Improving the Ability of Mathematic Communication through the Realistic Mathematic Education Approach (RME) at the Student Class Iv New SDN Karang 04 Cikarang Utara-Bekasi

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Abstract The purpose of this study is to obtain empirical data on the use of Realistic Mathematics Education Approach (RME) in improving the ability of mathematical communication. This research was conducted in grade 4 students of SDN Karang Baru 04 North Cikarang-Bekasi, which amounted to 30 students. The process of collecting data through the test of mathematical and non-test communication skills is the result of observation of Realistic Mathematics Education (RME) implementation using observation sheet of teacher and student activity and documentation result. The result of this research is the improvement of mathematics communication ability by applying Realistic Mathematics Education Approach (RME). It is proved by the value of the ability of mathematical communication before the pre-cycle of 53%, in cycle I the level of mastery increased by 67%, the second cycle reached 87%, the third cycle reached 93%. The implications of this study indicate that the Realistic Mathematics Education Approach (RME) emphasizes students working together in groups and solving learning problems faced in the learning group so that learning is more meaningful and student-centered.

Keywords: realistic mathematic education, mathematical communication

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1. Introduction

Study (TIMMS) in 2015. The results of PISA in mathematics learning show that Indonesia ranks 62 out of the 70 participating countries with mathematics competence achieving an average of 386. [1] While the TIMSS results indicate that Indonesia ranks 44th out of 56 countries participating with an average of 397. [2] Based on the results of the PISA and TIMSS shows that it is necessary to improve the ability of mathematical communication.

The result of the observation of mathematics communication ability possessed by students in mathematics subject is still very low. This happens in class IV SDN Karang Baru 04 Cikarang Utara Bekasi, that the ability of students in solving mathematical problems is still relatively low, especially on math related problems in communication math.

The importance of mathematical communication skills basically because in learning mathematics, the use of problem-solving in the form of notation, symbols, formulas and terms of a concept to determine the problem-solving. According to Baroody, there are several reasons why mathematical communication is important because 1) Mathematics as language and 2) mathematics is learning as a social activity. [3] It means that mathematics is not only a tool for thinking, but mathematics finds a pattern, concept, and problem-solving as well as mathematics as a social activity in the interaction of learning in the School, teacher communication and students which is an important part of mathematics learning in an effort to help students understand the pattern, the concept of solving a mathematical problem. The ability of mathematical communication to be important when the discussion between students is done, where students are expected to be able to say, explain, describe, hear, ask, and cooperate so as to bring students to a deep understanding of mathematics subjects. [4] Communication skills are seen as the ability of students in communicating the math learned as the content of messages to be conveyed. With students communicating the knowledge they have, it can happen mutually respond to the learning between students and the role of teachers only as a filter in the learning process takes place.

Turney et al in Marsh give the definition of communication that defines communication as the sharing of messages or attitudes that produce a degree of understanding between a sender and a receiver. in the classroom in the involves exchanging information constantly as the process involves a number of persons receiving and sending messages. One way of trying to analyze communication is to categorize it
Communication mathematics (De Lang, 2004) in Sadiq (2007) is a skill that must be mastered by students. Mathematical communication can be interpreted as a dialogue that occurs in a classroom environment that connects students' thinking with teachers or students with students, so the transfer of messages about mathematical material learned between teachers and students or among students in the classroom can be realized (Asikin, 2001). Sullivan & Mousley in Ansari (2003) views the ability of mathematical communication (KKM) as the ability of students to talk, explain, describe, listen, ask, clarify, cooperate, share, write, and finally report what has been learned. [6]

Mathematical communication is one of the standard processes in NCTM as described in Cooke & Buchholz that the communication standard highlights the importance of young children communicating their mathematical thinking coherent to peers and teachers. This standard also states that math language to express mathematical ideas. [7]

The mathematical communication is explained by Schneider & Peschek that In mathematical communication, in addition to verbal representations, such as symbolic representations (like arithmetical and algebraic expressions) are of particular significance. [8]

In Dewi Maulani's research, Suyono, Anton Noornia argued that the ability of mathematical communication is the ability to understand symbols, ideas, structures, diagrams, numbers, tables and mathematical sentences to further use them in problem-solving and re-express it in the learning of mathematics in the classroom. [9]

Research conducted by Mutiarani et al stated that the ability of mathematical communication is the ability associated with the ability of students to express ideas math appropriately. The ability of mathematical communication is needed by students, one of which is to communicate their ideas into a form of a mathematical model using symbols, forms of equations, tables, graphs to clarify a mathematical problem, especially in daily activities. [10]

Research conducted by Himmatul Ulya and Ratri Rahayu suggests that the ability of mathematical communication is very important for learners because, without the ability of adequate mathematical communication, learners will find it difficult to convey ideas and ideas in mind. [11]

Based on the above description, the researcher concludes that the ability of mathematics is the ability that students must have in expressing and using mathematical symbols, solving mathematical problems, conveying arguments to his mathematical ideas, describing the steps in the process of learning mathematics, and take conclusions in solving math problems.

In changing the paradigm that all teachers require learning innovations that can improve the ability of mathematical communication. So we need to use an approach in the learning process is closely related to the ability of mathematical communication, because the learning approach is a form of activity in the learning process that must be implemented teachers and students in order to achieve the learning objectives so that can be achieved effectively and efficiently. The learning approach used in overcoming mathematical communication ability is one of them is the Realistic Mathematics Education Approach (RME).

Approach Realistic Mathematics Education (RME) is an approach to motivate students to understand the concept of mathematics, by linking the concept with the problems in everyday life. The Realistic Mathematics Education (RME) approach fits the kind of contextual knowledge of mathematics. [12]

Research conducted by Lestari resulted in that Realistic Mathematics Education Approach (RME) was able to improve student learning outcomes. [13] Similarly, research conducted by Kurniawan and Astuti resulted in the Realistic Mathematics Education Approach (RME) is an approach in mathematics learning which in the process relates the real world context, but also to something that can be imagined by the students. [14]

Astuti, Yuanita, and Angraini explained his findings that the Realistic Mathematics Education Approach (RME) had a positive effect on students' math problem-solving skills. The application of realistic mathematics learning approach has a 76% impact on students problem-solving abilities. [15]

Research conducted by Rismaratri and Nuryadi explains that Realistic Mathematics Education Approach (RME) is a teaching approach that starts from real things for students, emphasizes the skills of process of doing mathematics, discusses and collaborates, argues with classmates so they can find self-solving strategy or problem-solve (student inventing as opposed to teacher teaching) and ultimately use mathematics to solve problems, both individually and in groups. [16] So the Realistic Mathematics Education Approach (RME) is an approach in the learning process to solve the Mathematical problem.

Based on the description of the findings, the Realistic Mathematics Education (RME) approach should be applied in the learning process because Realistic Mathematics Education (RME) approach has the advantage that the students are able to build their own knowledge so that students cannot forget their knowledge. The atmosphere in learning is fun because it uses real-life experience, each student will feel appreciated because in the learning process will be done with the assessment, fostering cooperation in groups, training the courage that students have explaining the answers they have, train students in conveying ideas and ideas owned, and the existence of mutual cooperation between groups in learning.

Based on the above description, the researcher is interested to conduct this research with the title of Improving Mathematical Communication Skills through Realistic Mathematics Education Approach (RME) in Grade 4 Students of SDN Karang Baru 04 Cikarang Utara Bekasi

1.1. Research Focus

Based on the background of the above problems, the focus of the research is the Improvement of Student Mathematics Communication Skills Through Realistic Mathematics Education (RME) Approach in fourth-grade students of SDN Karang Baru 04 Cikarang Utara Bekasi.

1.2. Formulation of the problem

Based on the focus of the research above can be put forward the formulation of the problem are: 1) Is the
Realistic Mathematics Education Approach (RME) can Improve the Communication Ability of Mathematics in the fourth grade students of SDN Karang Baru 04 Cikarang Utara Bekasi?; 2) How is the Realistic Mathematics Education Approach (RME) able to Improve the Communication Ability of Mathematics in the 4th Grade Students of SDN Karang Baru 04 Cikarang Utara Bekasi?

2. Methods

The research method used is Action Research. The action research used in this research is using Kemmis and Mc Taggart model. The research design is used in accordance with the rules of action research. This action research is conducted in an effort to improve the ability of mathematics communication in fourth-grade students by using Realistic Mathematics Education (RME) approach, through the giving of action which begins with a learning plan and followed by action in the class as well as reflection on the initial action and planning after learning.

The success of achieving the goal can be seen from the success of teachers to thoroughly that is 100% of students' success that is 80% of students who are in grade IV get the value above the completeness criteria of at least 70. Can be said successful if students who get ≥ 70 of 30 students, 24 students, then action research is considered successful. If the learning has already achieved the targeted outcome, then the research is said to be completed and not proceeded to the next cycle.

Sources of data in the implementation of this research are the fourth-grade students of SDN Karang Baru 04 Cikarang Utara Bekasi as the object of research which amounted to 30 students, consisting of 15 men and 15 women who made the study of viewing the ability of mathematical communication in following the learning process.

3. Results

3.1. Pre-cycle Data Result

Based on the results of the students’ initial tests after being corrected by the researchers showed that of the 30 (thirty) students who took the initial test, there were 7 people or 23% who scored between 80-100 (Criteria A), and 9 people or 30% between 70-80 (criteria B) and 12 people or 40% who scored between 60-70 (criteria C), and 2 or 7% of students who scored less than 55 (Criteria D). Preliminary test results above the average score of 69.53. If it is based on Minimum Exhaustiveness Criteria (KKM), it is known that there are sixteen (53%) complete students and an unfinished student of fourteen (47%). The results indicate that the average value of the acquisition of student learning outcomes is still below the criteria of successful research. For more details, the data can be seen in the appendix.

Initial test results are described in table form as follows:

| Value Range | Frequency | Percentage | Information |
|-------------|-----------|------------|-------------|
| 80 – 100    | 7         | 23%        | High        |
| 70 – 79     | 9         | 30%        | Medium      |
| 60 – 69     | 12        | 40%        | Less        |
| 50 – 59     | 2         | 7%         | Low         |

From the table above can be described in the graph of the percentage of mathematical communication ability as follows:

![Graph 1.](image)
Based on the graph is known that the classical achievement of student learning outcomes Mathematics is still low and does not meet the minimum mastery criteria. This is reinforced by several findings problems such as 1). At the time of learning process in class IV SDN Karang Baru 04 North Cikarang-Kabupaten Bekasi, seen teachers still dominate the course of the learning process so that students look passive and just listen to the teacher's lectures then students do the task was given teachers; 2). Teachers do not relate mathematics learning to events in the world of society; 3) Students lack communication in learning mathematics and lack of ideas and ideas that they have. Therefore, there should be improvements in learning that have a positive impact on improving student learning outcomes, especially Mathematics subjects.

3.2. Results of Cycle I Research

Based on the results of the learning cycle I tested the results of mathematical communication skills on the mathematical material about the area of the triangle, and after corrected by the researchers showed that of the thirty students who took the first cycle test, there were sixteen people (53%) who scored between 80-100 (Criterion A), and four people (13%) scored between 70-80 (Criterion B) and ten (33%) scored between 60-70 (C), and no one scored less than 55-60 (Criterion D). The results of the learning cycle I above the average score of 74.96. If it is based on Minimum Exhaustiveness Criteria (KKM), it is known that there are twenty (67%) and ten unresolved students (33%). The results of the test students are still fewer criteria for the success of the research. For more details, the data can be seen in the appendix shows that the average value obtained from the results of students' mathematical communication skills.

Results of the ability of class IV mathematics communication in cycle I am described in the form of tables as follows. The percentage of the results of students' mathematical communication skills in this cycle I only reached 67% of students who achieve mastery. In cycle I the number of students who completed twenty students, then students who have not completed still ten learners. This means that learning outcomes in the first cycle have not been maximized. So there needs to be an improvement in the next learning process. To clarify the results of the further study can be presented in the form of the following table.

| Value Range | Frequency | Percentage | Information |
|-------------|-----------|------------|-------------|
| 80 – 100    | 16        | 53%        | High        |
| 70 – 80     | 4         | 13%        | Medium      |
| 60 – 70     | 10        | 33%        | Less        |
| 50 – 65     | -         | -          | -           |

From the table above can be seen that the student learning outcomes in the first cycle have not been able to achieve from the specified target, from the number of 30 students only 20 new people who got the score above the KKM. To more clearly know the percentage of students' mathematical communication ability results are presented in graphical form below:

![Figure 2. Results of mathematical communication skills cycle 1](image-url)

| Learning outcomes | Many Students | Percentage |
|-------------------|---------------|------------|
| Completed         | 20            | 67%        |
| Not yet completed | 10            | 33%        |
| amount            | 30            | 100%       |

Table 2. Results of Communication Ability Mathematics Cycle I

Table 3. Presentation of Communication Ability Results Mathematics Cycle I
From the table above can be seen the results of communication skills mathematics cycle I have not fulfilled the desired so that the improvement in the next cycle. Based on the data and description above, the objectives to be achieved on the learning of the first cycle has not been achieved therefore the learning activities need to be continued in the next cycle. Based on the results of this cycle I, then for the second cycle of learning process should be implemented better, more interesting and more fun for learners so that learning can run smoothly and the results of learning maximum.

3.3. Cycle Research Result II

Based on the result of learning cycle II, the result of Mathematics communication ability in mathematics material about triangle area, and after corrected by the researcher showed that from thirty students who followed the cycle II test, there were nineteen people (63%) who got score between 80-100 (Criteria A), and seven people (23%) scored between 70-80 (criterion B) and four (13%) scored between 60-70 (C), and no one scored less than 55-60 (Criterion D). The results of the learning cycle I above the average score of 74.96. If it is based on Minimum Exhaustiveness Criteria (KKM), it is known that there are six (87%) and 4 (13%) unfinished students. The test results have met the criteria for the success of the research. To be more clear the data can be seen in the appendix shows that the average value obtained from the results of students' mathematical communication skills.

Results of the ability of class IV mathematics communication in cycle II is described in table form as follows. The percentage of the results of students' mathematical communication skills in cycle II reached 87% of students who achieve mastery. In cycle II the number of students who completed twenty-six students, then students who have not completed still four students. This means that the learning outcomes in cycle II are maximal. Therefore, researchers will still make improvements related to the improvement of the learning process and willing to continue again in the next cycle. To clarify the results of students' mathematical communication skills can be presented in the following table.

| Value Range | Frequency | Percentage | Information |
|-------------|-----------|------------|-------------|
| 80 – 100    | 19        | 63%        | High        |
| 70 – 80     | 7         | 23%        | Medium      |
| 60 – 70     | 4         | 13%        | Less        |
| 50 – 65     | -         | -          | -           |

From the table above can be seen that the results of students' mathematics communication skills on the second cycle has reached from the specified target, from the number of 30 students has 26 people who got the score above the KKM. To more clearly know the percentage of students' mathematical communication ability results are presented in graphical form below:

![Graph showing results of communication ability in cycle II](image)

**Figure 3.** Results of mathematical communication skills cycle II

**Table 5. Presentation of Communication Ability Results Mathematics Cycle II**

| Learning outcomes | Many Students | Percentage |
|-------------------|--------------|------------|
| Completed         | 26           | 87%        |
| Not yet completed | 4            | 13%        |
| Total amount      | 30           | 100%       |
From the table above can be seen the results of mathematical communication skills cycle II already meet the desired. Based on the data and description above, the objectives to be achieved on the learning of cycle II has been achieved but the researcher will continue the learning activities in the next cycle. Based on the results of this cycle II, then for the second cycle of learning process should be implemented with better, more interesting and more fun for learners so that learning can run smoothly and the results of learning more leverage.

3.4. Results of Cycle Research III

Based on the result of learning cycle III, the result of Mathematics communication ability in mathematics material about triangle area, and after corrected by the researcher showed that from thirty students who took the third cycle test, there were twenty-three people (77%) who got score between 80 -100 (Criteria A), and five people (17%) scored between 70-80 (criterion B) and two (7%) scored between 60-70 (C), and no one scored less than 55-60 (Criterion D). Results of students' ability in cycle III above average score 83.2. If it is based on Minimum Exhaustiveness Criteria (KKM), it is known that two (sixty) complete students (93%) and two (7%) unfinished students. The test results have met the criteria for the success of the research. To be clearer the data can be seen in the appendix shows that the average value obtained from the results of students' mathematical communication skills.

Results of the ability of mathematics communication class IV in cycle III is described in the form table as follows. The percentage of the results of students' mathematical communication skills in the third cycle reached 93% of students who achieve mastery. In cycle III the number of students who completed twenty-eight students, then students who have not completed only two students. This means that learning outcomes in cycle III are maximal. To clarify the results of students' mathematical communication skills can be presented in the following table:

| Value Range | Frequency | Percentage | Information |
|-------------|-----------|------------|-------------|
| 80 – 100    | 23        | 77%        | High        |
| 70 – 80     | 5         | 7%         | Medium      |
| 60 – 70     | 2         | 7%         | Less        |
| 50 – 65     | -         | -          | -           |

From the table above can be seen that the results of students' mathematics communication skills in cycle III have reached from the specified target, from the number of 30 students already 28 people who got the score above the KKM. To more clearly know the percentage of students' mathematical communication ability results are presented in graphical form below:

![Figure 4. Results of mathematical communication skills cycle III](image)

| Learning outcomes | Many Students | Percentage |
|-------------------|--------------|------------|
| Completed         | 28           | 93%        |
| Not yet completed | 2            | 7%         |
| amount            | 30           | 100%       |

Table 7. Presentation of Communication Ability Results Mathematics Cycle III
From the table above can be seen the results of the communication ability of mathematics cycle III already meet the desired. Based on the data and description above, the objectives to be achieved on the learning from cycle III. Based on the results of the third cycle, then for the third cycle of learning process carried out very well, very interesting and very fun for learners who make learning can be a very maximum learning result.

4. Discussion

The description on the implementation of the cycle I can be explained as follows:

Develop a lesson plan by applying the Realistic Mathematics Education Approach (RME) with this approach the students are given the task to solve the problems raised from daily experience and analyze to find the answers so that students build their own knowledge to improve learning outcomes.

Relating problems with materials to facilitate participants to connect new knowledge that can be on material and everyday life. Implement the learning activities according to the stage that has been planned. In the first activity do the motivation with question and answer activities related to the material and ask how the students experience related to the material to explain the purpose of learning. then the students pay attention to the story or activities undertaken by the teacher to as a material to find a solution to the problem to be resolved and the activities become more creative students and hone their thinking ability.

Giving direction and guiding students to make learning more effective. Giving students opportunities to create ideas, find new information and synthesize and make reports from the results of group discussions conducted. Provide evaluation questions to find out the results learners learn in the learning activities.

Learning by applying Realistic Mathematics Education (RME) Approach to class IV shows a fun learning activity ideas, find new information and synthesize and make more effective. Giving students opportunities to create problems quickly and accurately. The teacher always invite the students to conclude the material at the end of each lesson.

As in previous cycles, the teacher always gives the task of solving the problem in the group with such students can interact and exchange ideas with friends. This activity is able to make students respect each other's friends and foster a mutual attitude of mutual help. Generalize the ability of students so that they can learn in a balanced way, there is no tendency and differences between students, as well as growing confidence in presenting the results of discussions with the group. This activity is for students' courage and ability, and to encourage students to solve problems quickly and accurately. The teacher always invites the students to conclude the material at the end of each lesson.

Further comparison of student learning outcomes from pre-cycle, the cycle I, cycle II and cycle III is presented in the following table.

| Cycle | I       | II      | III     |
|-------|---------|---------|---------|
| Average | 74.96  | 80.56  | 83.2   |
| Percentage | 67%   | 87%   | 93%   |

Table 8. Comparison of mathematical communication skills Learning Cycle I, II and III

In the table presented can be seen that the value of students' mathematical communication skills on pre-cycle learning, cycle I, cycle II and cycle III increased, this can be seen from the learning ability of learners on pre-cycle learners who achieve the completeness criteria only 16 students, in the first cycle increased to 20 students, the second cycle increased to 26 students and then in the third cycle increased to 28 students who achieve the value of mastery, this is due to the lesson using Realistic Mathematics Education (RME) approach so that students' maximum improvement. Based on all available data, the percentage of learning result of pre-cycle, the cycle I, cycle II and cycle III is presented in tabular form below.

| Completeness | Percentage |
|--------------|------------|
| Many Students | Percentage |
| Pre-Cycle    | 16         | 53%        |
| Cycle I      | 20         | 67%        |
| Cycle II     | 26         | 87%        |
| Cycle III    | 28         | 93%        |

Table 9. Percentage of Pre-cycle Student Learning Outcomes, cycle I, Cycle II, and Cycle III

The achievement of the percentage of students' mathematical communication ability in the pre cycle, cycle I and cycle II has increased significantly so that it can be seen that the learning in cycle II can be said to have
maximal, special guidance to the students as a step of guidance to know more about the problem on the students. To facilitate the comparison of students' learning achievement in pre-cycle, with cycle I and cycle II, below will be described in the comparison graph of students' mathematical communication skills below:

![Graph of Comparison Result of mathematical communication ability of Prasiklus Cycle students I, II and III](image)

The results of the mathematics communication ability of grade 4 students showed that of the 30 students who took the initial test, there were 7 students (23%) scored 80-100 (A), there were 9 students (30%) scored between 70 - 80 (B), and 12 students (40%) got a score of 55 - 60 (C), and there were 2 students scored less than 55 (D). Based on preliminary test results above the average score of 69.53.

In the first cycle reached 67% or 20 students who completed with the score of 80 -100 there are 16 students, the acquisition value of 70 - 80 there are 4 students, and 10 people got 55 with an average score of 74.96.

In the second cycle has a significant improvement that is the result of communication ability of Mathematics of grade 4 students showed that from 30 students who take the test in Cycle II that is 19 students (63%) get score 80-100 (A), there are 7 students (23%) get score between 70 - 80 (B). and 4 students (13%) got a score between 55 - 60 (C). Based on the result of the test in Cycle II above the average score of 80.56 overall score overall 87%.

In cycle III, there was a significant improvement. The result of communication ability of Mathematics of Grade IV students showed that from 30 students who took the test in Cycle III, 23 students (77%) got 80-100 score (A), there were 5 students (17%) scores between 70 - 80 (B). and 2 students (7%) got a score between 55 - 60 (C). Based on the results of the test in Cycle III above the average 83.2 overall completeness score of 93% overall.

Based on data analysis and research findings, learning using Realistic Mathematics Education (RME) approach can improve mathematics communication ability in class IV DN Karang Baru 04 Cikarang Utara-Kabupaten Bekasi.

### 5. Conclude

The use of Realistic Mathematics Education (RME) Approach can improve mathematics communication ability in fourth-grade students of SDN Karang Baru 04 Cikarang Utara-Kabupaten Bekasi with learning completeness in cycle I of 67% increased to 87% in cycle II, then on learning completeness in cycle III increased again to 93%. Thus in this study, has reached the percentage of defined classical completeness of 93% > 85%.

In the application of learning Realistic Mathematics Education (RME) approach in cycle I have not reached the target expected by the researcher, due to less conducive class condition, and require more guidance so that cycle I have not reached the target of research or minimal mastery, II.

In the second cycle obtained that the results of students' mathematical communication skills, has met the target of research or research success criteria that is by achieving the average results of the mathematical communication skills well. The results have reached the minimum completion target of 70. However, researchers and collaborators continue to continue the research until the third cycle. In the third cycle obtained that the results of mathematical communication skills increased in accordance with the expected completeness criteria that is 93% of learning completeness that has been determined by 85%.

Seeing the results obtained can be said that the use of Realistic Mathematics Education Approach (RME) has succeeded in improving the ability of mathematics communication on grade 4 students SDN Karang Baru 04 North Cikarang-Bekasi District. By using the Realistic Mathematics Education Approach (RME), it becomes better and fun for learners. Motivation learners learn to be increased and the concentration of learners in the following learning becomes more focused. It turns out that learners are more active and feel happy because given the opportunity to learn to think realistically and improve their thinking power to solve problems in everyday life in the environment of learners.
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