Research Paper

Mathematical Communication Ability in Core Learning Realistic Mathematics Approach with the Assist of *Quizizz*

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ABSTRACT

Mathematical communication skills are very important in learning mathematics. The mathematical communication skills of grade III students at SD Tandang 02 were still relatively low, they have not been able to express opinions about mathematics or explain in notation or hull form. This study aimed to determine the increase in students' mathematical communication skills in CORE learning with a quizizz-assisted realistic mathematics approach. The method used in this study was a Quasi-Experimental method. The population in this study were class III students in the even semester of the 2020/2021 academic year. Selection of the sample using cluster random sampling technique. The sample in this study was class III students as an experimental class, the class that was subjected to CORE learning with a quizizz-assisted realistic mathematics approach. Data collection techniques in this study are documentation techniques, test techniques, observation, and interviews. The research instruments used were mathematical communication question sheets, interview guidelines and observation sheets when learning took place. The data analysis technique used is a prerequisite test which includes normality and homogeneity tests, hypothesis testing which includes completeness tests, average difference tests and influence tests. The results showed that there was an increase in mathematical communication skills using the CORE model with a realistic mathematical approach based on quizizz media. The success of this increase can be seen from the results of research on frequency tendencies which show an increase during the posttest or after being given learning. The completeness test also showed that the proportion of completeness of students subjected to the CORE learning model with a quizizz-assisted realistic mathematics approach is more than 75%. The results of the independent sample t-test to find out the difference between the control and experimental classes, the results of the significance value show the number 0.00 <0.05. This proves that there is a difference in the average mathematical communication ability of students in the experimental class and the control class after learning. In the matter of mathematical communication skills, there were no students who achieved high gain scores, students who achieved moderate gain scores had a percentage of 82%, and students who achieved low gain scores had a percentage of 18%.

Keywords: Communication Ability, Model CORE, RME Approach, Quizizz

INTRODUCTION

Mathematics is a universal science that underlies the development of modern technology and has an important role in various disciplines. In addition, mathematics also plays an important role in advancing human thinking power to master and create technology (Depdiknas, 2006). Through learning mathematics, it is hoped that students will be able to organize their reasoning, be able to think logically, critically, carefully, analytically, coherently,

systematically, and be consistent in behaving, so that the lessons learned can be applied in their daily lives.

Among the mathematics used in daily life there are the arithmetic operations of addition, subtraction, multiplication, and division which can be used in buying and selling activities with various kinds of numbers. After that, fractional material is needed for more detailed calculations. Another material is geometry which is used to calculate angles, areas, perimeters and volumes in various plane and spatial shapes. In the Islamic religion, mathematics is also needed as in the distribution of inheritance which uses the science of fractions. Apart from that, about prayer movements, calculating dates and months which require material understanding of angles.

In relation to the general goals of learning mathematics that have been mentioned by NCTM, one of the skills that needs to be achieved is communication skills. Based on these objectives, the learning carried out should be oriented towards the ability of students to communicate the material appropriately. One of the steps that needs to be implemented is to make meaningful learning in the classroom by applying the right learning model, then learning objectives can be achieved.

In connection with learning objectives so that they can be achieved, another important point in learning mathematics is good mathematical communication skills. Baroody (2018) stated that there are at least two important reasons why communication in mathematics learning needs to be developed among students, including: mathematics is not just a thinking tool, a tool for finding patterns, solving problems or drawing conclusions, but mathematics is also a social activity in learning. Mathematics as a vehicle for interaction between students and teachers, this show that mathematical communication is one of the important abilities that must be developed in students.

When a person can communicate good and correct material, his knowledge is beneficial. Communication in learning is carried out by both parties, namely educators and students. In addition, between students, and between students and their parents and the general public. Dahlan (2011) stated that communication is an essential part of mathematics and mathematics education. This is a way to share ideas and classify understanding.

According to Kusumah (2008) stated that communication is a very important part in learning mathematics, because through communication (1) mathematical ideas can be exploited in various perspectives; (2) students' way of thinking can be sharpened; (3) the growth of understanding can be measured; (4) students' thoughts can be consolidated and organized; (5) students' mathematical knowledge and problem development are constructed; (6) students' reasoning can be improved; and (7) student communication can be formed.

Lestari and Yudhanegara (2017) revealed that mathematical communication ability is the ability to convey ideas or ideas with symbols, tables, diagrams, or other media to clarify. This ability can be demonstrated orally or in writing. Mathematical communication skills are closely related to how to understand and accept ideas or ideas from other people carefully, analytically, critically, and being able to evaluate any information received.

According to Nopiyani (2016) mathematical communication ability is the ability to express ideas or mathematical ideas both in writing and pictures. Meanwhile, according to Safitri (2019) mathematical communication skills are abilities that exist in students to convey mathematical ideas both orally and in writing.

The importance of communication for students, makes it necessary to carry out research related to students' mathematical abilities. Furthermore, about the approach used in learning mathematics, it is necessary to use an approach that is oriented to real events in society, students can communicate material well. One of the varied learning that can be done is with the CORE learning

model. Lestari & Yudhanegara, (2017) explained in their book that CORE is a learning model that has a design that constructs students' abilities by connecting and organizing knowledge, then rethinking the concept being studied. Through this learning, students are expected to expand their knowledge during the learning process. The stages in CORE learning are *connecting, organizing, reflecting, and extending.*

When learning is learner-centered and fun, it is necessary to learn more about what model should be used to make learning flat shape material optimally achieved. besides that, students also have a good understanding of mathematical concepts and communication.

This CORE learning model begins by connecting the material to be studied with previous material, with daily life, or it can also be linked to material in other lessons. After that, organize the material gained by solving problems which are carried out in groups, so that students can practice communicating well. The third step is to reflect on the answers that have been obtained together, whether they are correct or need improvement. The last step is to further discuss what students have learned, in other words, it is necessary to strengthen and deepen the material that has been learned.

In addition to using CORE learning, researchers also use an approach that feels appropriate to make students able to communicate material, that was the RME approach. The RME approach used is expected to be able to make students communicate material easily because the problems presented are closely related to their daily lives. Realistic mathematics basically makes use of reality or concrete things that students can observe or understand by imagining, and the environment or everyday life which means the environment where students are, whether in the family, school or community environment that can be understood by students. This provides an indication that in

realistic mathematics learning which is the starting point in learning is something that is contextual in the environment of students, they can solve problems according to experiences in their lives (Sujatmiko, 2017)

In addition, the right media to improve mathematical communication is quizizz. Quizizz is fun and enjoyable for students, as is the process of using it which makes students must think quickly and accurately to make decisions from existing questions. When students can answer questions correctly, students' mathematical communication skills become better. In their daily lives, it is easy for students to communicate material well through questions on Quizizz. Quizizz is an online tool for creating interactive quiz games for use in classroom learning. Quizizz is very easy for anyone to use and can be shared with students in class. to enter this web tool, we must first login as a teacher. (Khasani, 2020)

This study aimed to determine the increase in students' mathematical communication skills in CORE learning with a quizizz-assisted realistic mathematics approach.

MATERIALS & METHODS

The method used in this study is a Quasi-Experimental method. quasi-experimental research is research subjects are not randomly grouped, but accept the subject's condition as it is.

The population in this study were class III students in the even semester of the 2020/2021 academic year. Selection of the sample using cluster random sampling technique. The sample in this study was class III students as an experimental class, the class that was subjected to CORE learning with a quizizz-assisted realistic mathematics approach. For testing the problem-solving ability test instrument was carried out in class IV.

The research subjects were students who were taught using the CORE learning model with a quizizz-assisted realistic mathematics approach, namely class III SDN Tandang 02. This study attempted to understand the

level of independence of students and mathematical communication abilities. Mathematical communication skills and student learning independence were closely studied by focusing on learning mathematics fraction material using the CORE learning model with a realistic mathematics approach assisted by Quizizz. The research was carried out in the even semester of the 2021/2022 school year.

Data collection techniques in this study were documentation techniques, test techniques, observation, and interviews. The research instruments used were mathematical communication question sheets, interview guidelines and observation sheets when learning took place.

The data analysis technique used is a prerequisite test which includes normality and homogeneity tests, hypothesis testing which includes completeness tests, average difference tests and influence tests.

RESULT

The results of research related to improving mathematical communication skills are described below:

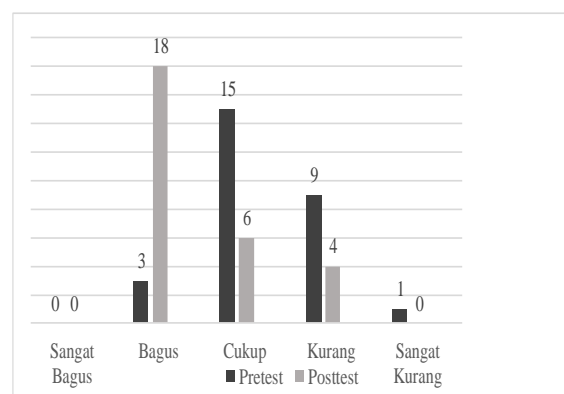1. Frequency of the Experiment Class Students' Mathematical Communication Ability

   The increase in mathematical communication skills using the CORE learning model with a realistic mathematical approach assisted by quiziz can be seen from the pretest-posttest scores of class III students at SD N Tandang 02. The following table showed the tendency of students' mathematical communication skills as presented in Table 1.

Table 1. Pretest-Posttest Results of Mathematical Communication Ability

Score Range	Category	Frequency Absolute		Frequency Relative (%)	
		Pretest	*Posttest*	*Pretest*	*Posttest*
86-100	Very Good	-	-	-	
71-85	Good	3	18	10,71	64,28
56-70	Fair	15	6	53,57	21,44
40-55	Less	9	4	32,13	14,28
25-39	Very Less	1	-	3,5	-

The trend analysis of the results of students' mathematical communication skills before and after participating in learning with the CORE learning model with a quizizz-assisted realistic mathematics approach showed an increase. Mathematical communication skills on the pretest results there were no students who were in the very good category, 3 students were in the good category with a percentage of 10.71%, 15 students were in the sufficient category with a percentage of 53.57%, 9 students were in the less category with percentage of 32.13%, and 1 student is in the very poor category with a percentage of 3.5%. After learning was carried out using the CORE learning model with a realistic mathematics approach assisted by quizizz and posttest, the results showed that no students were in the very good category, there were 18 students who were in the good category with a percentage of 64.28%, 6 students were in the moderate category. with a percentage of 21.44%, 4 students are in the less category with a percentage of 14.28%, and no students are in the very lacking category. For more detailed picture can see in Picture 1.

Picture 1 Absolute Frequency of Students' Mathematical Communication Ability

Based on Picture 1, it seen clearly that the students' mathematical communication

abilities were in the very good category before being given treatment none of the students achieved it, after being given treatment with the CORE learning model with a quizizz-assisted realistic mathematics approach there were also no students who achieved it students who reached the good category were 3 people and significantly increased to 18 people after being given treatment. Students who reached the sufficient category before being given treatment were 15 students and became 6 students after being given treatment. The poor category was achieved by 9 students before being given treatment, and being 4 students after being given treatment. Before being given treatment, students who were in

the very less category were 1 person and reduced to no students who were in the very lacking category after being given treatment. Based on this, it can be said that there is an increase in mathematical communication skills using the CORE learning model with a realistic mathematical approach assisted by quizizz

1) Frequency of the Control Class Student's Communication Ability

The control class in this study only uses the problem based learning model. The following table shows the tendency of the control class students' communication skills presented in Table 2.

Table 2. Tendencies in the Pretest-Posttest Results of Control Class Students' Communication Ability

Score Range	Category	Frequency Absolute		Frequency Relative (%)	
		Pretest	*Posttest*	*Pretest*	*Posttest*
86-100	Very Good	-	-	-	-
71-85	Good	3	3	10,71	10,71
56-70	Fair	11	16	39,29	57,11
40-55	Less	7	6	25	21,43
25-39	Very Less	7	3	25	10,71

Analysis of the results of the tendency of the mathematical communication skills of control class students before and after participating in learning using the problem based learning model only showed a slight increase. Mathematical communication skills on the results of the pretest there were no students who were in the very good category, 3 students were in the good category with a percentage of 10.71%, 11 students were in the sufficient category with a percentage of 39.29%, 7 students were in the less category with percentage of 25%, and 7 students are in the very poor category with a percentage of 25%. After the learning and posttest were carried out, the results showed that there were no students who were in the very good category, there were 3 students who were in the good category with a percentage of 10.71%, 16 students were in the sufficient category with a percentage of 57.11%, 6 students are in the less category with a percentage of 21.43%, and 3 students are in the very less category

with a percentage of 10.71%. A more detailed picture can see in Picture 2.
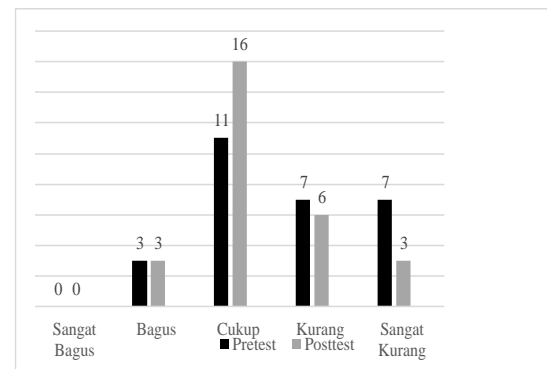

Figure 2 Absolute Frequency of Students' Mathematical Communication Ability

Based on Picture 2, it can be seen clearly that the mathematical communication skills of the control class students were in the very good category both before and after being given treatment, none of the students achieved it. Before learning, students who reached the good category were 3 people and there were still 3 people after learning. Students who reached the sufficient

category, before given learning as many as 11 students and became 16 students after learning. Poor category was reached by 7 students before learning, and became 6 students after learning. Before learning, students who were in the very less category reached 7 people and reduced to 3 students after learning.

1) Due Completeness Test

The completeness test in the study used the *sample t-test*. The results of the *sample t-test* of students' mathematical communication skills can be seen in Table 3.

Table 3 Test Sample t-Test Mathematical Communication Ability

Test Value = 75	t	df	Sig. (2-tailed)
	2.876	28	.005

Based on the data obtained in Table 4.9, it can be seen that the Sig. shows a result of $0.05 \leq 0.05$ meaning that H0 is rejected, in other words that the proportion of completeness of students subjected to the CORE learning model with a quizizz-assisted realistic mathematics approach is more than 75%.

1) Average Difference Test

Differences in improving students' mathematical communication abilities in learning with the CORE model with a realistic mathematical approach assisted by Quizizz can be identified by conducting a t-test. The t test used is the independent sample t-test which is a different average test by comparing the posttest results of the control class and the experimental class. The results of the calculation of the independent sample t-test of students' mathematical communication skills between the experimental class and the class can be seen in Table 4 below.

Table 4 Posttest of t-test Students' Mathematical Communication Ability

Sig. 2 tailed	α	Mean		Keterangan
		Experiment	Control	
0,00	0,05	87.65	72.25	There was a difference in the average mathematical communication ability

Based on the posttest t-test table above, it can be seen that the significance value indicates the number 0.00 <0.05. This proved that there was a difference in the average mathematical communication ability of students in the experimental class and the control class after learning. In the mean box it seen that the experimental class mean showed a result of 87.65, while in the control class it showed a result of 72.25. This showed that the average mathematical communication ability of students in the experimental class is higher than the average mathematical communication ability of students in the control class.

1) Experimental Class N-Gain Test

The Gain test was conducted to determine the difference in the increase in students' mathematical communication skills from pretest to posttest. The results of the N-Gain test can be seen in Table 5

Table 5 Calculation Results of the N-Gain Test

Aspect	Total Score	Average Gain	Category Gain
Mathematical Communication Skills	12.242	0.43	Average

Based on the data in Table 5, it can be seen that the average N-Gain of students' mathematical communication skills shows a result of 0.43 which is in the medium category. The results of the N-Gain calculation for each student can be seen in Picture 3.
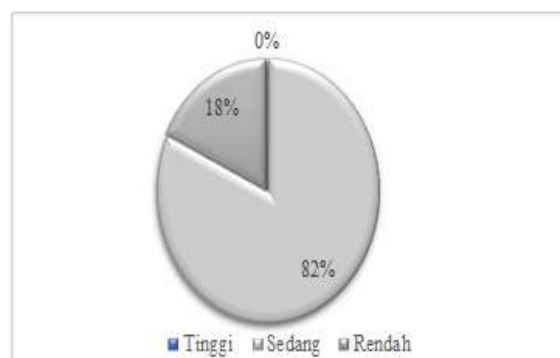
Pictue 3 N-Gain Experiment Class Learning Achievement

Based on Figure 3, it can be seen that in the problem of mathematical communication skills, there were no students who achieved a high gain score, students who achieved a moderate gain score had a percentage of 82%, and students who achieved a low gain score had a percentage of 18%.

1) Control Class N-Gain Test
The Gain test was conducted to determine the difference in the increase in students' mathematical communication skills from pretest to posttest. The results of the N-Gain test can be seen in Table 6.

Table 6 Calculation Results of the Control Class N-Gain Test

Aspect	Total Score	Average Gain	Category Gain
Mathematic Communication Skill	9.341	0.33	Average

Based on the data in Table 6, it seen that the average N-Gain mathematical communication ability of control class students showed a result of 0.33 which is in the medium category. The results of the N-Gain calculation for each student can be seen in Picture 4.
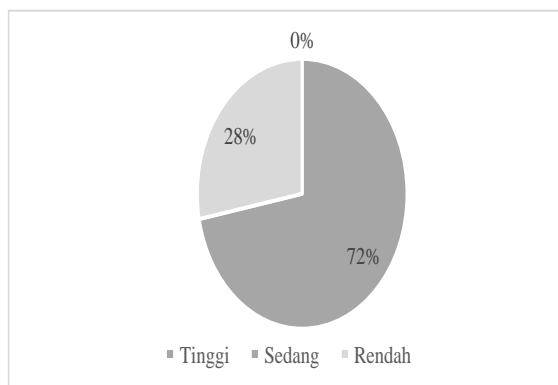

Figure 4 N-Gain Control Class Mathematical Communication Ability

Based on Picture 4 it seen that in the matter of students' mathematical communication skills there were no students who achieved high gain scores, students who achieved moderate gain scores had a percentage of 72%, and students who achieved low gain scores had a percentage of 28%.

DISCUSSION
Mathematical communication ability is an ability that must be possessed by students. It is intended that students were able to communicate ideas with symbols, tables, diagrams, or other media to clarify situations or problems. In addition, in the 2013 curriculum one of the mathematics competencies that students must achieve is having the ability to communicate mathematical ideas clearly and effectively. Mathematical communication is also one of the standard processes in learning mathematics. There are at least two important reasons why communication in mathematics learning needs to be developed among students, including: mathematics is not just a thinking tool, a tool for finding patterns, solving problems or drawing conclusions, but mathematics is also a social activity in learning; mathematics as a vehicle for interaction between students and also between teachers and students. This showed that mathematical communication is one of the important abilities that must be developed in students. The importance of mathematical communication skills is an important component in learning mathematics, a tool for exchanging ideas, and clarifying mathematical understanding (Hariyanto, 2016).

Mathematical communication skills have increased using the CORE learning model with a realistic mathematical approach assisted by quizizz. The success of this increase can be seen from the results of research on the tendency of frequency which shows an increase during the posttest or after being given learning using the CORE learning model with a quizizz-assisted realistic mathematics approach. The completeness test also shows that the proportion of completeness of students subjected to the CORE learning model with a quizizz-assisted realistic mathematics approach is more than 75%.

The researcher also used an independent sample t-test to find out the difference between the control and experimental classes. The results showed a significance

value of 0.00 <0.05. This proves that there was a difference in the average mathematical communication ability of students in the experimental class and the control class after learning. In the mean box it seen that the experimental class mean showed a result of 87.65, while in the control class it showed a result of 72.25. This shows that the average mathematical communication ability of students in the experimental class was higher than the average mathematical communication ability of students in the control class.

The results of the average N-Gain students' mathematical communication skills were in the medium category. In the matter of mathematical communication skills, there were no students who achieved high gain scores, students who achieved moderate gain scores had a percentage of 82%, and students who achieved low gain scores had a percentage of 18%.

The success of this increase was due to the use of the CORE model with a realistic mathematical approach assisted by Quizizz. CORE is a model that requires students to work in groups through social interaction, that was discussing a given problem. CORE is a learning model based on constructivism. In other words, the CORE learning model is a learning model that can be used to make students active in building their own knowledge. In building their own knowledge, students are required to interact with their environment (Fadhilah, 2014).

The success of using the CORE model for mathematical communication skills is in line with the results of research conducted by Prasetia, et al (2020) obtained that students' mathematical connection abilities in the CORE model achieved classical mastery, the average mathematical connection ability of students with the CORE model was not higher statistically from the average mathematical connection ability of PBL model students. Even so, the proportion of students' mathematical connection abilities with the CORE model was higher than the proportion of students' mathematical connection abilities with the PBL model. Also in line with the results of research Aryati, et al. (2017) showed that CORE learning can be used to improve mathematical connection skills. Meanwhile, Agustianti & Amelia (2018) stated that students' mathematical connection abilities with the CORE learning model were better than students' connection abilities before the model was implemented. The same thing was expressed by Azizah et al. (2012) that the mathematical connection abilities of the CORE class achieve completeness and are better than classes with expository learning, as well as an increase in the mathematical connection abilities of the CORE class.

Beside using the CORE model, students were also taught with a realistic mathematical approach. In realistic mathematics education, the real world is used as a starting point for developing mathematical ideas and concepts. The real world is everything outside mathematics, such as other subjects besides mathematics, or everyday life and the environment around us (Cai, 1996).

During learning using a realistic approach, students are faced with real problems related to fractional material, students are asked to express their ideas using their own sentences based on the knowledge and experience possessed by students. During learning, students appear active and enthusiastic about participating in learning, students' curiosity is high so that students become proactive in the learning process.

The existence of contextual problems as the starting point of the learning process, is able to make students more active in producing and constructing their knowledge through making mathematical models. These mathematical models are a form of representation of the problems needed to make it easier to solve contextual problems. With these models, both informal and formal, students can discover for themselves the concepts or procedures of mathematics being studied. The stages of solving these problems are a part that must be experienced by students in the process of developing written mathematical

communication and also in the learning process with PMR. Thus it understood that the contextual problems given can be used as a starting point in developing students' mathematical communication skills, especially in writing. Furthermore, the discussion as a bridge to help each other between students who are lacking with students who are better at understanding the model given. So that learning with PMR is suitable for all levels of students' mathematical abilities in improving mathematical communication skills.

The success of increasing mathematical communication skills using a realistic mathematical approach is supported by the results of research from Jamilah (2013) which states that there is a different effect on the mathematical communication abilities of students who use reflective learning with a realistic approach with Islamic nuances and students who use conventional learning. If seen from the marginal average of each group, it can be concluded that the application of a reflective learning model with a realistic mathematical approach with Islamic circumstances provides better mathematical communication skills than the application of conventional learning models.

This CORE learning model begins by connecting the material to be studied with previous material, with everyday life, or it linked to material in other lessons. After that, organizing the material obtained by solving problems carried out in groups, so that students can practice communicating well, while assisted by quizizz makes it fun and enjoyable for students, as is the process of using it which makes students have to think quickly and precisely to solve problems. make a decision from the question at hand. When students are able to answer questions correctly, students' mathematical communication skills become better. In their daily lives, it is easy for students to communicate material well through questions on Quizizz.

The use of Quizizz media is in accordance with the results of research from Aini (2019) which stated that Quizizz can produce creative, innovative and fun learning media so that it needs to be used as a learning medium, then Quizizz can be utilized by elementary school educators as an alternative ICT-based learning media. to be utilized as much as possible in order to achieve learning objectives.

CONCLUSION

There was an increase in mathematical communication skills using the CORE model with a realistic mathematical approach based on quizizz media. The success of this increase can be seen from the results of research on frequency tendencies which show an increase during the posttest or after being given learning. The completeness test also showed that the proportion of completeness of students subjected to the CORE learning model with a quizizz-assisted realistic mathematics approach is more than 75%. The results of the independent sample t-test to find out the difference between the control and experimental classes, the results of the significance value show the number $0.00 < 0.05$. This proved that there was a difference in the average mathematical communication ability of students in the experimental class and the control class after learning. In the matter of mathematical communication skills, there were no students who achieved high gain scores, students who achieved moderate gain scores had a percentage of 82%, and students who achieved low gain scores had a percentage of 18%.

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