

## ANALYSIS OF CLASS VII STUDENTS' MATHEMATICAL COMMUNICATION ABILITY IN ALGEBRA CALCULATING OPERATIONS

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### **Abstract**

*The problem is that teachers dominate class communication by explaining concepts, showing examples, and directing questions and answers. This study aims to analyze the communication skills of junior high school students in solving algebraic arithmetic operations. The research was conducted on class VIII students of SMP Negeri 1 Rawamerta for the 2022/2023 academic year. The method used in this research is qualitative, with a descriptive approach. Data collection in this study was carried out by providing mathematical communication ability test instruments used by previous researchers. Based on the data analysis that has been done, the percentage of students communicative abilities in the average score for solving algebraic arithmetic problems is 14.58%. Understanding communication in completing algebraic arithmetic operations for class VIII students of SMP Negeri 1 Rawamerta needs to be more profound.*

**Keywords:** Mathematics; Mathematical Communication; Student.

### **Introduction**

Mathematics is a subject that is studied at every level of education. Mathematics has become a fundamental science that has a crucial role in training students' abilities to solve problems in life. Therefore mathematics is no stranger to humans because mathematics is a subject at every level of education. Pursuing mathematics is not just memorizing a formula but requires understanding to learn what material is being studied and is expected to have mathematical abilities that can be used in life.

Mathematics has a crucial role in the current development of science and technology. It can be seen from the development of science and technology, which is part of mathematics participation. (Cemerlang, n.d.) reveals that mathematics lessons at school aim not only for students to know the mathematical module being explained but other vital purposes, namely that students have reasoning abilities, communication, connections, mathematical representations and solutions to mathematical problems, and attitudes. That is mandatory for students to get after studying mathematics (Rizki, 2008).

Communication is a social process by which students connect, share information, and promote each other's progress. According to (Sihotang, Syofra, Sirait,

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[& Rahmayanti, 2022](#)), Mathematical communication is how students express and explain mathematical ideas orally or in writing in the form of pictures, tables, diagrams, formulas or demonstrations. From the meaning of communication described, it can be summarized that mathematical communication means processes or social activities carried out by exchanging information, ideas or ideas, and mathematical understanding between one person and another.

[\(Rinaldy, 2021\)](#) In mathematics lessons, indicators of mathematical communication skills can range from (1) the ability to express and visualize mathematical ideas through oral, written, and demonstrations; to (2) understanding, interpreting, and evaluating oral and written mathematics. Other visual formats, Thinking ability; (3) Ability to express ideas, describe relationships, and simulate situations using terminology, mathematical symbols, and structures.

According to [\(Supardi, Khairiyah, & Fitriani, 2022\)](#), traditional teaching methods commonly used in teaching mathematics in Indonesia have few opportunities to exchange ideas. Teachers dominate class communication by explaining concepts, giving examples, directing questions and answers, or having discussions. It has been shown in research by [\(Supardi et al., 2022\)](#) that students do not use mathematics as a language to solve problems. Respondents who pay attention only to a small part of the text when trying to explain the reasoning behind a statement will say that this section needs symbols but provides supporting evidence [\(Lestari & Suryadi, 2020\)](#) and [\(Yusnia & Fitriyani, 2017\)](#).

Based on what has been explained above, the researcher is motivated to conduct a study to analyze further "Analysis of Mathematical Communication Ability of Class VII Students in Algebraic Computing Operation Material".

## **Research methods**

his research is qualitative research using descriptive methods. Qualitative research is research to study, find, describe, and reveal the quality of the origin of social impacts that cannot be explained, measured or described through a quantitative approach [\(Haryati, 2012\)](#) dan [\(Supardi et al., 2022\)](#).

According to [\(Narbuko & Ahmadi, 2018\)](#), descriptive research means research that explains current problem-solving based on the data used to present, analyze and interpret it. Based on this definition, qualitative research produces descriptive data to obtain a complete illustration of a thing or phenomenon derived from reality and according to the person and object to be studied to achieve the original purpose of this research.

This study aims to analyze the level of understanding of junior high school students in solving problems related to algebraic arithmetic operations. This research was conducted at SMPN 1 Rawamerta for the 2022/2023 academic year. The subjects of this study were 16 students of class VIII. The object of this research is the ability of mathematical communication. The data collection method for this research is an essay

question instrument relevant to indicators of mathematical communication ability using the subject of algebraic arithmetic operations ([Marcella, 2022](#)).

The criteria for evaluating mathematical communication abilities originating from the journals ([Aziz & Sudihartini, 2021](#)) can be reviewed in the following table:

Indikator	Skor	Kriteria
Kemampuan melukiskan atau mempresentasikan benda nyata gambar, dan diagram dalam bentuk ide atau simbol matematika.	0	Sama sekali tidak menjawab
	1	Dapat menuliskan hubungan antar gambar yang diberikan
	2	Dapat menghubungkan gambar dalam bentuk aljabar
	3	Dapat menyelesaikan permasalahan tapi jawaban kurang tepat
	4	Dapat menyelesaikan permasalahan dengan tepat
Mengungkapkan kembali suatu uraian atau paragraf matematika dalam bahasa sendiri.	0	Sama sekali tidak menjawab
	1	Bentuk aljabar yang ditulis tidak sesuai dengan situasi matematika
	2	Bentuk aljabar yang ditulis sesuai dengan situasi matematika tapi tak disertai makna variabel yang dipakai
	3	Bentuk aljabar yang ditulis dan makna variabel yang dipakai tak sesuai situasi matematika
	4	Bentuk aljabar yang ditulis dan makna variabel yang dipakai sesuai situasi matematika
Kemampuan menyatakan peristiwa sehari-hari dalam bahasa atau simbol matematika atau menyusun model matematika suatu peristiwa.	0	Sama sekali tidak menjawab
	1	Dapat mengubah kejadian nyata menjadi bentuk aljabar
	2	Dapat mengubah kejadian nyata menjadi bentuk aljabar dengan disertai makna variabel yang digunakan
	3	Dapat menyelesaikan masalah tapi jawaban kurang tepat
	4	Dapat menyelesaikan masalah dengan tepat

**Table 1. Criteria Giving Score Mathematical Communication Ability**

With the following formula:

$$x = a/b \times 100\%$$

Information:

x = Percentage of Points for correct answers

a = Correct answer points

b = Maximum possible points achieved

Then the percentage score obtained is then interpreted to determine the level of the student's ability to understand concepts ([Adnan, Ridwan, & Fildzah, 2016](#)). The criteria are shown in the score criteria table below:

Persentase	Kriteria
0% - 20%	Sangat Rendah
21% - 40%	Rendah
41% - 60%	Cukup
61% - 80%	Tinggi
81% - 100%	Sangat Tinggi

**Table 2. Criteria for Mathematical Communication Ability Score**

## Results and Discussion

This research was conducted at SMP Negeri 1 Rawamerta for the 2022/2023 academic year in class VIII J with 16 students. The researcher gave the students five essay questions derived from a mathematical communication indicator. The following table summarizes the percentage of students' mathematical communication skills at SMPN 1 Rawamerta, namely:

Indikator	Persentase	Kategori
Kemampuan melukiskan atau mempresentasikan benda nyata gambar, dan diagram dalam bentuk ide atau simbol matematika. (1 dan 3)	0 %	Sangat Rendah
Mengungkapkan kembali suatu uraian atau paragraf matematika dalam bahasa sendiri. (2)	0%	Sangat Rendah
Kemampuan menyatakan peristiwa sehari-hari dalam bahasa atau simbol matematika atau menyusun model matematika suatu peristiwa. (4 dan 5)	43.75 %	Cukup

**Table 3. Percentage Summary of Mathematical Communication Ability**

The average percentage of students' overall understanding of the concept was 14.58%. Therefore, students' mathematical communication skills in solving algebraic operations could be more profound.

Then analyze the images derived from student answers in solving questions related to using the following algebraic arithmetic operations:

A. Indicators: The ability to present pictures of natural objects and diagrams in the form of ideas or mathematical symbols.

Problem Number 1: Create a mathematical model to calculate the block volume below if it is known that the length of the block is  $2x+1$ , the block's width is half the length, and the height of the block is twice the length. Then arrange a story according to the picture.

*(The formula for the volume of a block = length  $\times$  width  $\times$  height)*

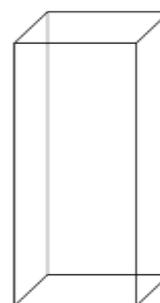


Image 1.

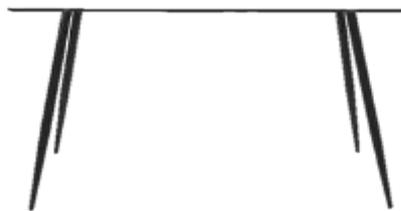
From the results of the analysis of student's answers for each indicator, a percentage score of 0% was produced. The first indicator, presenting natural objects, images, and diagrams as ideas or mathematical symbols, must be categorized as very low. The following is a description of the ability to understand question no 1.



**Figure 2. Wrong answer**

Figure 2 needs to be corrected for the student answers. Students have not been able to present natural objects in images. As shown in Figure 2, students could not answer the questions.

Problem Number 3: Rina's father made Rina a table with a rectangular surface with a length of  $5x$  and a width of  $3y$ .



**Figure 3.**

1. Buat gambar permukaan meja belajar Rina hingga mudah dipahami.
2. Susunlah model matematika guna menghitung keliling serta luar permukaan meja belajar Rina

In question number 3, with the first indicator, the students also needed help to work on the questions. Figure 4 is the student's wrong answer. Students have not been able to present natural objects in images.



**Figure 4. Wrong Answer**

- B. Indicators: Delivering back descriptions or paragraphs of mathematics in their language.

Problem Number 2: Make a mathematical description of the algebraic form  $2x + x + 5x + 4y$  with everyday events.

From the analysis of student's answers for the second indicator, a percentage score of 0% was obtained, which means that the second indicator was categorized

as very low. The following describes students' abilities in the second indicator for question no 2.



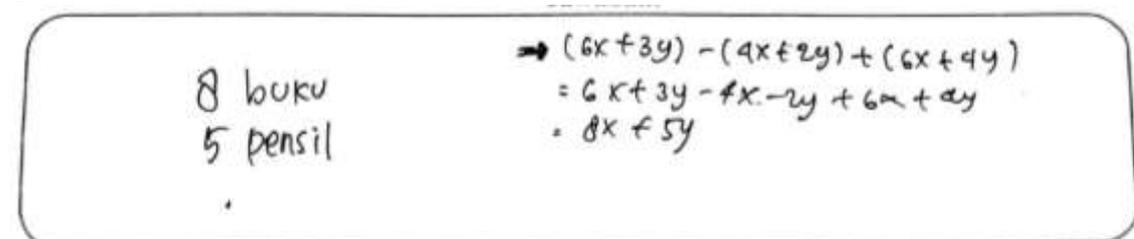
**Figure 5. Wrong Answer**

In Figure 5, students answered incorrectly because the communication response needed to be more efficient and misinterpreted. Therefore, students have not been able to fulfil the indicators of conveying more descriptions or paragraphs of mathematics in their language.

- C. Indicator: The ability to say everyday events in language or mathematical symbols or construct a mathematical model of an event

Problem Number 4: Lina went to the supermarket with her mother one Sunday. Lina bought six books and three pencils. After arriving home, Lina gave her sister four books and two pencils. On Tuesday, Lina went to buy six books and four pencils, the same as the books and pencils she purchased on Sunday. Make an algebraic math model and find out how many books and pencils Lina has.

From the analysis of student's answers for the third indicator, a percentage score of 43.75% was obtained, which means that the third indicator was categorized as sufficient. The following describes students' abilities on the third indicator for question no 4.



**Figure 6. Correct Answer**

Problem 4 requires students to be able to state everyday events or construct mathematical models of events in language or mathematical symbols. Below are answers from students who met those metrics. In the responses, students are seen being able to say everyday events in language or mathematical notation or form a mathematical model of events.



### Figure 7. Wrong Answer

Figure 7 needs to be corrected for the student's answers. Students have not fulfilled the third indicator, namely the ability to say events in mathematical symbols or formulate a mathematical model of an event ([Ariawan & Rufus, 2017](#)). As shown in Figure 7, the student's answers were blank, or the students did not answer question number 4.

Question Number 5: The difference in the ages of Dedi and Tara is five years, while the sum of the ages of Dedi and Tara is 18 years. Make a mathematical model of the algebraic form of the statement.

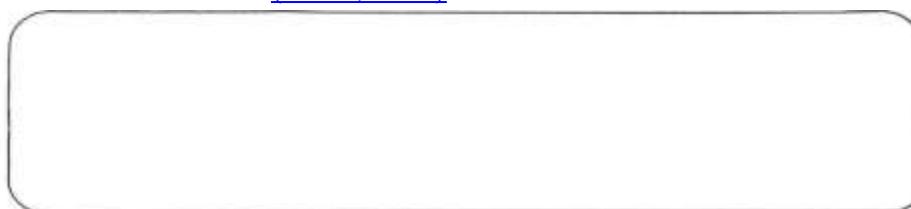


A handwritten note on a piece of paper, enclosed in a rounded rectangular border. The text is written in black ink and includes the following:

$$\begin{aligned}x &= \text{umur dedi} \\ y &= \text{umur tara} \\ \text{Modelnya: } x - y &= 5 \\ x + y &= 18\end{aligned}$$

### Figure 8. Correct Answer

In question 5, with the third indicator, students can solve the problem correctly. Figure 8 is the student's correct answer. Students can complete the ability to express everyday events or mathematical models that form events in language or mathematical notation ([Umar, 2012](#)).



### Figure 9. Wrong Answer

Figure 9 needs to be corrected for the student's answers. Students have not been able to fulfil the third indicator. As shown in Figure 9, the student's answers were blank, or the students did not answer question number 5 ([Hodiyanto, 2017](#)).

From the description above, students' mathematical communication skills in algebraic arithmetic operations are still categorized as very low.

## Conclusion

The conclusion from the description of the research results and discussion is that the average percentage score of students' understanding of SMPN 1 Rawamerta class VIII J in solving algebraic arithmetic operations material questions can be categorized as very low with a score percentage of 14.58%. The ratio obtained for the first indicator is 0%, which is classed as very low, and the percentage score for the second indicator is 0%, categorized as very low. And the percentage score for the third indicator is 43.75% which is classified as sufficient. This shows that students are superior in the third

indicator, namely the ability to say everyday events in language or mathematical symbols or construct mathematical models of events.

And it can be seen that the average score of all questions from all students is in the shallow category with a percentage of 14.58%. The reason why students still make many mistakes can be seen from the students' answers; namely, students need help understanding the material concept of algebraic arithmetic operations. Even though understanding the picture is very crucial for the development of students because if students already know the idea of using it properly and correctly, students can solve problems on existing questions. Students' skills could be better in drawing conclusions, resulting in students answering questions without clear reasons. So, this needs to be more relevant to the existing mathematical communication indicators used by researchers.

To overcome this, students should train and hone their abilities more by doing exercises on algebraic arithmetic operations material so that students are better at working on problems and can improve their mathematical communication skills.

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