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EFFORTS TO IMPROVE STUDENTS' MATHEMATICAL COMMUNICATION ABILITY THROUGH RECIPROCAL TEACHING LEARNING MODEL FOR CLASS VIII SMPS DEVELOPMENT NATIONAL SCHOOL OF MILK BASE

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Abstract

This study aimed to determine the improvement of students' mathematical communication skills in relation and function materials through the Reciprocal Teaching learning model in class VIII of SMPS National Development Pangkalan Susu. The researchers used classroom action research (CAR) which is carried out in 2 cycles, each cycle was carried out in 2 meetings. The subjects in this study were students of class VIII of SMPS National Development Pangkalan Susu, totaling 22 people. Data collection techniques used were teacher and student observation sheets, and tests of mathematical communication skills. The test was carried out 3 times, namely a diagnostic test, a test for mathematical communication skills I, and a test for mathematical communication skills II. The results of the research at the time of the diagnostic test showed that the students' mathematical communication skills in explaining/writing the elements were known, the elements were asked and concluded correctly and completely (33.4%), painting pictures, diagrams, graphs, or tables completely and correctly (38%), and express mathematical ideas using symbols or mathematical language in writing as a complete and correct representation of an idea or ideas (32%). After being given action in Cycle I and Cycle II, the students were able to explain/write known elements, ask questions and conclusions correctly and completely, describe pictures, diagrams, graphs, or tables completely and correctly, and state mathematical ideas using symbols or mathematical language in writing as a complete and correct representation of an idea or idea. The results of the mathematical communication ability test given in the classical cycle I obtained that students who completed were 10 students (45.45%) out of 22 students with an average of 58.09, in the second cycle who completed increased to 16 students from 22 students (81 ,81%) with an average of 74.18 and has achieved the classical completeness criteria because 80% of the number of students have mathematical communication skills in the sufficient category, namely 70. Based on the results of the study, it can be concluded that the Reciprocal Teaching model can improve students'

mathematical communication skills in SMPS National Development of Pangkalan Susu.

Introduction

The most fundamental is mathematics, where mathematics plays a very important role in knowledge and technology. (Leung & Hasratuddin, 2018) stated that mathematics is a science that supports human potential and can increase logical, critical thinking patterns, and the value of human potential and rational thinking patterns. Thus, one of the benchmarks and the original goal of learning mathematics is the ability to communicate mathematically to gain more interest in learning (Litkowski, Duncan, Logan, & Purpura, 2020). (Harahap, 2012) states that communication plays an important role, because using good communication among students, teachers, and the environment can exchange inspiration (Li & Peng, 2012). So it is necessary to know more about understanding mathematical communication skills (Rohid, 2019).

According to (Purwandari, Astuti, & Yuliani, 2018), mathematical communication is a dialect in the classroom with the topic of mathematical material on that day. Mathematical communication ability can also be interpreted as a student's ability to express mathematical ideas either orally or in writing (Sarah, Mursalin, Muliana, Nuraina, & Rohantizani, 2021), and is included in pictures, tables, symbols, diagrams, and algebra (Awiria, Santosa, & Yuhana, 2021).

Mathematical communication can be expanded with the process of learning mathematics in schools (Kusuma, 2021). It happens because of the ability of students to think which is developed from the science of logic. Thus, learning mathematics is crucial for mathematical communication that is developed (Hodiyanto, 2017).

Mathematical communication skills can be measured from six criteria:

a. Expressing conditions, pictures, diagrams, or other into language, symbols, ideas or mathematical models
b. Mathematical ideas, conditions and relations are explained orally or in writing
c. Listening and discussing and writing related to mathematics
d. Reading with understanding a written mathematical representation
e. Making conjectures, compiling arguments, formulating definitions, and generalizing
f. Restate a mathematical description or paragraph in your own language

However, in the learning process mathematical communication skills have not been fully developed explicitly. The reality in the field shows that students' mathematical communication skills are still low and many students have difficulties in learning mathematics.

As happened in class VIII-1 of the Pangkalan Susu National Development Junior High School, researchers conducted an initial test on February 26, 2021 with a total of 21 students. From the results of the initial test conducted. Based on the results of the initial test, it was obtained that the skills of students who were able to explain/write mathematics (Known elements, were asked and conclusions) only 11 students (33.4%) belonged to the very low category, students who were able to describe mathematics (Described) pictures, diagrams, graphs, or tables completely and correctly) only 9 students (38%) belong to the very low category and students who are able to express mathematics/mathematical representations (Stating mathematical ideas using symbols or mathematical language in writing) only 8 students (47 ,61%). Rate. average. ability. student mathematical communication. on. test. ability. beginning. is 72.73% with 16 students who are not capable of mathematical communication (value 70). So that the value has not reached classical completeness because the number of students who have completed (the score 65) has not reached 85% of the total number of students.

Efforts to build students' mathematical communication skills, one of which is influenced by the learning model applied by the teacher in order to create effective learning in learning mathematics, it is necessary to have a learning model involving the teacher, namely the teacher and students or students. The monotonous learning process will make students feel bored, the teacher must actively adapt the learning model to the material being taught.

One of the learning models of Reciprocal Teaching which is expected to improve students' mathematical communication skills. This learning model supports student involvement in learning activities.

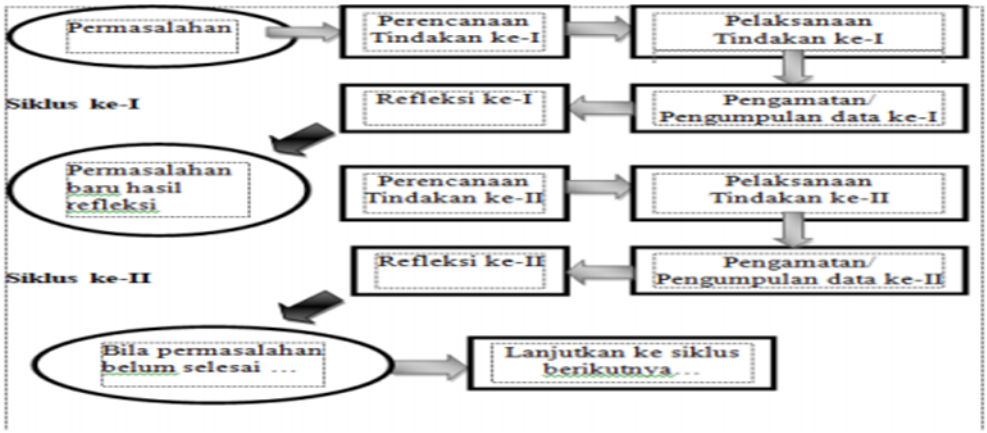
(Meilia, 2021) argues that:

Reciprocal Teaching is an upgrading approach that practices 4 independent description strategies (Said, 2021), namely formulating learning materials, organizing problems and solving them, re-explaining the insights that have been obtained (Hidayah, Ulfah, & Suryaningsih, 2021), after that predicting the next problem from the case presented to students. The benefit is that it can increase the enthusiasm of students in upgrading because students are demanded to actively share ideas and explain their professional results well so that the ability to design something especially the language of mathematics can be achieved. So it can be concluded that Reciprocal Teaching is a form of upgrading where students are given the opportunity to work on the module first. After that, students re-explain the modules they have learned to other students. The teacher only works as a provider and mentor in upgrading, which is to straighten or provide a description of module matters that cannot be solved independently by students.

Research Method

This type of research is classroom action research (Classroom Action Research) which aims to improve students' mathematical communication skills by applying the Reciprocal Teaching learning model to the material Relations and Functions in class VIII-1 students. Classroom Action Research is defined as research conducted in the classroom and aims to overcome various problems that occur in the classroom.

The subjects in this study were students of class VIII-1 SMPS National Development Base Milk, as many as 21 people. The object of this study is to improve students' mathematical communication skills in relation and function material by using the Reciprocal Teaching learning model in class VIII of the Pangkalan Susu National Development Middle School for the 2021/2022 Academic Year.



Picture 1. Classroom Action Research.

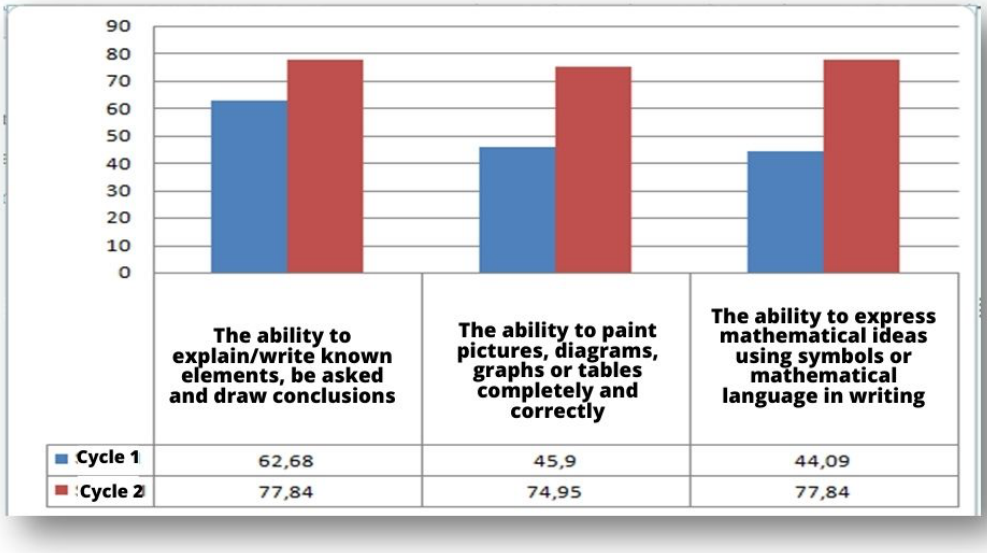
Result and Discussion

This research was conducted at SMPS National Development Pangkalan Susu Class VIII-1, which consisted of 21 students. The problem in this study is in accordance with the background of the problem, namely the low mathematical communication skills of students. The problem was obtained from the results of the initial ability test on students' mathematical communication skills given during observation. The results are described in the following table.

Table 1. Improving Students' Mathematical Communication Understanding Ability in Cycle I and Cycle II.

Ability Indicator	Cycle I	Cycle I	Improvement
Write/explain the known elements, ask questions and draw conclusions.	62,68	77,84	15,16
describe pictures, diagrams, graphs, or tables completely and correctly.	45,90	74,95	29,05
express mathematical ideas using symbols or mathematical language in writing.	44,09	77,84	33,75
Grade average	58,09	77,11	19,02
Classical completeness	45,45%	81,81%	36,36%

The average value obtained by students classically on the steps of mathematical communication on each test of mathematical communication skills II has increased. The following is a description of the students' mathematical communication steps:



Picture 2. Description of the Increase in the Average Score of Ability.

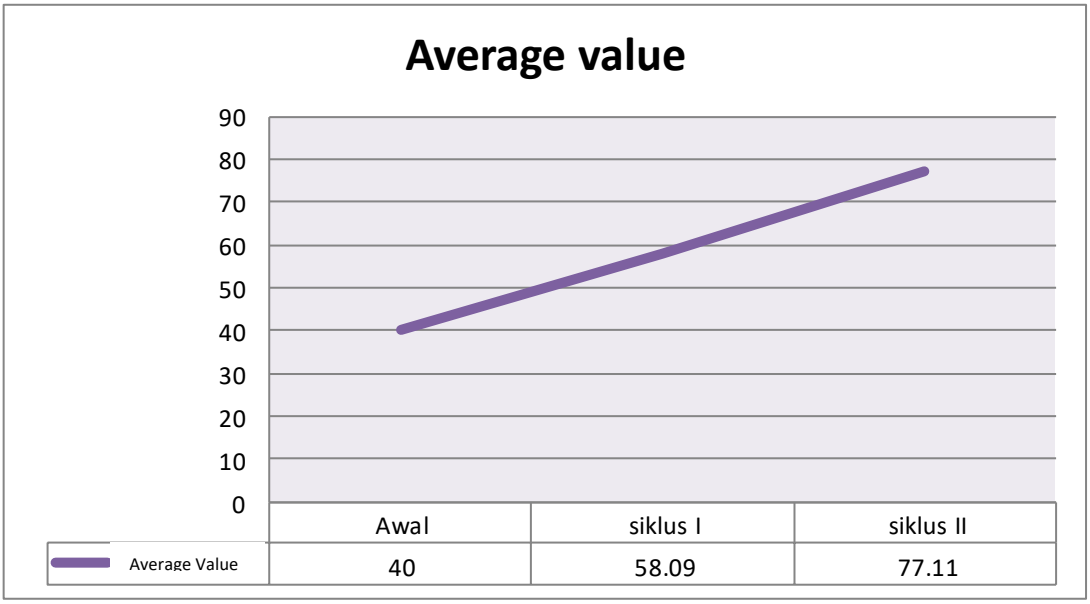
Based on the test results of students' mathematical communication skills in the initial ability test, the average test score from 40.00 increased to 58.09 in the first cycle and increased to 77.11 in the second cycle the percentage of students who have been able to communicate mathematically from 27.27 % in the initial ability test increased to

45.45% in the first cycle and increased to 81.81% in the second cycle. More details can be seen in table 2.

Table 2. Level of Mathematical Communication Ability Each Cycle.

Value Interval	Mathematical Communication Ability Level	Beginning	Cycle I	Cycle II
90 ≤ TKKM ≤ 100	Very High	-	-	-
80 ≤ TKKM < 90	Tall	-	-	5
65 ≤ TKKM < 80	Enough	6	10	11
56 ≤ TKKM < 65	Low	16	12	6
	∑	22	22	22
	Class Average	40,00	58,09	77,11

The results are presented in a graph in Picture 3.



Picture 3. Graph of the Average Value of the Communication Ability Test in Each Cycle.

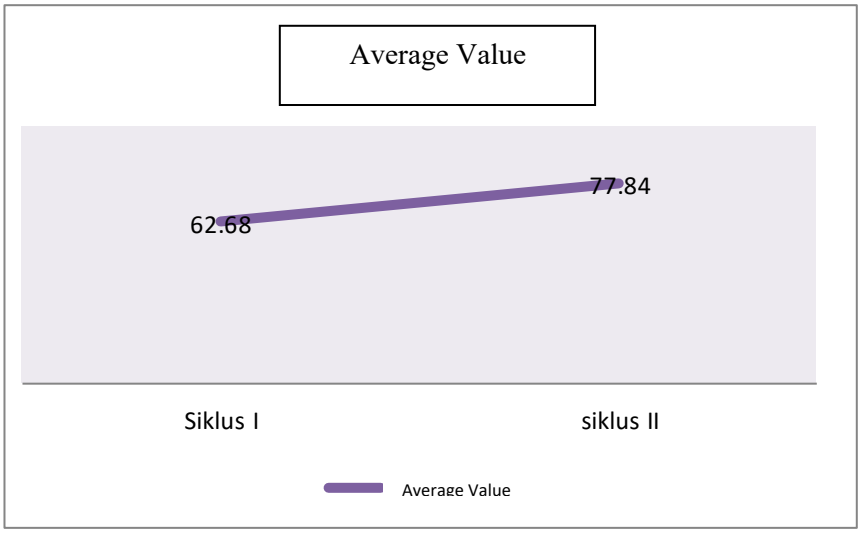
The students' ability in writing/explaining known elements, asked elements, and drawing conclusions on the questions in the first cycle obtained an average value of 62.68 and in the second cycle of 77.84 with an increase of 15.16. More details can be seen in table 3.

Table 3. Mathematical Communication Ability Level Cycle.

Value Interval	Mathematical Communication Ability Level	Cycle I	Cycle II
90 ≤ TKKM ≤ 100	Very High	-	-
80 ≤ TKKM < 90	Tall	5	8
65 ≤ TKKM < 80	Enough	10	12
56 ≤ TKKM < 65	Low	7	2
	∑	22	22

	Class Average	62,68	77,84

The results are presented in a graph in Figure 2



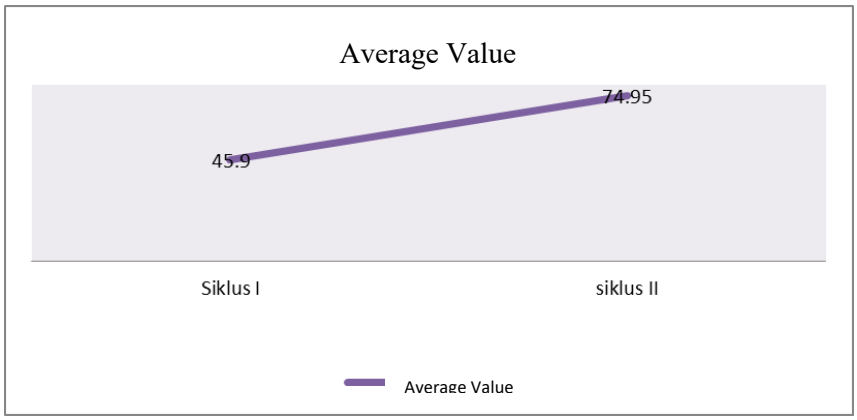
Picture 4. Graph of Mathematical Communication Ability Level Each indicator of ability to write/explain known elements, asked elements, and draws conclusions.

The ability to paint pictures, diagrams, graphs, or tables completely and correctly in the first cycle was 45.90 and in the second cycle the average value was 74.95 with an increase of 29.05. More details are noted in table 4.

Table 4. Level of Mathematical Communication Ability Each Cycle Indicator of ability to paint pictures, diagrams, graphs, or tables completely and correctly

Value Interval	Mathematical Communication Ability Level	Cycle I	Cycle II
90 ≤ TKKM ≤ 100	Very High	-	-
80 ≤ TKKM < 90	Tall	-	4
65 ≤ TKKM < 80	Enough	8	14
56 ≤ TKKM < 65	Low	14	4
	∑	22	22
	Average Class	45,90	74,95

The results are presented in a graph in Picture 5.



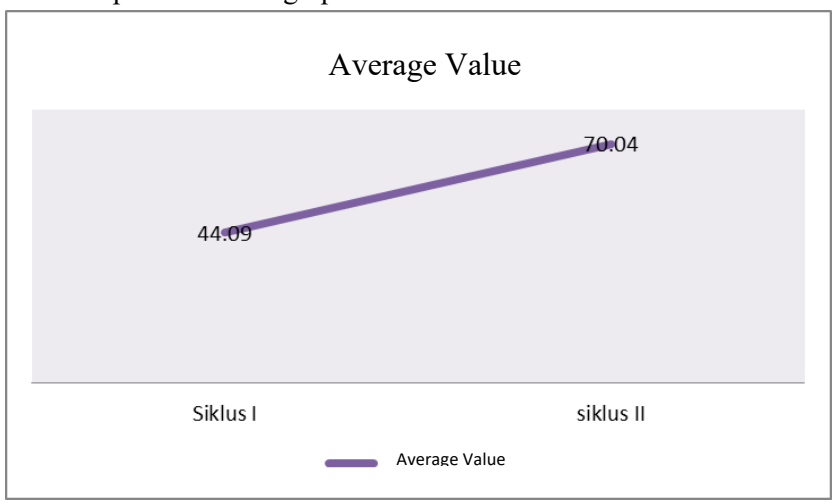
Picture 5. Graph of Mathematical Communication Ability Level Each Indicator depicts a complete and correct picture, diagram, graph, or table.

The ability to express mathematical ideas using symbols or mathematical language in writing in the first cycle was 44.09 and in the second cycle the average value was 70.04 with an increase of 29.14. More details are noted in table 5.

Table 5. Level of Mathematical Communication Ability Each Cycle Indicator states mathematical ideas using symbols or mathematical language in writing.

Value Interval	Mathematical Communication Ability Level	Cycle I	Cycle II
90 ≤ TKKM ≤ 100	Very High	-	-
80 ≤ TKKM < 90	Tall	-	2
65 ≤ TKKM < 80	Enough	7	15
56 ≤ TKKM < 65	Low	15	5
	∑	22	22
	Class Average	44,09	70,04

The results are presented in a graph in Picture 6.



Picture 6. Graph of Mathematical Communication Ability Level Each Indicator expresses mathematical ideas using written mathematical symbols or language.

From the description of the research results, it can be seen that through the reverse learning model (reciprocal teaching) can increase student activity because the principle of this learning is a learning that applies four cognitive strategies that direct students to be independent, active in understanding a material. So in every learning the more active role is the students.

In the first cycle, the observations showed that the students were quite happy and enthusiastic about learning with the application of the reciprocal teaching model to inform that this learning model could create a positive response for students to learn mathematics. Students also look smarter and bolder in applying the reverse learning model.

The results of the study after being given an action that was carried out in 2 cycles to see students' mathematical communication skills, namely in the first cycle, student learning was carried out according to the lesson plans that had been made in the material being studied and after learning was completed, students presented the results of their discussions. Cycle I was carried out in 2 meetings, after completing the first cycle at the end of the meeting students were given a test to measure mathematical communication skills by being given questions that matched the indicators of mathematical communication. The results of the implementation of the first cycle is 50.89 with the level of mathematical communication skills in the low category.

After the results obtained from the first cycle, it can be seen what problems have not been resolved in the learning process or at the time of giving the mathematical communication ability test. In the second cycle of group learning, there were still some groups that were not compact and not yet active. Researchers provide understanding to students about the importance of cooperation. The researcher determined that one of the students was the leader of the group who was encouraged to invite his friends to do an investigation together so that each member of the group could participate properly. Researchers guide students to divide tasks to each group member when presenting the results of the discussion in order to make time efficient.

Increasing indicators of mathematical communication skills, namely writing mathematics from cycle I to cycle II, increased from cycle I students who completed writing/explaining known elements, asked elements, and drawing conclusions there were

15 students (68.19%) and cycle II increased to 20 students (90.0%). The ability to paint pictures, diagrams, graphs, or tables completely and correctly also increased from 8 students (36.36%) to 18 students (81.82%). The ability to express mathematical ideas using symbols or written mathematical language has increased from 7 students (31.81%) to 17 students (77.28%).

Of the 4 indicators of mathematical communication skills that have the lowest average value is the ability to express mathematical ideas using symbols or written mathematical language. Because students do not really understand giving mathematical ideas in the form of symbols or mathematical language. Therefore, teachers should teach students various examples related to mathematical symbols.

Based on the results of the research that has been stated above, it shows that the application of the Reciprocal Teaching model can improve students' mathematical communication skills.

Based on the results of data analysis, learning mathematics on the material Relations and Functions using the Reciprocal Teaching model in cycle I can be said to be ineffective because it does not meet one of the indicators of learning effectiveness, namely classical mastery of students' mathematical communication ability tests that do not reach 80%, namely 58.09%. While in the second cycle of learning is said to be effective because: the classical mastery of the second mathematical communication skill test of students reached 81.81% and the process of implementing learning is in the good category.

Based on the description above, it can be concluded that the Reciprocal Teaching model is an alternative that can be used in improving students' mathematical communication skills (Iskandar, Jannah, & Wicaksono, 2021), especially the material on relations and functions at the Milk Base National Development Junior High School (Kilelu, van der Lee, Koge, & Klerkx, 2021).

Conclusion

The Reciprocal Teaching model is able to improve students' mathematical communication skills. The increase in students' mathematical communication skills is also supported by the increase in students' mathematical communication ability test results. The results of the student's mathematical communication ability test given in the classical cycle I obtained that students who completed were 10 students (45.45%) out of 22 students with an average of 58.09 and had not achieved classical completeness, in the second cycle students who completed increased to 16 students (72.72%) of 22 students with an average of 74.18 and have reached the classical completeness criteria. Based on the results of this study, it was concluded that the application of the Reciprocal Teaching model could improve the mathematical communication skills of class VIII students of the National Development SMPS Pangkalan Susu T.A 2021/2022 on the material of Relations and Functions.

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