the 2023/2024 academic year. Sampling was done using purposive sampling techniques. The data collection method used is the documentation and test method, previously the data was tested with validity, reliability, differentiation, and level of difficulty. The data analysis technique uses a t-test of one right-hand sample, a z-test of one right-hand sample, and a t-test of one right-hand hand for two samples, with normality and homogeneity tests first carried out. The results of the study show that: (1) The mathematical communication skills of students taught with the Thinking Aloud Pair Problem Solving learning model achieved completeness with the result of $t_{count} = 4{,}44 \geq t_{table} = 1{,}74$, then the average sample was more than the KKTP, which was 70 and $z_{count} = 2{,}07 \geq z_{table} = 1{,}65$ so that the number of students who achieved the KKTP was more than 75%, (2) The mathematical communication skills of students taught with the Thinking Aloud Pair Problem Solving learning model were better than students who are taught with the conventional learning model, the results are obtained from the t-test where $t_{count} = 1{,}76 \geq t_{table} = 1{,}69$.

Keywords: Effectiveness, TAPPS Learning Model, Mathematical Communication Ability

1 INTRODUCTION [ARIAL, 12-POINT, BOLD, UPPER CASE AND LEFT ALIG.]

In the current era, it is inevitable with the rapid development of science. In the world of education in Indonesia, it is no exception to experience extraordinary developments as a demand for global world development. Mathematics is a very important material in the world of education around the world. Mathematics is the basic science of all fields of science that underlie the development of modern technology, has an important role in various disciplines and advances human thinking (Yuliani, Zulfah, & Zulhendri 2018).

Communication is indispensable in the learning process. Teachers use communication to explain the material to be delivered to students, while students use communication to express ideas related to the concept of teaching materials, in this case, mathematical communication. Mathematical communication has an important role in mathematics learning, because students can express, explain, describe/describe, listen to make students to a deep understanding of mathematics. As expressed by many experts who have defined the ideas, principles and standards of mathematical communication (Paridjo, 2017: 60).

From the results of observations and interviews with Mrs. Tri Eka Pujiastuti, S.Si as a mathematics teacher in grade VIII of Muhammadiyah Margasari Junior High School, Tegal Regency, that students in grade VIII of Muhammadiyah Margasari Junior High School experienced difficulties in understanding mathematics subject matter. This is evidenced by low learning outcomes. For some classes, students' proficiency in learning mathematics is around 10%. So of the number of students, only a few get a score above KKM 70, the rest are still below the KKM.

Teacher-centered learning is also another difficult factor that makes students less active and bored during learning. Teachers are the only source of learning materials without the support of students or other sources. Teachers still use conventional learning models, teacher-centered learning, where the role of teachers controls most of the presentation of learning or it can also be referred to as a lecture

method that causes students to become bored and bored and lack motivation makes them less interested in participating in mathematics learning. If you look at mathematical communication, of course, it is also lacking, because it is difficult to understand so that students only want a shortcut to solve a problem in a problem so that it can be solved quickly without knowing the correct process. With these problems obtained through observation, there is a need for changes in the learning process, namely with breakthroughs and innovative ways of learning models. With the aim that the learning process can run well, fun and meaningful for students. The selection of the right learning model will greatly support the achievement of learning objectives (Prasetyo, t.t.).

The right learning model in overcoming the problems faced by students is the Thinking Aloud Pair Problem Solving learning model. This is due to the interaction between the Listener and the Problem Solver which has heterogeneous abilities, with one of the steps of the Problem Solver being (1) reading the problem aloud, (2) starting to solve the problem yourself. While the steps of the Listener are the details of each step taken by the Problem Solver, and (2) guide the Problem Solver to continue talking, but do not interfere with the Problem Solver when thinking, then by carrying out these steps, the Problem Solver and Listener can improve mathematical communication skills that meet one of the indicators of students' mathematical communication skills, namely according to Sumarmo as for the mathematical communication indicators, namely providing answers using their own language, modeling situations or problems using oral, written, concrete, graphs and algebra, explaining and making questions about mathematics that have been learned, listening, discussing and writing about mathematics, making conjectures, arranging arguments and generalizations. With this description, the author wishes to conduct research "The Effectiveness of the Thinking Aloud Pair Problem Solving Learning Model on the Mathematical Communication Skills of Grade VIII Students of Muhammadiyah Margasari Junior High School, Tegal Regency for the 2023/2024 Academic Year"

2 METHODOLOGY

The approach used for this study is a quantitative approach because the data obtained is quantitative data in the form of numbers. The method used in the study is a *quasi-experimental method,* which is an experimental method that does not allow researchers to fully control other factors that affect experimental variables and conditions. The sample consists of two different classes that get learning with different methods. The experimental design used in this study is the type of posttes only with nonequivalent desaign. The population in this study is students of kels VIII SMP Muhammadiyah Margasari in the 2023/2024 even semester academic year. The sample consisted of three classes, namely class VIII A (experimental class), class VIII B (control class), and class VIII C (trial class).

The sampling technique used in this study is *the purposive sampling technique.* The data collection techniques used are documentation techniques and test techniques. A research instrument is a tool used to measure observed natural and social phenomena. The instruments in this research are used to measure and collect data so that workers can easily process them. The instrument used in this study is a test instrument (mathematical communication test). The research instrument for the mathematical communication test uses a description test with a type of question based on mathematical communication indicators. The test is intended to find out students' mathematical communication in mathematics learning. The mathematical communication skills in this researcher used according to Losi et al., (2021) that the characteristics of a person's communication skills can be seen from three indicators, namely:

(1) Drawing ability, which includes the ability of students to express mathematical ideas in the form of drawings, diagrams, graphs, tables and algebraically,
(2) Written text, which is the ability to provide explanations and reasons mathematically in correct and easy-to-understand language
(3) The ability to express mathematical expression, namely the ability to make mathematical models.

3 RESULTS

3.1 Research Results

The results of the research at SMP Muhammadiyah Margasari in the 2023/2024 school year are as follows:

3.1.1 Description of the completeness of the data results of mathematical communication skills of two-variable linear equation system material using the *Thinking Aloud Pair Problem Solving Learning Model*

Table 1. Description of the Completeness of Mathematics Learning Outcomes of Experimental Class Students

Score	Categories of Learning Completeness	Frequency	Presentation (%)
0 < x < 70	Tidak Tuntas	1	5
70 ≤ x ≤ 100	Tuntas	19	95
Quantity Experiment		**20**	**100**

Based on table 1, it appears that of the 20 students as research subjects, there are 19 (95%) who are complete and 1 (5%) who are incomplete. This means that students who are taught using the *Thinking Aloud Pair Problem Solving* learning model have achieved classical completeness where classical completeness is achieved if at least 75% of students in the class have reached the minimum completeness score that has been set by the school.

3.1.2 Data Description of Mathematical Communication Skills on the Subject of Two-Variable Linear Equation System Using the *Thinking Aloud Pair Problem Solving Learning Model* and the Conventional Learning Model

The mathematical communication ability of the subject matter of the two-variable linear equation system using *Thinking Aloud Pair Problem Solving* (Experimental Class) and the Conventional Learning Model (Control Class) is presented in the data description table as follows:

Table 2. Description of Mathematical Communication Ability Data

No	Value	Experimental Classes	Control Classes
1	Number of Students	20,00	20,00
2	Maximum	83,00	82,00
3	Minimum	66,00	53,00
4	Mean	75,05	71,30
5	Median	73,00	71,50
6	Modus	80,00	70,00
7	Varians	27,31	65,95
8	Standard Deviation	5,23	7,89
9	Koefisien Variansi	0,069	0,113

The description of the data on students' mathematical communication skills showed that the average score of students' mathematical comprehension skills taught using the *Thinking Aloud Pair Problem Solving* learning model was 75.05 higher than the mathematical communication skills of students who were taught using the conventional learning model with an average of 71.30. In addition, looking at the median value and the experimental class mode showed that the value was higher than the median and control class mode.

The description of the data above shows that students who are taught using the *Thinking Aloud Pair Problem Solving* learning model have better mathematical communication skills than students who are taught using the conventional learning model.

3.2 Data Analysis

3.2.1 Normality Test

In this study, the normality test uses *the Liliefors test* with a significance level of 5%. The results of the calculation of the data normality test are as follows:

Table 3. Results of the Normality Test of Mathematical Communication Skills

No	Class	L_0 Maks	L_{table} (α = 5%)	Results
1	Experiment	0,163	0,190	Normal
2	Control	0,093	0,190	Normal

Based on the table above, it can be concluded that the data on students' mathematical communication skills is normally distributed because $L_{count} < L_{table}$.

3.2.2 Homogeneity Test

The data of this study was tested for homogeneity using the *Bartlett test* with a significance level of 5%. The results of the calculation of the data normality test are as follows:

Table 4. Homogeneity Test Results of Experimental and Control Classes

No	Variable	X^2_{count}	X^2_{table} (α = 5%)	Conclusion
1	Communication Skills	3,534	3,841	Normal

When viewed from the results of the homogeneity test, it shows that with a significance level of 5% of the results $X^2_{count} < X^2_{table}$, so it can be concluded that the data is homogeneous.

3.2.2 First Hypothesis Test

From the data from the results of the mathematical communication ability test of students taught with the *Thinking Aloud Pair Problem Solving learning model,* tests were carried out to find out whether they had met the criteria for completeness or not.

***Table* 5** Completeness Test *Results*

KKTP Achievement Test Results (t_{count})	t_{table}	Completeness Test Results (z_{count})	z_{table}
4,43	1,73	2,07	1,64

From the results of the data in table 5, it can be concluded that the results of the mathematical communication ability test of students taught with the $t_{count} > t_{table}$ & $z_{count} > z_{table}$ *Thinking Aloud Pair* Problem *Solving learning model* reached completeness.

3.2.2 Second Hypothesis Test

To test whether the mathematical communication skills of students who are taught with the *Thinking Aloud Pair Problem Solving* learning mode are better than those who are taught with the conventional learning model through a hypothesis test of the right-hand side t-test.

***Table 6** Test Results*

Variable	t_{count}	t_{table}
Mathematical Communication	1,74	1,69

From the results of the data in table 6, it can be concluded that the mathematical communication skills of students who are taught with the $t_{count} > t_{table}$ *Thinking Aloud Pair Problem Solving learning model* are better than students who are taught with the conventional learning model through the hypothesis test of the right-hand one-sided t-test.

4 CONCLUSIONS

Based on the analysis of data obtained from the results of the research of grade VIII of Muhammadiyah Margasari Junior High School, it can be concluded that (1) the mathematical communication skills of students taught with the *Thinking Aloud Pair Problem Solving* learning model achieve classical completeness, and (2) the mathematical communication skills of students taught with the *Thinking Aloud Pair Problem Solving* learning modelbetter than students who are taught with conventional learning models

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