APPLICATION OF THE RECIPROCAL TEACHING APPROACH TO EXAMINE MATHEMATICAL COMMUNICATION SKILLS IN STATISTICAL MATERIAL IN TERMS OF STUDENT MATHEMATICAL ABILITIES

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Abstract

This study explains skills in conveying mathematical concepts in writing through a Reciprocal Teaching learning approach on the topic of statistics. This study applies a qualitative descriptive approach with subjects consisting of grade VIII A students at SMP Negeri 04 Kota Tegal. The collected data is analyzed through the process of data reduction, data presentation, and conclusions. The findings showed that students with high communication skills were able to meet well the 4 indicators of mathematical communication, while students with moderate communication skills managed to meet the 3 indicators of mathematical communication well, and students with low communication skills managed to meet the 2 indicators of mathematical communication quite well.

Keywords: Analysis, Communication Skills, Reciprocal Teaching, Mathematization

1 INTRODUCTION

Education as a process of learning knowledge and skills has a huge impact on nation building. Mathematics, as a crucial part of education, contributes to the development of science and technology. The purpose of education is to develop the potential of individuals to become dignified human beings, which has an impact on attitudes, behaviors, and values in society. Through mathematics subjects, learners can improve mathematical communication skills, which play a vital role in understanding and conveying mathematical ideas effectively.

Mathematical communication skills are the ability to convey mathematical ideas / ideas into mathematical models both oral and written that help students in understanding the information obtained (Afifah et al). This ability is important for expressing mathematical ideas in the form of symbols, tables, diagrams, or other media. In the learning process, mathematical communication has a fundamental role in developing a deep understanding of mathematics. A learning atmosphere that supports expression, imagination, and exploration also influences the development of students' mathematical communication skills. Learning strategies, such as the reciprocal teaching model, are a solution to improve mathematical communication skills. Learning strategies, such as the reciprocal teaching model, are a solution to improve mathematical communication skills by providing opportunities for students to interact in mathematical language.

Based on Rachmayani's research (2014: 13) conducting research on the application of Reciprocal Teaching learning, the results showed that the mathematical communication skills of students who use Reciprocal Teaching learning are better than students who use direct learning. In this model, learners engage in various activities such as reading, summarizing, asking questions, solving problems, and making predictions, which together enrich their mathematical communication skills (Resnick in Lestari and Yudhanegara 2015: 69). Previous research has shown that the application of this model can improve students' mathematical communication skills and learning independence. In this context, mathematical communication and mathematization are interrelated, where mathematical communication allows the transfer of ideas of phenomena into mathematical symbols, whereas mathematization involves modeling phenomena into mathematical concepts.

2 METHODOLOGY

The research method used in this study is descriptive qualitative research. The group of students who were the subjects of this study were students from class VIII A at SMP Negeri 4 Kota Tegal in the

2022/2023 academic year. Subject selection was carried out through purposive sampling techniques, where two subjects were selected from each category, namely subjects with high ability taken from the upper quartile (Q3), two subjects with moderate ability taken from the middle quartile (Q2), and two subjects with low ability taken from the bottom quartile (Q1), based on the results of mathematical communication ability tests. Data collection is done through documents, observations, tests, and interviews. The process of data analysis involves steps such as data reduction, data presentation, and conclusions.

The indicators of mathematical communication skills used in this study are:

1. The ability to connect real problems into mathematical ideas.
2. The ability to express everyday events with mathematical symbols.
3. The ability to explain ideas, everyday situations and mathematical relations with tables and with pictures.
4. The ability to understand and evaluate mathematical ideas in solving everyday problems.
5. The ability to communicate conclusions to answers to everyday problems according to questions.

The horizontal and vertical mathematization indicators used in this study are:

1. Rephrase the problem using his own sentences.
2. Write down how to get answers through visualizations in the form of pictures or tables of given problems.
3. Write down the sentences contained in the problem with mathematical symbols.
4. Solve given problems using mathematical language and with solving algorithms.
5. Make a general statement about a given issue

3 RESULTS

After understanding the student's abilities, the next step is to determine the research subject through the application of purposive sampling techniques, which are used to select research subjects based on special considerations. The purpose of this subject selection is to represent the important characteristics of each group. From each group, one of each category was selected, namely students who received high, medium and low mathematical communication skills test scores. Based on the category of mathematical communication skills, the results result in a grouping of mathematical communication skills as seen in the table below.

Table 1. *Clarification of mathematical communication skills.*

Group	Border
Tinggi	$x \geq 82$
Sedang	$61 < x < 81$
Rendah	$x \leq 60$

The results of the evaluation of mathematical communication skills are divided into three categories, namely groups with high, medium, and low mathematical communication skills. These groupings are found in the table below.

Table 2. *Results of mathematical communication skills*

Group	Sum
Tall	6
Keep	11
Low	6

Total	23

From the data listed in Table 3, it can be identified that there are students who fall into each category of mathematical communication skills. There are six students with high mathematical communication skills, eleven students with medium mathematical communication skills, and six students with low mathematical communication skills. After the group selected one research subject from each group, the following research subjects were obtained:

Table 3. *List of Research Subject Names*

Code Name	Capability Grouping	Subject Code
E-01	Tall	T-1
E-12	Keep	S-1
E-19	Low	R-1

3.1 Analysis of Students' Mathematical Mathematical and Communication Skills

The research subjects that have been determined will be analyzed for their mathematical skills first and then analyzed for their mathematical communication skills, from the results of the test answers as follows:

Based on question number 1, namely "Arga is a grade VIII student of SMP Harapan Bangsa. In the first semester, Arga must complete five basic competencies in mathematics". The results of Arga's mathematical assessment on five basic competencies are presented in the form of frequency distribution tables, the following analysis is obtained:

3.1.1 Analysis of Horizontal and Vertical Mathematization Processes

a. Subject T-1 (E-01)

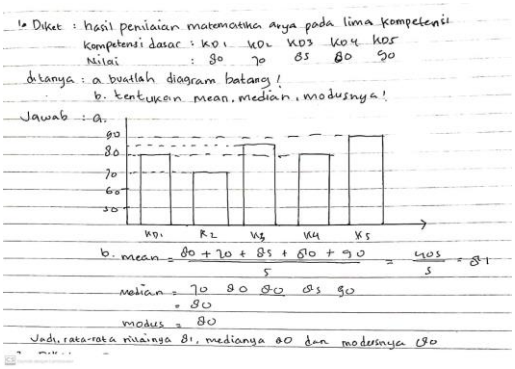

Figure 1*. Answer Results of Subject T-1*

Based on the analysis of mathematization with horizontal and vertical mathematization indicators, it can be concluded that Subject T-1 successfully meets all four indicators of mathematization ability. This includes the ability to rephrase a problem using one's own sentences, write down how to get an answer through visualization in the form of pictures or tables of a given problem, solve a given problem using mathematical language and with solving algorithms and make general statements about a given problem.

b. Subject S-1 (E-12)

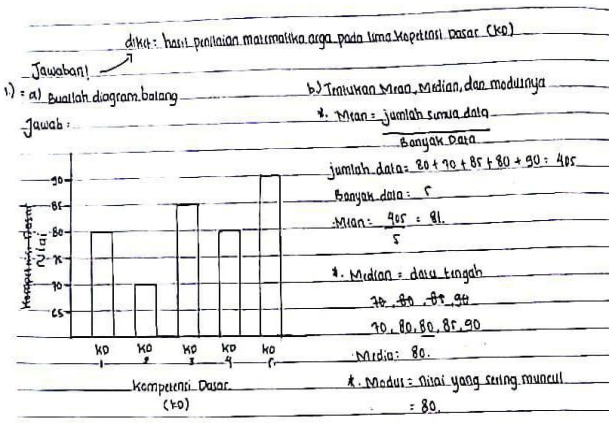

***Figure 2**. Answer Results of Subject S-1*

Based on the analysis of mathematization with horizontal and vertical mathematization indicators, it can be concluded that Subject S-1 successfully meets all three indicators of mathematization ability. This includes the ability to reexpress problems using one's own sentences, write down how to obtain answers through visualizations in the form of images or tables of a given problem and solve given problems using mathematical language and with solving algorithms.

c. Subject R-1 (E-19)

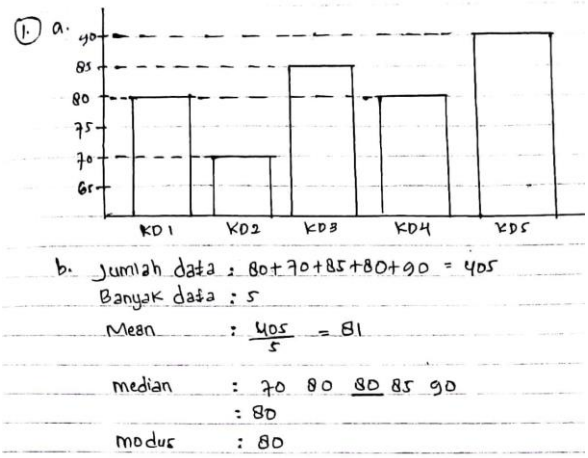

***Figure 3**. Answer Results of Subject R-1*

Based on the analysis of mathematization with horizontal and vertical mathematization indicators, it can be concluded that Subject S-1 successfully meets both indicators of mathematization ability. This includes the ability to write down how to obtain answers through visualizations in the form of images or tables of a given problem and solve a given problem using mathematical language and with solving algorithms.

3.1.2 Analysis of Mathematical Communication Skills

a. Subject T-1 (E-01)
Based on the analysis of tests on written mathematical communication skills in subject T-1 in figure 1, it can be concluded that students with a high level of mathematical communication skills successfully meet all four indicators of written mathematical communication skills. These indicators involve the ability to relate mathematical concepts to everyday life, the ability to explain mathematical ideas and their relationship with figures and tables, the ability to understand and evaluate mathematical ideas in solving problems in daily situations in writing,

and the ability to convey conclusions answers to daily problems in accordance with the questions asked. This view is reinforced by Nasriadi's (2022) view which shows that good communication skills are able to meet the four indicators in a comprehensive and appropriate way.

b. Subject S-1 (E-12)
From the analysis of the responses given by S-1 participants in figure 2, it can be seen that individuals with the ability to talk about mathematics are effectively successfully meeting the three-point mathematical communication assessment in writing. These aspects include the ability to relate mathematical concepts to real-life situations, the ability to explain ideas and their relationship to everyday contexts and their representation in the form of tables or figures, and the ability to understand and assess mathematical ideas in the context of daily problem solving in writing. This finding is in line with previous statements from Rakhmahwati (2019: 157) and Ritonga (2018: 116) which stated that individuals with good mathematical communication skills are able to meet the three assessment points competently and completely.

c. Subject R-1 (E-19)
From the analysis of responses given by R-1 participants in figure 3, it can be concluded that individuals with low mathematical communication skills are able to fulfill two aspects of mathematical communication assessment in writing well. These aspects include the ability to explain ideas and their relationship to everyday situations and aspects of the ability to understand and evaluate mathematical ideas in daily problem solving in writing. This finding is in accordance with previous views from Ritonga (2018: 123) and Rakhmahwati (2019: 163) which stated that individuals with low communication skills are only able to meet two aspects of assessment well and comprehensively.

4 CONCLUSIONS

Based on the discussion of qualitative data that has been obtained, it is concluded that the mathematical communication ability of students is directly proportional to the mathematical ability of students, namely the ability of mathematical communication in writing for students with high mathematical ability through reciprocal teaching learning models meet four indicators of written mathematical communication skills which are categorized by good mathematical communication criteria, communication skills Mathematical in writing for students with moderate mathematical ability meets three indicators of written mathematical communication ability which is categorized by good mathematical communication criteria and mathematical communication ability in writing for students with low mathematical ability meets two indicators of written mathematical communication ability which is categorized with good mathematical communication criteria.

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