Improving Mathematical Communication

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Abstract. This research was conducted due to the lack of mathematical communication skills among prospective elementary school teachers. Knowing the mathematics communication skills of prospective elementary school teachers is the aim of this study. The method used is descriptive qualitative. The subjects used in this study were 6 semester 1 students in the basic concepts of mathematics subject. The data collection uses questions related to Combination material with 6 items related to mathematical communication skills.

Key words: mathematical communication skills;

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INTRODUCTION

At this time the field of knowledge was progressing rapidly, namely in the field of mathematics education. Mathematics is a field that really matters in the advancement of science and technology, in line with Kadarisma (2016) which explains that mathematics is a field that has benefits for many people. Students are required to complete mathematics, so that students can understand mathematics completely and feel the benefits, so that students are required to understand some mathematical abilities, one of which is mathematical communication skills.

Based on what Muliawan (2012: 51) said, "Mathematics studied in school is an original field of education that prioritizes numbers, symbols, symbols. It is not surprising, based on various studies, it shows but does not prove the results that make happiness related to their application in daily activities. Based on the opinion of Yamin (Musfiqon, 2012) "communication: students and teachers are the delivery of messages (material) lessons in which it occurs and the achievement of reciprocal and reciprocal / communicative relationships.

Students have the ability to solve problems, including explaining problems, designing mathematical models, solving and interpreting models to find solutions, and adopting a resilient attitude and confidence in solving problems are mathematical goals. (Mustika, 2016). Communication also means relationships / activities related to relationship problems / exchange of opinions. Communication can be described as a contact relationship between humans (Ismarwan, 2013). According to (Isnaeni, & Maya, R, 2014), some people argue that the role of mathematics communication is a representation of students' understanding of concepts in mathematics itself and other fields.

One of the abilities students have is that it requires reasoning on shapes, properties and forming generalizations that are carried out by manipulating mathematics, compiling evidence, explaining ideas in mathematics, using ideas using tables, diagrams or other forms of objects to clarify situations and appreciating the various uses of mathematics in activities including having curiosity and interest in learning mathematics, resilience, confidence in solving problems in mathematical problems.

Mathematical communication skills can provide a reasonable review of solving problems in mathematics, can improve existing descriptions in mathematical models, be able to describe mathematical ideas in the form of relevant descriptions. In connection with the notion of mathematical communication, conclusions can be drawn from several definitions that the importance of student ability, one of which is mathematical communication. The facts in the field indicate that students' communication skills are still low. The reason for the low mathematical communication skills is one of them because the students do not understand and communicate systematic thoughts in learning mathematics (Ariawan & Nufus, 2017).

According to Slamet (Geometry is an introduction to the shape of area, volume, and area. Building geometric concepts in children starts with identifying shapes, investigating buildings and separating ordinary pictures, such as rectangles, circles and triangles. Learning the concept of location, as in below, above, right, left laid the initial foundation for understanding

geometry.The concept of geometry is related to the basic ideas that are always related to points, lines, planes, surfaces, and space.

The concept of geometry is abstract, but this concept can be realized through semi-concrete or concrete ways. Geometry is divided into two, namely flat and space shapes. Space constructs are shapes that have volume, for example, cubes, cones, tubes, balls, blocks, and so on. Meanwhile, flat shapes are geometric shapes that have long and wide sides, for example, rectangles, circles, rhombuses, rectangles, triangles, and others.

One of the abilities that students need in education in Indonesia is mathematics communication, for example, it is mentioned in the 2006 Ministry of National Education. Regarding this, it is contained in the document "Mathematics Education Process Standards" in the US, as follows: (a) problem solving, (b) reasoning and evidence, (c) communication, (d) connections, and (6) representations that exist in NCTM, 2000. The way of sharing ideas and explanations of understanding is the meaning of communication (Wahyudin, 2012: 527).

METHOD

The method used in this research is qualitative. Based on Moleong (2001) states that the definition of qualitative research methods is a research process that embodies descriptive data in the form of written and spoken language expressed by people and observable attitudes.

Table 1. Mathematical Communication Indicators

NO	INDICATOR
1	Proving everyday events with words, symbols.
2	Depicting real objects, pictures and diagrams into mathematical ideas
3	Making math questions in the form of pictures, tables and graphs
4	Explaining or asking questions or stories about certain mathematical models or graphs / tables

METHODS

a) Research methods

This research was conducted on PGSD UNNES students. The subjects of the research on mathematical communication skills were 6 students regarding combination material. The data from the research carried out was in the form of research in which the data was collected using instruments in the form of a description test of 5 items.

b) Research Subjects

In this study, selection standards are used to determine the object of research through testing, quota selection, network selection, and comparative selection between cases (Sutopo, 2002: 28). This study used students majoring in mathematics education at the National University of Sampo who were studying basic mathematical concepts. The initial subjects are 6 students with mathematical communication skills and will be developed as needed. Data Collection Procedures.

To achieve the data needed in this study, the techniques that will be used are:

1) This test method is used to determine the level of mathematical communication skills to solve each problem. This data will be used to classify the research topic.

2) In-depth Interview (Indepth Interview)

Interview is a dialogue for a specific purpose. Dialogue is carried out by 2 groups, the first group is called the interviewer, whose job is to ask questions, and the second group is the interviewer who provides answers to these questions (Moloeng, 2007: 186). At the start, the interviews in the study were repeated with 2 students, each student representing each level of mathematics communication skills. Interviews will always be conducted to saturate data. Interviews aim to get detailed information about student awareness.

c) Data analysis

Data analysis is divided into three steps, namely data reduction, data presentation and conclusion / validation. Qualitative research data analysis is the process of reducing data into a form that is easy to read and explain. Qualitative research treats data as the creation of a way of providing explanations for researchers, in this explanation the data contains meaning with reference meanings. Hence, the data generated by the construction of the interaction between the researcher and the information provider. Using qualitative methods to analyze data analysis activities obtained from research, which means classifying and selecting research data based on the quality of facts, then describing and

concluding the results to solve existing problems.

To analyze the scores of students' mathematical communication skills, be able to see the guideline values in the table below.

Table 2. Guidelines for Mathematics Communication Ability Test Scores

Communication Indicator	Communication Aspect	Score
Describe a picture or diagram into a mathematical idea	No Answer	0
	The problem can be explained by providing an argument about a mathematical problem, but it is incomplete and wrong	1
	The problem can be explained by arguments that actually solve the math problem	2
	The problem can be explained properly rather than a complete argument from a mathematical problem	3
	This problem can be explained by providing parameters so that the math problem is complete and correct	4
Drawing or explaining mathematical ideas in writing	No Answer	0
	Able to draw, charts, graphs and tables, but incomplete and incorrect	1
	Able to draw pictures, charts, graphs and tables to completion but not very good	2
	Able to draw pictures, graphs and tables correctly but not completely	3
	Can draw pictures, graphs, graphs and tables completely and correctly	4
Mathematical expressions or expressions of the situation into language or mathematical symbols.	No Answer	0
	Can use symbols or mathematical language to express mathematical ideas in written form as an expression of ideas, but it is incomplete and incorrect	1
	Mathematical symbols or language can be used to express mathematical thinking in written form, but they cannot fully represent thought or thought	2
	Can correctly but not fully use symbols or mathematical language to express mathematical ideas in written form as an expression of ideas	3
	Mathematical symbols or language can be used to express mathematical thoughts in written form as an expression of complete and correct thoughts or thoughts	4

Based on the research results summarized the achievement of students' mathematical communication skills which are presented in The Table below:

Table 3. Recapitulation of Average Communication Ability Achievement

No	Communication Indicator	Persetase
1	Using words and symbols to represent everyday events	75
2	Reflecting real objects, pictures, and diagrams as mathematical ideas or models	64
3	Modelling mathematical situations or problems as diagrams, tables and graphs	68.18
4	Explaining or create questions / stories about certain mathematical models or graphs or tables	62

Based on the table above, among the 4 indicators of mathematical communication skills, only 1 indicator that meets the standard is very good, namely this indicator can be used to re-reveal information using a distribution table of 81.82%. There are 3 indicators that meet good standards, namely clear and accurate. Indicators write down ideas or problem solving steps,

namely 75.00% (good); indicators use bar graphs to represent information and write down ideas or problem solving steps clearly and accurately 64% (good); indicators in ordinary language The proportion of expressions or explanations of mathematical models in the form of images is 68% (good), and indicators using mathematical formulas 62% (good) write down what you know and want to ask. It can be seen from the table above that the average score of all student questions is included in the good standard, namely 69%.

Following are the results of students' answers to each indicator of mathematical communication skills.

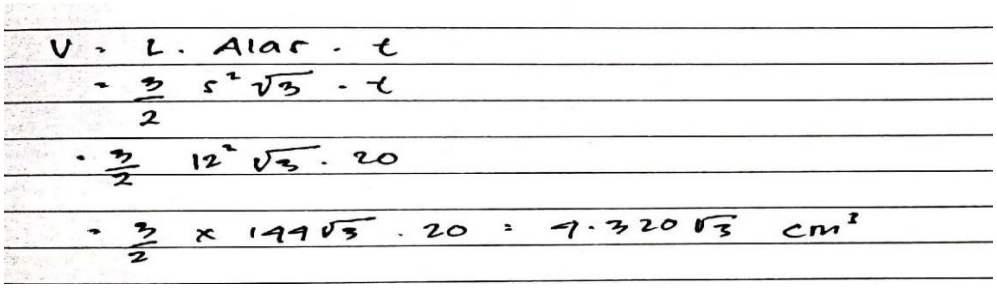

Figure 1. above shows one of the answers of students who have not been able to explain a picture or diagram into a mathematical idea.

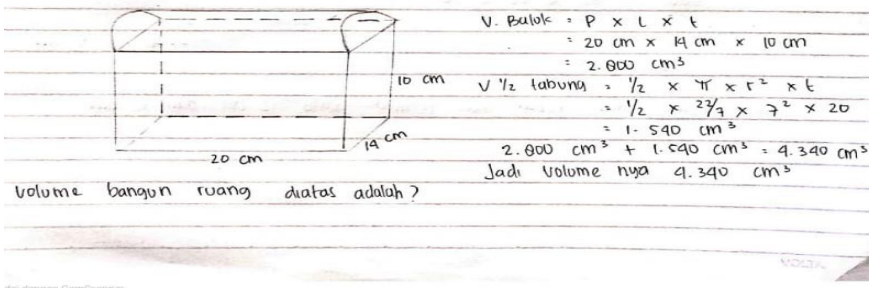

Figure 2. Answers (2)

It can be seen that students are able to express themselves in mathematical symbols, but students are one of the steps to complete and multiplication calculations in algebra. In the third indicator, there are 40 students who are unable to express themselves in the form of mathematical symbols.

Judging from the research results, PGSD UNNES mathematical communication skills are still low, because only the first indicator that describes a picture or diagram becomes mathematical ideas that can be achieved. There are many factors behind why communication skills are still low, one of which is that the researcher found that at the time of the interview, students were afraid when learning mathematics, and mathematics is said to be a very difficult subject / course. Meanwhile we know one of the goals of learning mathematics in school is to exchange ideas with symbols, tables, diagrams or other media to explain a situation or problem. (Depdiknas, 2007). Communication is one of the important factors in the learning process of mathematics inside and outside the classroom. Communication plays an important role in mathematics.

CONCLUSION

PGSD UNNES mathematical communication skills found that for 4 indicators of mathematical communication skills, only 1 indicator that meets very good standards, namely this indicator can be used to re-reveal information using a distribution table of 81.82%. There are 3 indicators that meet good standards, namely clear and accurate. Indicators write down ideas or problem solving steps, namely 75.00% (good); indicators use bar graphs to represent information and write down ideas or problem solving steps clearly and accurately 64.77% (good); indicators in ordinary language The proportion of expressions or explanations of mathematical models in the form is 68.18% (good), and indicators use mathematical formulas 62.50% (good).

REFERENCE

Ariawan, R., & Nufus, H. (2017). Hubungan Kemampuan Pemecahan Masalah

Matematis dengan Kemampuan Komunikasi Matematis Siswa. Theorems (The Original Research of Mathematics), 1(2), 82-91.

Depdiknas. 2006. Peraturan Pemerintah Nomor 19 Tahun 2005 tentang Standar Nasional Pendidikan. Jakarta: Depdiknas.

Ismarwan, Bambang, & Hamdani. (2013). Kemampuan Komunikasi Matematis Siswa Dalam Materi Sistem Persaman Linear Dua Variabel Di Kelas VIII SMP. Jurnal Penelitian FKIP UNTAN.

Isnaeni, Maya, R. (2014). Meningkatkan Kemampuan Komunikasi dan Disposisi Matematik Siswa Sekolah Menengah Atas Melalui Pembelajaran Generatif. Jurnal Pengajaran MIPA, Volume 19, Nomor 2, Oktober 2014, Hlm. 195-165.

Istiqomah. (2016). Penerapan Teorema Binomial Untuk Menentukan Peluang Kejadian (Kasus : Percobaan Pelemparan Koin Tak Seimbang). 2(2), 61– 70.

Kadarisma, G. (2018). Penerapan Pendekatan Open-Ended dalam Meningkatkan Kemampuan Komunikasi peserta didik SMP.: Jurnal Ilmiah Pendidikan Matematika, 1(2), 77-81.

Moleong, L. J. (2001). Metode Penelitian Kualitatif. Bandung: Remaja Rosdakarya.

Muliawan, J. U. 2012. Menyulap Peserta didik Kaya Prestasi di Dalam dan Luar Sekolah. Yogyakarta: FlashBooks.

Musfiqon, H.M. 2012. Pengembangan Media dan Sumber Pembelajaran. Jakarta: PT. Prestasi Pustakaraya.

Mustika, A., Suhartati, & Syahyuzar. (2016). Penerapan Pembelajaran Kontekstual Melalui Hands on Problem Solving Pada Materi Kubus dan Balok Kelas VIII SMP Negeri 10 Banda Aceh. Jurnal Ilmiah Mahasiswa Pendidikan Matematika, 1, 49–58.

NCTM. 2000. Curriculum and Evaluation Standard for School Mathematics. Reston. VA: NCTM

Sutopo, H.B. 2002. Metodologi Penelitian Kualitatif. Surakarta: UNS Press

Wahyudin, (2012), Filsafat dan ModelModel Pembelajaran Matematika. Bandung: Mandiri.