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Junior High School Students' Mathematical Communication in the Written Answers Problem

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Abstract

The mathematical communication of junior high school students is contained in written answers to mathematics, especially in finding patterns of problem-solving, presentation, and rewriting using the language, which is the purpose of this research. Expressing a mathematical situation into a mathematical model in writing can be done by reading and understanding the problem repeatedly, making connections between mathematical concepts and relevant images, making observations on the pictures given, then sorting the numbers based on the views, providing a complete explanation. Then ask students to illustrate the correct and correct answers in their language. The need to pay attention and maximize the time for students to communicate their findings. Creating a learning atmosphere that supports mathematical communication by getting students to dare to express opinions or ideas related to lessons and enrich themselves by seeking information from various sources.

Abstrak

Komunikasi matematis siswa SMP yang terkandung dalam jawaban tertulis matematika, terutama dalam menemukan pola pemecahan masalah, penyajian, dan penulisan ulang menggunakan bahasanya. Menyatakan situasi matematika ke dalam model matematika secara tertulis, dapat dilakukan dengan cara membaca dan memahami masalah secara berulang-ulang, membuat hubungan antara konsep matematika dan gambar yang relevan, melakukan pengamatan pada gambar yang diberikan, kemudian mengurutkan angka berdasarkan gambar, memberikan penjelasan yang lengkap, kemudian meminta siswa untuk mengilustrasikan jawaban dalam bahasa mereka sendiri yang benar dan benar. Perlunya memperhatikan dan memaksimalkan waktu bagi siswa untuk mengomunikasikan temuannya. Menciptakan suasana belajar yang mendukung komunikasi matematis dengan cara membiasakan siswa memberanikan diri mengemukakan pendapat atau gagasan terkait pelajaran, dan memperkaya diri dengan mencari informasi dari berbagai sumber.

Keywords: *Mathematical Communication; Written; Answers; Problem*

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INTRODUCTION

People are taught to think, solve issues, and make decisions due to their education. Thinking can broaden one's knowledge (Muhonen et al., 2017). The thinking process entails characterizing the object's makeup and rearranging its components to study or study it (Paulo and Nita Freire International Project for Critical Pedagogy. & The University of North Carolina at Greensboro., 2016). Education can assist someone in making a clear statement about something.

The instructor instructs students on solving mathematical issues (P. Purba et al., 2017). Understanding the problem, creating mathematical models, establishing completion plans, and carrying out the completion plans are steps in teaching pupils to solve math problems (Aini et al., 2019). A set of instructor activities that create challenges or motivate pupils to learn mathematics is problem-solving instruction.

Based on this, teachers must educate pupils on problem-solving skills and mathematics communication skills. NCTM that a mathematics teacher may educate pupils on how to communicate their mathematical ideas to their friends, the instructor, and others, both orally and in writing (Harjo et al., 2019).

Students' written solutions from the problem-solving process are often carried out according to the teacher's instructions and guidance. On the other hand, students rarely ask questions or explain themselves; therefore, they rarely receive answers (Prayitno, 2018). As a result, only a tiny percentage of students can communicate mathematically (P. Purba et al., 2017). This is evident in the way teachers traditionally teach mathematics, and students cannot convey their thoughts (Mukherjee, 2021). As a result, the teacher has the upper hand when teaching concepts, offering instances of questions, and leading practice questions.

As a result, the teacher's thoughts dominate the students' mathematical communication style in written replies to mathematics. According to research, few teachers clarify concepts, present examples, and guide inquiries and responses (Humbría Burgos & González, 2020). Students' poor mathematics communication abilities must be addressed.

It's essential to pay attention to how students convey their mathematical ideas. Mathematics is more than a tool for identifying patterns, solving problems, and making inferences (Ning et al., 2017). Mathematics is also a social activity in learning mathematics, and mathematics is a medium for student interaction and teacher-student communication (Zahara et al., 2020).

"Mathematics learning aims to make students have the ability to communicate ideas with symbols, tables, diagrams, or other media to clarify situations or problems," according to one of the general goals of learning mathematics prepared by the government through the National Education Standards Agency acronym by Badan Standar Nasional Pendidikan (BSNP) (Fitriani et al., 2018).

According to one of the topics, students can communicate thoughts or ideas through symbols, tables, diagrams, or other media to clarify a situation or problem (Kurniati et al., 2015). Because abstract mathematics is expressed in terms and symbols, many students accept the material without comprehending and assimilating the information contained therein.

Memorizing and recalling formulas are common in some mathematical situations (Kappen, 2020). Learning mathematics is, in essence, a mathematical process, not memorizing recipes. Students

can still explain and describe an event or situation, communicate ideas, and use a variety of symbols, tables, and diagrams, among other things.

In general, student mathematics communication in written replies is the process of students transmitting messages to professors or other students in such a way that the message is comprehended and understood by the recipient of the message (Handajani et al., 2018; Pratama & Retnawati, 2018; Widana, 2018). Meanwhile, students' mathematical communication abilities include reading, writing, listening, researching, understanding, and assessing mathematical ideas, symbols, terminology, and information (Kurniati et al., 2015).

Students' ability to communicate their thoughts, ideas and mathematical ideas vocally and in writing is one of the fundamentals of their comprehension process in digesting all of the mathematical material presented (Pratiwi et al., 2020; Solihah et al., 2018). However, some children have trouble speaking to express and communicate answers connected to problem-solving, and the outcomes are less than ideal (Setyowati et al., 2020; Susanti et al., 2020). As a result, students' mathematical communication skills must be addressed in greater depth.

If pupils can explain and convey thoughts linked to the provided mathematical problems, they have high mathematical communication skills. Some Middle students in Parepare can articulate mathematical concepts well and actively reply to teacher questions. However, some students struggle with communicating mathematical ideas, particularly in writing.

One of the causes is that students frequently work on questions without being asked to explain the process of getting answers, memorizing formulas related to problems, and solving issues correctly in writing, resulting in them having difficulty writing mathematical sentences correctly and well. This difficulty leads to increased reporting of mathematical features such as graphs, drawings, and mathematical symbols, all of which alter pupils' mathematical communication skills.

The mathematical communication pattern generally starts with a problem supplied by the teacher or a book to understand and accurately answer the questions (Fitriani et al., 2018; Rohmah, 2020; Suendang & Darmawijoyo, 2020). On the other hand, students are rarely allowed to ask questions or explain whence they acquire their answers (Indriani & Novianti, 2018; Masrura et al., 2021). As a result, students rarely use mathematics to communicate. The mathematical communication patterns of junior high school pupils were investigated in written replies to mathematics, particularly in presenting and rewriting the description of a picture or design offered in their language, which was the study's focus.

It was evident that students' mathematics communication abilities are still lacking. Because students still struggle with mathematical communication, it is critical to find approaches to improve students' mathematical communication skills (Utari et al., 2020; Zahara et al., 2020). In this research, students' mathematical communication is defined as translating ordinary occurrences into a written mathematical model. Students can translate visuals into mathematical models and connect mathematical concepts to relevant imagery.

Based on the description above, how is the mathematical communication of junior high school students on written mathematical answers, especially finding problem-solving patterns, presenting, and rewriting using their language, writing everyday situations into mathematical

models, expressing pictures into mathematical models, and connecting mathematics with ideas, with relevant images?

METHOD

This study will reveal the mathematical communication of junior high school students contained in written answers to mathematics. Two mathematical communications are the focus of this research: (1) the process of finding patterns of problem-solving, presenting and rewriting them using their language, and (2) written statements that express images into mathematical models and link mathematical ideas with images, which is relevant. According to (Bauer et al., 2020), this research is qualitative.

The research instrument is the researcher himself, guided by the task sheet instrument to construct dynamic event graphs and interview guidelines. In this case, the researcher is a planner, implementer of data collection, analysis, interpreter of data, and finally becomes a reporter for research results.

While the researcher himself developed the task sheet instrument used in this study, the research instrument has been reviewed to adjust to the conditions of the research field. The results of the instrument review include: The problem is by the research objectives, the problem boundaries have been formulated, and the expected solution is clear.

In the assessment of the construction of the problem, the following criteria have been met: (1) the sentence does not cause multiple interpretations, (2) the limits given are sufficient to solve the problem, (3) the formulation of the problem uses a question or command sentence, (4) the boundaries of the problem given are clear and functional. While the assessment of the language has met the criteria: (1) the language is by excellent and correct rules, (2) the problem formulation uses words that are known to the students, (3) the communicative problem formulation, (4) the problem formulation uses the correct mathematical sentence, (5) the formulation of the problem does not lead to multiple interpretations.

Data collection through interviews was carried out by combining structured and unstructured interviews. A structured interview is when the interviewer sets his problems and questions to be asked to find answers to the hypothesis. Furthermore, to find non-standard information and go deeper into a problem, it is necessary to emphasize deviations, unusual interpretations, reinterpretations, or new approaches, then conducted with unstructured interviews. In unstructured interviews, the questions are not prepared in advance but are adapted to the unique circumstances and characteristics of the respondents.

The following criteria were used to evaluate the problem's construction: (1) the sentence does not cause multiple interpretations, (2) the limits given are sufficient to solve the problem, (3) the problem's formulation uses a question or command sentence, and (4) the problem's boundaries are clear and functional.

While assessing language, the following criteria were used: (1) using language following excellent and correct rules, (2) problem formulation using words that students are familiar with, (3) communicative problem formulation, and (4) problem formulation using accurate mathematical statements. (5) The problem formulation does not allow for different interpretations.

Interviews were used to obtain data, and both organized and unstructured interviews were used. Structured interviews are conducted by determining the issues and questions that will be asked to answer

the hypothesis. Furthermore, to uncover non-standard information and go deeper into a topic, it is required to emphasize deviations, uncommon interpretations, reinterpretations, or novel methods, which are then pursued through unstructured interviews. The questions in unstructured interviews are not planned and are tailored to the respondents' specific circumstances and qualities. SMP Negeri VIII Parepare and SMP Negeri 2 Parepare were used for this study (if needed). The test was taken by twenty-five pupils, 11 males, and 14 females. All students who have studied pattern and number sequences. Furthermore, problem-solving outcomes are divided into high, medium, and low categories.

Six students are in the high category, seven in the middle class, and twelve in the poor group. Two persons in each group, two people in the high sort (ST1 and ST2), two people in the medium kind (SS1 and SS2), and two people in the low sort (SR1 and SR2) (Noel Míguez Passada, 2019). These distinctions impact the way people think and the quality of their reasoning.

The data collection process in this study used task-based interviews. Subjects were given paper and pencil to do several tasks, asked to explain what they were doing, discussed why they drew conclusions and other possibilities. Furthermore, clinical interviews, observations, and documentation were carried out with a Handycam. For the research to run well, the interviewer must act as a neutral party in conducting interviews.

To become a neutral observer, it is necessary to consider the obstacles usually faced by observers: observers are generally teachers or former teachers, so research subjects do not feel free to express their opinions. This can happen because the issue may feel embarrassed or afraid if the answer is wrong. Second, the observer makes words/phrases gestures that provide intervention to the subject to turn the subject's thinking on something.

After the data is collected, then the validity of the information is checked. (Bauer et al., 2020), there are four criteria to test the validity of the data: credibility, dependability, confirmability.

RESULT AND DISCUSSION

Result

1. Find patterns in solving problems, presenting, and rewriting using their language.

- High ability subject

The following are the results of written tests and interviews of ST1 and ST2 subjects working on patterns and number sequences. Figure 1. ST1 Subject Test Results can be seen in the appendix.

Based on the picture above, the ST1 subject can understand the problem but has not been able to adequately describe the description of the pattern given to the question. However, the issue tried to explain the image shown. In describing the picture, the subject reads the question and observes the picture repeatedly. Students find patterns of problem-solving, present, and rewrite using their language. In addition, students present solutions in mathematical models in writing, express images into mathematical models, and relate mathematical ideas to relevant photos. But not yet precise in defining patterns and sequences of numbers.

Based on the results of the ST2 interview, it was revealed that describing the picture, the subject reads the question and observes the image repeatedly. Students can define and use their language, but it is not accurate, and they also understand the definition of pattern and number sequence. Figure 2. ST2 Subject Test

Results can be seen in the appendix.

ST2 subjects were able to describe the given image. This shows the mathematical communication pattern found in ST2's written answers, especially in presenting and rewriting the description of the picture or design given using their language. In addition, students' ability to express images into mathematical models and relate mathematical ideas to images is less relevant.

Based on the confirmation of ST2's answer, information was obtained that the subject observed the image given and then described it according to the subject's understanding. The issue also said that he was not a number pattern but only a pattern. Apart from that, so far, the matter has been able to write and present a description of a given picture or design using their language.

- Medium Ability Subject

The following is the written test result data from the SS1 subject in describing the image on the pattern and number sequence questions. Figure 3. SS1 Subject Test Results can be seen in the appendix.

Based on the SS1 written work results, the subject's written mathematical communication skills could describe the image according to the subject's understanding of the pattern and number sequence material. Issues find patterns of problem-solving, present, and rewrite using their language. In addition, students present mathematical models in writing, express images into mathematical models, and connect mathematical ideas with relevant images but are not yet precise in defining patterns and number sequences.

Based on the results of a search on SS2 related to the effects of working on the SS2 subject, information was obtained that the issue had understood the problem and was able to describe the image given using his language by what he had previously studied. Figure 4. SS2 Subject Test Results can be seen in the appendix.

Based on the SS2 written work results, the subject's written mathematical communication skills were able to write a description of the image according to the subject's understanding of the pattern and number sequence material. The issue did not understand the meaning of the question, so it was given. Subjects describe pictures with odd and even numbers.

SS2 has not understood the problem based on the search results, so it cannot correctly describe an image and pattern. However, the subject can explain the answers' meaning using their understanding and language. In addition, the issue has found ways of problem-solving, presenting, and rewriting using their language. In addition, students offer mathematical models in writing, express images into mathematical models, and connect mathematical ideas with relevant images but are not yet precise in defining patterns and number sequences.

- Low Ability Subject

The following is the written test result data from the SR1 subject describing the image on the pattern and number sequence questions. Figure 5. SR1 Subject Test Results can be seen in the appendix.

Based on SR1's written answer, the subject's written mathematical communication ability describes the picture one by one. The issue connects the dots at the beginning to make the following point many, and then the next moment makes the following fact a lot. And for the following picture, the subject provides a description in the name of the shape and the

number of sides that are constantly increasing by one. This shows that the issue understands the problem, but it isn't easy to describe the picture in the correct language.

Based on the results of SR1's search for answers, the subject has difficulty in arranging words in terms of describing. But the issue tries to explain it with his understanding and words. This proves that the subject of SR1 in presenting and describing the pictures or patterns given in their language can be said to be capable even though they still have difficulty assembling the words.

Based on SR2's written answer, written mathematical communication skills describe an image with a row of odd and even numbers. Based on the results of the written mathematical communication skills interview above, the subject of SR2 understands the image given but is unable to write a description of the image using his language. Figure 6. SR2 Subject Test Results can be seen in the appendix.

Based on the results of SR2's search for answers, the subject has difficulty in arranging words in terms of describing. But the issue tries to explain it with his understanding and words. This proves that the subject of SR2 in presenting and describing the pictures or patterns given in their language can be said to be capable even though they still have difficulty assembling the words.

The description of the presentation of data on high-ability subjects shows that ST1 and ST2 subjects find patterns of solving problems, presenting, and rewriting using their language, and can state everyday situations into written mathematical models and express images into mathematical models. As well as linking mathematical ideas with relevant images. Subjects with moderate ability showed that subjects SS1 and SS2 found patterns of solving problems, presenting, and rewriting using their language, were less systematic and less communicative and had not been able to express everyday situations into mathematical models in writing said pictures to others, in mathematical models, as well as linking mathematical ideas with relevant images. Meanwhile, subjects with low abilities showed that subjects SR1 and SR2 had not been able to find patterns of solving problems, presenting, and rewriting using their language, were less systematic and uncommunicative, and had not been able to express everyday situations into mathematical models in writing, and stated images into mathematical models, as well as linking mathematical ideas with relevant images (Sriraman et al., 2017).

The description of the images given is not too difficult but not too easy either. They quickly understand the problems given and observe the pattern of the given picture and try to use their language to describe the pattern picture shown. One indicator of mathematical communication skills stated that the subject could make conjectures, develop arguments, formulate definitions and generalizations of a problem or image using their language (P. Purba et al., 2017).

However, most say it is difficult to describe the image given for those with moderate and low abilities, and few say it's not that hard. The ability to understand the picture is still lacking, especially the ability to rewrite the photograph's description given in its language (Fitriani et al., 2018). the reason is that students still lack understanding of the problems presented, are less thorough, and have difficulty identifying and collecting information from the pictures or issues given (Megalou, 2019).

1. Expressing everyday situations into mathematical models in writing, and expressing images into mathematical models, as well as connecting mathematical ideas with relevant images

- Highly Skilled Subjects

The data displayed is the result of written test data for ST1 and ST2 subjects. Based on ST1's written answers in expressing everyday situations into mathematical models, ST1 subjects can say mathematical conditions or everyday situations into mathematical models. ST1 issue writes down what is known in the problem and understands what is asked. The topic also describes the completion process, understands the meaning of mathematical symbols, and writes down the correct answer according to the question request.

Based on the results of the ST1 search, it was revealed that the ST1 subject was able to mention and write down what was known on the question, understanding the meaning of the symbol terms that the issue used. So, it can be concluded that ST1 subjects have written mathematical communication skills to express mathematical situations or everyday situations into mathematical models on number pattern problems.

Based on ST2's written answers in expressing everyday situations into mathematical models, his written mathematical communication skills in terms of expressing mathematical conditions or everyday situations into mathematical models are said to be capable. ST2 subjects can write down known and asked questions and solve them into a mathematical model. However, the issue did not to write down the formula used, and there was an error in writing the numbers. However, the subject gives a conclusion at the end of its completion.

Based on the results of the ST1 search, it was revealed that the ST1 subject had decent written mathematical communication skills in terms of expressing mathematical situations or everyday situations into registered mathematical models on pattern questions and number sequences. Just lacking in terms of thoroughness in writing answers.

- Medium Ability Subject

The data displayed is the result of the written test data of SS1 and SS2 subjects. Based on SS1's written answers in stating everyday situations into mathematical models, this subject has written mathematical communication skills in terms of expressing mathematical problems or everyday concerns into mathematical models on pattern material and number sequences. SS1 issues can write the final answer according to the question but do not describe the completion process so that from the question sheet, it does not appear that he has fulfilled this indicator. However, the subject understands and knows the process.

Based on the results of the SS1 search, it was revealed that the subject of SS1 understood the questions so that they knew what was known and asked. However, based on the written test results, the issue does not have written mathematical communication skills to express mathematical situations or everyday situations into mathematical models on pattern material and number sequences.

Based on SS2's written answers in expressing everyday situations into mathematical models, the subject has not been said to be able to tell everyday situations into mathematical models. Topic For this question, the response given by the subject is incomplete. The issue did not write down the value/number information in the

question. The matter did not write the formula directly on the arithmetic operation, which was not explained. The final answer was wrong because of an error in writing the information.

Based on the results of the SS2 search, it was revealed that the subject was in a hurry, so the values entered were incorrect, and the answers given were less precise. Although the issue understands the problem, the SS2 subject does not yet have written mathematical communication skills to express mathematical situations or everyday situations into mathematical models on pattern material and number sequences.

- Low ability subject

The data displayed are the results of the written test data of SR1 and SR2 subjects. Based on SR1's written answer in stating everyday situations into a mathematical model, the matter can write down the things being asked. Still, the answers given are not by the questions shared. The issue also does not seem to use a mathematical model in solving the problem, so the indicators of stating mathematical situations or everyday situations into mathematical models on pattern material and number sequences have not been said to be capable.

Based on the results of the SR1 search, it was revealed that the subject understood what was known in the problem but was still confused in using mathematical terms and symbols, so changing the situation into a mathematical model was very difficult for the subject.

Based on SR2's written answer in expressing everyday situations into a mathematical model, the subject did the calculations manually. The issue did not write well what was known and asked about the problem, did not use mathematical terms and symbols, and did not convert the situation into a mathematical model. The subject concluded at the end of the work, but the answers were incorrect. The issue looks easier to work on the problem with manual calculations. Based on the results of the written mathematical communication skills interview above, the SR2 subject in the number pattern test has not been able to express mathematical situations or everyday situations into mathematical models on pattern material and number sequences.

Based on the results of the SR2 search, it was revealed that the subject understood what was known in the problem but was still confused in using mathematical terms and symbols, so changing the situation into a mathematical model was very difficult for the subject.

The description of the presentation of data on high-ability subjects shows that subjects SR1 and SR2 in stating everyday situations into mathematical models in writing, expressing images into mathematical models, and connecting mathematical ideas with relevant images, complete and correct communicative. Subjects with moderate abilities showed that SS1 and SS2 subjects said everyday situations into mathematical models in writing, expressed images into mathematical models, and connected mathematical ideas with relevant photos were incomplete but accurate, less communicative. Meanwhile, subjects with low abilities showed that subjects SR1 and SR2 had not been able to express everyday situations into mathematical models in writing. They said images into mathematical models and linking mathematical ideas with relevant photos were wrong and less communicative.

The description of the images given is not too difficult but not too easy either. They quickly understand the problems given and observe the pattern of the given

picture and try to use their language to describe the pattern picture shown. One indicator of mathematical communication skills is that the subject can make conjectures, develop arguments, and formulate definitions and generalizations of a problem or image using their language (Batlolona et al., 2018).

However, most say it is difficult to describe the image given for those with moderate and low abilities, and few say it's not that hard. The ability to understand the picture is still lacking, especially the ability to rewrite its description in its language. The reason is that students still lack understanding of the problems presented, are less thorough, and have difficulty identifying and collecting information from the pictures or problems given (Sukardjo & Salam, 2020).

2. Represent images into mathematical models and relate mathematical ideas to relevant images

- Highly Skilled Subjects

The data displayed are the results of the written test data of SR1 and SR2 subjects. Based on ST1's written answer in expressing the image into a mathematical model and connecting mathematical ideas with relevant images, ST1's subject on his observations of the pictures given is perfect, so he sorts the numbers based on the pictures. Give a complete explanation and the correct final answer. Then when asked to illustrate the photograph, the answer given is accurate and correct.

The results of a search on ST1 revealed that the subject could have written mathematical communication skills in terms of expressing images into mathematical models and connecting mathematical ideas with relevant images on pattern material and number sequences.

Based on ST2's written answers in expressing images into mathematical models and connecting mathematical ideas with relevant images, the subject can solve problems with the help of pictures and create images that are relevant to the problem. However, in converting the image into a mathematical model, the subject did not write down the process entirely or use symbols or mathematical terms. But the answer given by the appropriate topic is correct.

The results of a search on ST2 revealed that the subject understood the questions and gave the correct answers. Subjects also use relevant images according to the inquiry request. So the issue can be concluded that the ST2 case has written mathematical communication skills to express visions into mathematical models and connect mathematical ideas with relevant images on pattern material and number sequences.

- Medium Ability Subject

The data displayed is the result of the written test data of SS1 and SS2 subjects. Based on SS1's written answer in stating the image into a mathematical model and connecting mathematical ideas with relevant images, the subject understands the vision in the problem and presents it in a mathematical model clearly and precisely using mathematical symbols. The resulting final answer is also correct. For some parts of the subject matter, only write the definitive answer. The subject also provides an image quite relevant to the question request.

The search results on SS1 revealed that the subject met written mathematical communication skills in terms of expressing images into mathematical models and connecting mathematical ideas with relevant images on pattern material and number sequences.

Based on SS2's written answer in expressing the image into a mathematical model and connecting mathematical ideas with relevant images, the subject only wrote down some information, but it was not clear and detailed. The final answer is correct, but no calculation operation process is described. Henceforth, the subject seems to provide relevant images to the question. However, once again, the completion of the arithmetic operation was not elaborated, and the results obtained were inaccurate. Also, do not write down the information contained in the questions.

The search results on SS2 revealed that SS2 subjects had written mathematical communication skills to express images into mathematical models and connect mathematical ideas with relevant images on pattern material and number sequences. However, there are still many mistakes in the process due to a lack of accuracy.

- Low Ability Subject

The data displayed are the results of the written test data of SR1 and SR2 subjects. Based on SR1's written answer in expressing images into mathematical models and connecting mathematical ideas with relevant images, in converting images into mathematical models, the subject is still having difficulties. Providing relevant photos is good enough; it's just that they still can't use symbols and mathematical terms in solving these problems.

The search results on SR1 revealed that the subject expressed difficulty understanding the image and providing relevant photos. This proves that the issue cannot say mathematical situations or everyday situations into mathematical models on pattern material and number sequences.

Based on SR2's written answer in expressing the image into a mathematical model and connecting mathematical ideas with relevant images, the subject has not understood the image given well so that in converting it to the form of a mathematical model, it is not appropriate. However, in providing relevant images, it is correct, but in solving it, the subject of SR2 still uses the manual method, and the answers given are also incorrect.

The search results for SR2 revealed that the subject found it challenging to convert the image into a mathematical model in this number pattern problem. Meanwhile, providing relevant photos is good enough, but the final answer is inappropriate.

3. Results of Interviews with Educators

As additional data, the researcher conducted interviews with several educators. Based on the interview guidelines that the researchers have made, the researchers then conducted interviews with several educators. As a mathematics teacher in class VIII, the discussion was born in the teacher's room at SMPN 8 Parepare MRS H (initials). Interviews were conducted quite casually, like regular conversations, so they were not structured. The essence of the interview questions regarding the mathematical communication skills of class VIII students, especially for their written mathematical communication.

As for some of the results of interviews, including In general, the mathematical communication skills of class VIII students cannot be classified as good. Some students have difficulty when doing the given task. Student activities that are appropriate for learning are less active due to the COVID-19 pandemic, which requires students to do online learning for a long time. When students have difficulty under-

standing, they are reluctant to ask questions that they do not understand or feel unclear.

In this online learning, the teacher gives assignments as exercises at home. The teacher provides instructions so that the work done is sent privately, not to the group, to avoid the behavior of students copying the work of other students. From the results of this work, he can conclude that any student who understands, understands a little, and does not understand at all will be given exceptional guidance. He also explained that the results of the assignments were only about 5 out of 24 students who could be said to be excellent and sound because these students were exemplary in mathematical communication, primarily written mathematical communication.

Based on the data, the results of those with high, medium, and low abilities indicate that they have moderate to high mathematical communication skills for this indicator. They easily convert images into mathematical models and provide images relevant to mathematical ideas or ideas. Completely write down what is known and asked and provide answers to the questions. Overall the subject can explain, write, or make sketches or drawings about the mathematical ideas to solve problems (Lailiyah et al., 2021). However, some topics could not convert the image into a mathematical model and solve it for those with moderate and low abilities.

Based on the overall results of research and related theories in general, students' written mathematical communication skills at SMPN 8 Parepare in solving pattern and number sequence problems are classified as moderate. Students' ability to express images into mathematical models and relate mathematical ideas to relevant photos and express mathematical situations or everyday situations into mathematical models in writing is classified as good in the medium to high achievement category. Meanwhile, the ability to present and rewrite the description of an image or pattern given using their language is relatively low. This is in line with the theory contained in the NCTM, which says that mathematical communication is defined as one way for students to explain algorithms and methods to solve problems, construct and explain real-world phenomena graphically, words/sentences, equations, tables, and presentations. Physically or the way students give guesses about geometric figures.

Students' written mathematical communication skills are influenced by learning models that are not fully face-to-face. Some of the meetings are conducted online due to the pandemic that has not entirely subsided. So that teaching staff is required to innovate in the teaching and learning process. Teachers carry out one way of learning is by utilizing video media and social media to deliver learning materials. The absence of interaction during the mathematics learning process causes communication that occurs only in one direction and is not reciprocal. It can be said that his mathematical communication skills are still lacking.

This needs to get more attention because it remembers the importance of students' mathematical communication in learning mathematics. According to Baroody (Mulenga & Marbán, 2020), two reasons make contact one of the focuses in learning mathematics. First, mathematics is the language of mathematics itself. And secondly, in the teaching and learning process of mathematics, a social activity must involve at least two parties, namely teachers and students.

Discussion

Mathematical communication ability is the ability of students to interact orally and in writing to obtain information according to the mathematics subject matter taught by educators. This mathematical communication is accompanied by the absorption and comprehension ability of students. In the following, some of the author's findings or the findings of others are discussed.

1. Present and rewrite the description of a given picture or pattern using their language.

This research shows that people with high mathematical communication skills are not complicated and easily describe photos or images. They quickly understand the challenges presented, observe patterns in the given pictures, and attempt to articulate the practices in their language. In line with the results of research (Pratiwi et al., 2020; Solihah et al., 2018). Which states that mathematical communication skills can be seen from the subject's ability to build conjectures, develop arguments, formulate definitions, and generalize a problem or picture using their language.

Research results (Fitriani et al., 2018; Setyowati et al., 2020; Susanti et al., 2020) stated that most people find it challenging to describe a given image or photo, especially for people who have low and moderate mathematical communication skills. , they are a little difficult to explain. In line with research findings (Rohmah, 2020; Suendang & Darmawijoyo, 2020), students' ability to articulate ideas connecting one concept to another through language is still limited. In this study, the ability to understand images and the ability to rewrite, as well as the ability to describe ideas that are presented in their respective languages, is still low. One of the reasons is that students still find it challenging to understand the problem comprehensively, and it is difficult to identify and collect data from photos or difficulties.

2. Expressing mathematical situations or everyday events into mathematical models in writing

High-ability students have strong written mathematical communication skills. Students who have this ability can understand the meaning of a problem and conclude from the given circumstances. Subjects can also write down the facts in the problem, explain the problem, and make conclusions that can be true. On the other hand. In line with research (Zahara et al., 2020), which states that students who have high abilities can explain and justify whether the solution is correct or not.

In contrast to the results of research (Sunanto et al., 2020), which states that students have medium and low communication skills. Students do not fill out the answer sheet wholly based on the information contained in the questions. In line with the research results (Utari et al., 2020), some students enter their values first, then interpret and make conclusions. Some students make counts by hand, without using formulas or concepts and mathematical symbols. While in this study, most of the students were less careful and always in a hurry to complete the tasks given to them. As a result, the values entered are sometimes incorrect, resulting in a wrong final answer.

3. Represent images into mathematical models and relate mathematical ideas to relevant images

Students who have high, medium, and low abilities in converting photos or images into mathematical models and connecting relevant mathematical concepts and pictures. This study indicates that stu-

dents with medium and high mathematical communication skills can easily convert photos into mathematical models and make associations between images and mathematical concepts or ideas. Students can write down everything known and ask, then answer the questions. In line with research (Batlolona et al., 2018), high-ability students can explain, write, sketch, or draw mathematical ideas to solve problems. Meanwhile, students with low communication skills cannot convert images into mathematical models and solve them.

For students who have moderate to high abilities, students' ability to articulate images into mathematical models, connect mathematical ideas with relevant photos, and express mathematical situations or everyday events into written mathematical models is considered good. Meanwhile, their ability to present and modify images or pattern descriptions using their language is limited. This is following the opinion (Megalou, 2019), which states that mathematical communication is "one way for students to explain algorithms and methods to solve problems, build and explain graphical presentations of real-world phenomena, words/sentences, equations, tables, and physical expressions. . , or the way students guess geometric pictures".

Another addition from the results of this study is that learning that is not entirely face-to-face impacts students' written mathematical communication skills. Prolonged effects of the pandemic. Several online meetings show that teachers must be willing to try new things in the classroom. For example, teachers use videos and social media to present subject matter in one learning method.

In line with the research results (Harjo et al., 2019; Maskur et al., 2020), students are given films related to number patterns and sequence material and are taught online design and number sequence material. After students view and study the learning video, the lesson teacher will, of course, open a discussion forum and offer homework as a means of assessing students' understanding of the lesson. 16% of students can understand the assignments given, and the written mathematics communication is relatively high.

About 32% of the children in the class did not get it, and the rest could be classified as low in line with the results of research (Sriraman et al., 2017), which states that students are given films related to number patterns and sequence material when studying pattern information and sequence numbers online. After students see and learn the learning video, the lesson teacher will, of course, open a discussion forum and provide homework to assess students' understanding of the lesson. However, only about 16% of students can understand the given task, despite their excellent written mathematics communication. About 32% of the children in the class could not understand, while the rest were average or low.

This research needs attention to the importance of students' mathematical communication in learning mathematics. In line with the study results (Harjo et al., 2019; Samo et al., 2017) stated that mathematical communication focuses on learning mathematics. There are two reasons. First, mathematics is the language of mathematics, and second, mathematics is a social activity, a learning process that requires the participation of teachers and students.

Based on the results of students' written tests and interviews with mathematics subject teachers on each indicator. Students with written mathematical communication skills for patterns and numerical sequence materials classified as moderate

can practice making presentations and rewriting descriptions of a picture or design. Meanwhile, students with low written mathematical communication skills indicate that there is still room for improvement.

CONCLUSION

Students' mathematical communication skills are seen when they articulate images into mathematical models, relate mathematical ideas to relevant images, and relate mathematical models to everyday events in writing. This ability is seen when they present and modify prints or patterns using simple language. Subjects observe the provided pictures sort the numbers based on the photos; they are asked to give a thorough explanation, give final answers, turn the images into mathematical models, and combine mathematical ideas with relevant images. Students try to build mathematical communication using their language, especially in terms of explaining the exhibited photos, articulating ordinary situations into mathematical models in writing, and expressing views into mathematical models. The students who have difficulty understanding the problem or question. They are assisted in observing patterns and pictures, given instructions, visually describing mathematical concepts. Based on the findings and conclusions of the study. Teachers should pay more attention to students' mathematical communication skills and help them develop them. Mathematical communication is primarily written. Teacher creativity in learning is an effort to create a stimulating learning environment, especially when pandemic conditions require online knowledge. Students must also be more involved in the teaching and learning process, dare express opinions or ideas about teaching, and enrich themselves by seeking information from various sources. For the conclusions to be more generalizable, it is recommended to continue further research in a broader topic, more general material, and the appropriate process about this research, which uses minimal subject matter, specific material, and a straightforward approach.

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Appendix

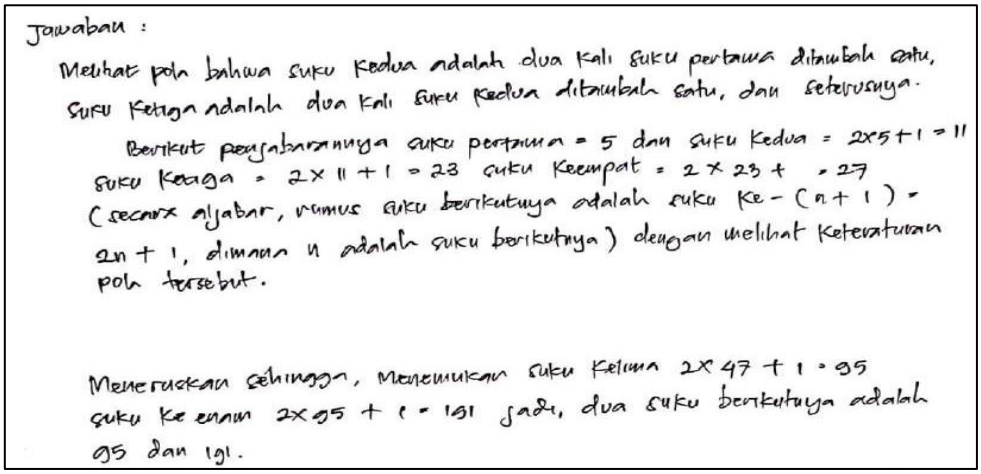

Jawaban :
Melihat pola bahwa suku Kedua adalah dua kali suku pertama ditambah satu, suku Ketiga adalah dua kali suku Kedua ditambah satu, dan seterusnya.
Berikut penjabarannya suku pertama = 5 dan suku Kedua = 2x5+1 = 11 suku Ketiga = 2x11+1 = 23 suku Keempat = 2x23+ = 27 (secara aljabar, rumus suku berikutnya adalah suku Ke-(n+1) = 2n+1, dimana n adalah suku berikutnya) dengan melihat keteraturan pola tersebut.
Meneruskan sehingga, menemukan suku kelima 2x47+1 = 95 suku ke enam 2x95+1 = 191 jadi, dua suku berikutnya adalah 95 dan 191.

Figure 1. ST1 Subject Test Results Describe the Image

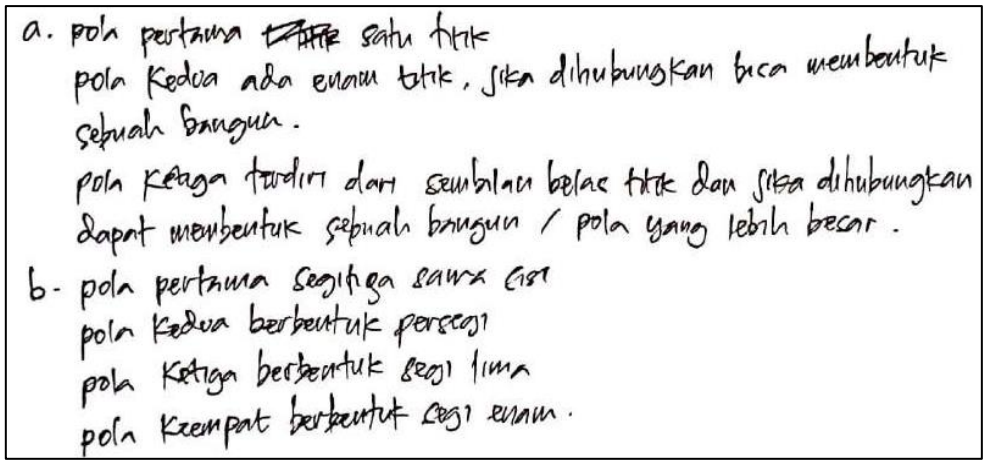
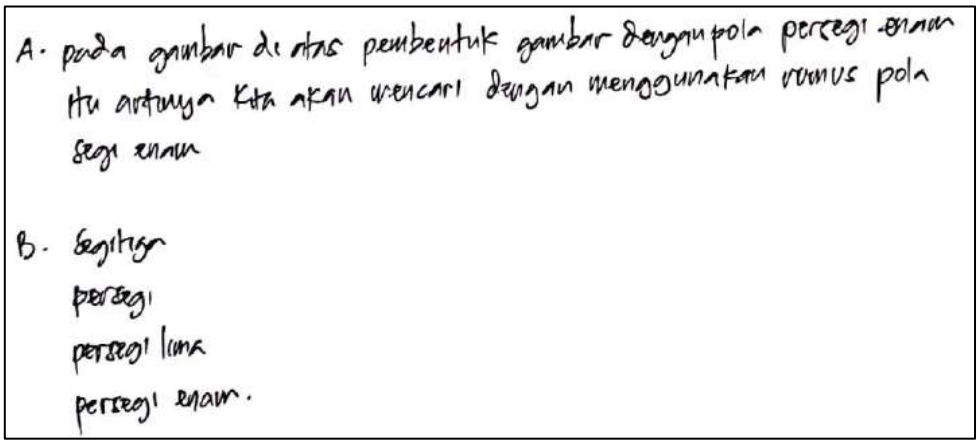

a. pola pertama ~~titik~~ satu titik
pola Kedua ada enam titik, jika dihubungkan bisa membentuk sebuah bangun.
pola ketiga terdiri dari sembilan belas titik dan jika dihubungkan dapat membentuk sebuah bangun / pola yang lebih besar.
b. pola pertama segitiga sama sisi
pola Kedua berbentuk persegi
pola Ketiga berbentuk segi lima
pola Keempat berbentuk segi enam.

Figure 2. ST2 Subject Test Results Describe the Image


A. pada gambar di atas pembentuk gambar dengan pola persegi enam itu artinya kita akan mencari dengan menggunakan rumus pola segi enam

B. segitiga
persegi
persegi lima
persegi enam.

Figure 3. SS1 Subject Test Results Describe the Image

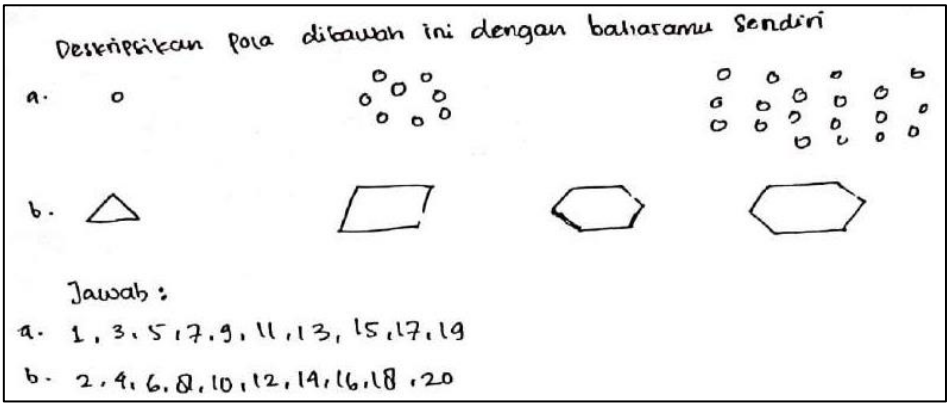


Figure 4. SS2 Subject Test Results Describe the Image

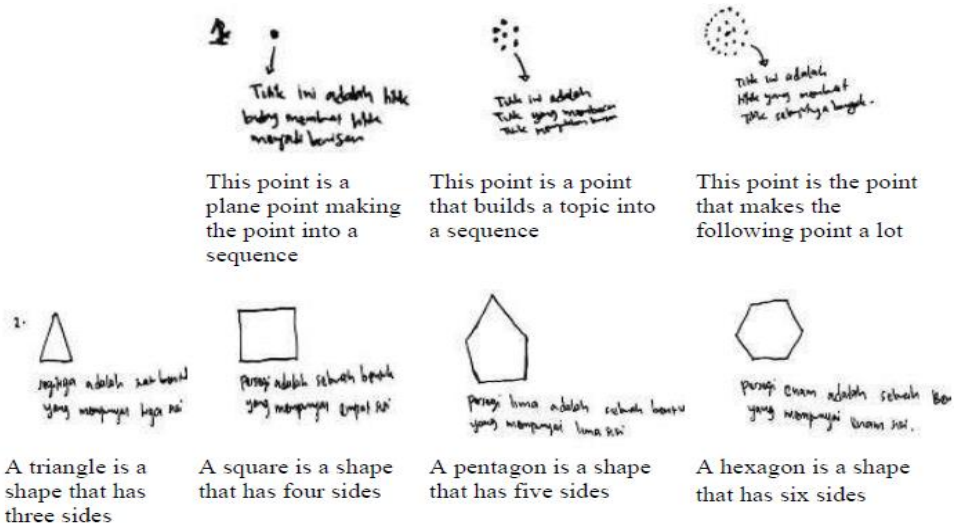


Figure 5. SR1 Subject Test Results Describe the Image

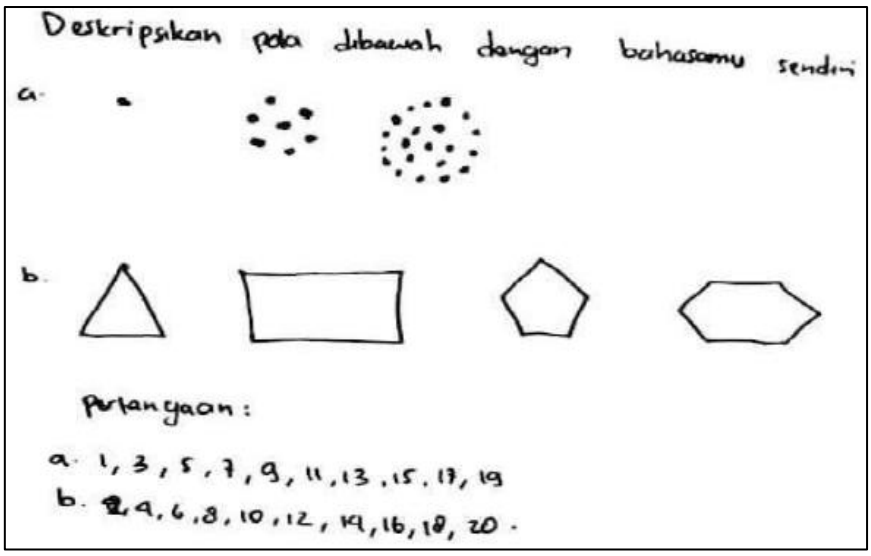


Figure 6. SR2 Subject Test Results Describe the Image