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Profile of Mathematical Communication Process of Prospective Mathematics Teachers Reviewed from Self-Confidence

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Abstrak
Kepercayaan diri merupakan salah satu aspek afektif yang penting dalam meningkatkan komunikasi matematis. Penelitian ini bertujuan untuk menganalisis proses komunikasi matematis calon guru matematika dalam memecahkan masalah berdasarkan kepercayaan diri. Metode yang digunakan adalah kualitatif. Subyek penelitian adalah mahasiswa Pendidikan Matematika, Universitas Muhammadiyah Purwokerto. Instrumen penelitian terdiri dari angket, tes, dan wawancara. Hasil angket kepercayaan diri dikategorikan dalam tinggi, sedang, dan rendah. Setiap kategori mengambil satu orang sebagai responden. Analisis data menggunakan tahap reduksi, penyajian, dan kesimpulan. Hasil penelitian menunjukkan siswa kategori kepercayaan diri tinggi dan sedang memiliki karakteristik proses komunikasi yang baik. Siswa menggunakan simbol dengan tepat untuk menjelaskan informasi dan masalah yang diketahui serta menuliskan jawaban secara terperinci. Siswa kategori kepercayaan diri rendah membutuhkan bantuan untuk menerjemahkan informasi dan simbol matematika. Hal ini mengakibatkan kesulitan dalam menyelesaiakan masalah dengan tepat. Kondisi ini menunjukkan bahwa tahap identifikasi informasi dan representasi masalah sebagai kunci awal proses komunikasi matematika.
Kata Kunci: Kepercayaan Diri; Masalah Kontekstual; Proses Komunikasi Matematis

Abstract
Self-confidence is one of the important affective aspects in improving mathematical communication. This study aims to analyze the mathematical communication process of prospective mathematics teachers in solving problems based on confidence. The method used is qualitative. The subject of the study is a student of Mathematics Education, Universitas Muhammadiyah Purwokerto. The research instrument consisted of questionnaires, tests, and interviews. The results of the confidence questionnaire are categorized into high, medium, and low. Each category takes one person as a respondent. Data analysis uses reduction, presentation, and conclusion stages. The results showed that students in the high and medium confidence categories had the characteristics of a good communication process. Students use symbols appropriately to explain known information and problems and write down answers in detail. Students in the low confidence category need help translating mathematical information and symbols. This results in difficulties in solving problems appropriately. This condition shows that the stage of information identification and problem representation is the initial key to the mathematical communication process.
Keywords: Contextual Problems; Mathematical Communication Process; Self-Confidence

I. Introduction

Communication skills are one of the four must have skills in the 21st century or known as the '4Cs' (Nastiti & Ni'mal'Abdu, 2020; Yulianti & Wulandari, 2021). In mathematics, things related to communication are called mathematical communication. A person's skill in understanding a concept represented through symbols or mathematical notation and then applying it in solving everyday problems is mathematical communication skills (Chasanah et al., 2020). In line with Yusuf and Rozal (2022), they explained that the fundamental ability students must have to gain a good understanding of mathematical concepts is mathematical communication skills. According to Rohid et al. (2019) explained that mathematical communication consists of several indicators, including 1) creating mathematical ideas that are connected through communication, (2) conveying mathematical ideas to others communicatively, (3) assess and analyze ideas used by other people; and (4) the use of symbols or mathematical notation to express an idea correctly. Good mathematical communication skills can support students' learning process in understanding mathematical concepts and applying them to real problems. This leads to the importance of mathematical communication in solving problems.

According to Rajagukguk et al. (2022) explains the relationship between mathematical communication and motivation in mathematics learning. In communication activities in learning, students express their ideas, explain the solution process clearly, and think critically about the findings of their ideas. The uniqueness of mathematics provides opportunities to develop mathematical communication skills. Using mathematical sentences, symbols, notation, tables, and graphs allows students to explain their ideas mathematically. Learning will be more interesting and certainly increase students' enthusiasm and motivation in learning mathematics (Lestari et al., 2022). The findings of Tong et al. (2021) describe conditions in the field where students often use communication to understand a mathematical concept and its solution. In this context, evaluation activities can train students to communicate ideas for answers in writing and orally. In the context of classroom learning, one of the focuses that must be improved is mathematical communication (Putri & Musdi, 2020; Setiyani et al. 2020; Sulastri, 2023). Students are able to express ideas through symbols, tables, diagrams, and other visual forms in order to solve existing problems. Thus, mathematical communication is strongly related to the student's technique of conveying the mathematical ideas that he has obtained clearly. Students' mathematical communication abilities can be reviewed based on non-cognitive aspects. A person's personality has different characteristics, one related to self-confidence.

Not only can cognitive aspects influence students' mathematical communication skills but they can also be influenced by affective aspects including self-confidence (Azhar et al., 2021; Febriani et al., 2020), self-efficacy (Ashim et al., 2020; Maspe et al., 2021), mathematical disposition (Minarti & Wahyudin, 2019), and learning

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styles (Tahmir et al., 2023; Marzuki et al., 2019). Someone with high self-confidence will find it easier to convey their ideas to other people and not be nervous. However, conversely, if they do not have self-confidence, the ideas conveyed will be unclear because they cannot communicate well. Self-confidence is defined as confidence that certain tasks are completed properly and completely (Kiverstein et al., 2019; Ulfa & Sundayana, 2022; Efwan et al., 2024). Someone has used all their abilities in carrying out a job. Regarding mathematical communication skills, students with high self-confidence will be able to explain the ideas they have discovered clearly and in detail to others. Apart from that, in making decisions, you also need a good attitude of self-confidence. Sumarmo et al. (2021) define indicators to identify a person's self-confidence, namely believing in their talents, making decisions independently, having an optimistic self-concept, and having the courage to convey ideas.

Several studies on the mathematical communication process have been carried out, including research by Putri et al. (2022), which explains the correlation between self-confidence and mathematical communication. The higher a person's level of self-confidence, the better their mathematical communication skills will be. Furthermore, the study of Ashim et al. (2020) produces levels of self-efficacy aspects in the context of mathematical communication skills. The research of Kamid et al. (2020) explains the profile of students' communication skills based on the field dependent category that the information known from the problem is incomplete. This condition clearly has an impact on the inaccuracy of the problem-solving process. In the context of mathematics, it represents the problem into that simple and clear mathematics is the main key. The research provides the main keywords in the form of representation of existing problems and information. The study also proves that students' mathematical communication skills based on gender have the same achievements, namely meeting the indicators well. The research was continued by Chasanah et al. (2020) regarding improving mathematical communication through learning models. Based on the lack of mathematical communication reviewed from the cognitive style, the problem posing and RME learning model is a real alternative to improve mathematical communication, especially written communication. Both approaches have a positive impact. Related to the mathematical communication process, Rohid et al. (2019) who conducted research in the Indonesian context regarding students' mathematical communication skills in solving contextual problems. The mathematical communication process consists of explaining mathematical ideas, analyzing ideas, and conveying ideas using symbols, notation, and mathematical terms correctly. However, it has yet to systematically study the stages of the mathematical communication process in solving problems. Further research uses the stages of the mathematical communication process sequentially by combining them with aspects of self-confidence.

In the context of classroom learning, students do not have the courage to solve problems and convey ideas. Students tend to be passive and do not want to express their opinions. The reason is that students are afraid if the ideas conveyed are wrong or wrong. This condition illustrates in real terms the lack of student confidence. In addition, in the context of mathematical problem solving, mathematics is certainly inseparable from symbols or notations that can be used in the problem-solving process. The current condition illustrates the difficulties students have in identifying existing and relevant information and presenting it into mathematical models or visualizations in a simple way. If these indicators are implemented properly, it will have an impact on easy and precise problem solving. This condition explains the process of mathematical communication. In the current era, students must have affective competence in the form of confidence to face the challenges of complex times. Students are also faced with mathematical problems that are contextual and complex, so they need to have mathematical communication skills to simplify information and facilitate problem solving. These conditions show a clear picture and provide motivation to know the characteristics of the mathematical communication process based on self-confidence comprehensively.

The difference between this research and the previous one lies in the stages of the mathematical communication process. This research uses four stages of the mathematical communication process, namely problem identification, representation, algorithm, and evaluation. The explanation above provides a problem formulation in this research, namely, "How is the student's mathematical communication process in solving problems in terms of self-confidence?"

II. Method

This research belongs to the qualitative type. The research was carried out at the Universitas Muhammadiyah Purwokerto with the subject of students majoring in Mathematics Education. The research was carried out in the even semester of 2023-2024. The research data was collected using three instruments. The first is distributing a self-confidence questionnaire containing 20 statements to determine students' self-confidence levels, and the second is using a written test containing one contextual question to determine students' mathematical communication. From the answers to the self-confidence questionnaire, students were grouped into high, medium, and low categories. With purposive sampling techniques, one student in the high, medium, and low self-confidence categories was selected as a respondent. The high, medium, and low respondents used the symbols D1, D2, and D3. The third instrument is an interview guideline to explore more accurate data on written test answers to mathematical communication process. All respondents were interviewed in depth about the mathematical communication process. Experts first validate the instruments used.

The research applies qualitative methods to describe students' mathematical communication processes based on self-confidence. This research also explains the characteristics of each stage of mathematical communication in solving problems in terms of student self-confidence.

Researchers involved 60 students in the Department of Mathematics Education, Universitas Muhammadiyah Purwokerto. All students are given an online self-confidence questionnaire with a maximum filling time of 20 minutes. The results of the questionnaire were summarized and then grouped into three categories, namely high, medium, and low. One student was taken as a respondent for each self-confidence category using a purposive sampling technique (Sukestiyarno, 2020). This technique is carried out with specific considerations that support research, including good oral skills, test scores, and detailed and precise student work results. To make it easier for researchers, each respondent in the high, medium, and low categories is symbolized by D1, D2, and D3. This research also did not provide specific treatment to all students during learning.

Data collection techniques include self-confidence questionnaires, tests, and interview guides. The instruments used are first corrected and validated by experts. In this case, the expert has research experience in mathematical communication and instrument development at national and international levels. The results obtained show valid and reliable aspects for use in research. The test instrument is designed to measure students' mathematical communication. The following are the questions used in the research.

In a classroom lesson, students who are able to answer questions or respond or give input receive a reward in the form of star-shaped paper. Here are the items that can be exchanged for star paper.

- 2 stars can be exchanged for 1 eraser,
- 1 eraser and 2 stars can be exchanged for 2 pencils,
- 1 pencil and 2 erasers can be exchanged for 2 books, and
- 2 books, 3 pencils, and 1 eraser can be exchanged for 1 bag.

How many stars do you need to redeem for 1 bag?

Figure 1. Contextual Problem

Figure 1 shows the question given to measure the process of mathematical communication. The context of the problem is related to the daily life of students in the form of social arithmetic and cognitive competence in the HOTS category. The focus of the interview lies on the student's mathematical communication process in solving mathematical problems. Based on the test results, we explored the stages of student mathematical communication through interviews.

The data analysis technique used consisted of data reduction, data presentation, and providing conclusions. The data reduction includes summarizing and focusing on essential data according to the research variables. The next step is to present the data obtained through tables, pictures, and interview quotes. The final step taken in data analysis is to provide a conclusion. The results of tests and interviews with students are compared for correlation, and then a final sentence is given as a conclusion. The results of the analysis focused on determining the mathematical communication process based on self-confidence consisting of the stages of problem identification, problem representation, algorithm, and evaluation.

III. Result and Discussion

Mathematical communication skills tests are given to students via online media. Students work on the questions for 15 minutes under the lecturer's supervision. Likewise, the self-confidence questionnaire is given to students via an online link for up to 20 minutes. The recapitulation results provide data on self-confidence divided into three categories, namely high, medium, and low. Table 1 provides information on obtaining self-confidence questionnaire scores and group categorization based on questionnaire scores.

Table 1.
Data Obtained from the Self-Confidence Questionnaire Score

Respondents	Score	Score Criteria	Categories
D1	90	80 ≤ Score ≤ 100	High
D2	75	50 ≤ Score < 80	Medium
D3	35	0 ≤ Score < 50	Low

The results of tests on students' mathematical communication skills in the high, medium, and low categories were analyzed for each process, and each student was given an in-depth interview with the main focus of the students' mathematical communication process in solving problems. Mathematical communication involves problem identification, representation, algorithm, and evaluation stages. An explanation of the characteristics of each stage is explained in Table 2.

Table 2.
Mathematical Communication Process

Stages	Description
Identification	Expressing problems into mathematical ideas in writing.
Representation	Expressing the problem in the form of a mathematical model or image.
Algorithm	Solve mathematical problems in writing wholly and correctly.
Evaluation	1. Check the results of the work. 2. Provide conclusions.

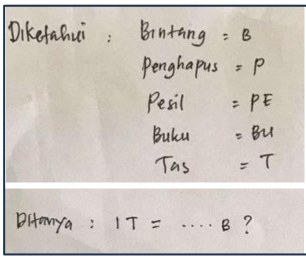
Based on the analysis of students' mathematical communication processes in solving problems, table 3 provides the results for each category of self-confidence regarding the stages of mathematical communication.

Table 3.
Identification of Mathematical Communication Processes Based on Self-Confidence

Stages	Self-Confidence Category		
	High	Medium	Low
Identification	Clear	Clear	Clear
Representation	Clear, complete	Clear, complete	Not complete
Algorithm	Detailed, clear	Clear, detailed	Not detailed, false
Evaluation	Clear	Clear	False

A description of each stage of students' mathematical communication processes in solving mathematical problems based on self-confidence category will be explained.

A. High Self-Confidence Category

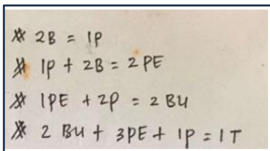


Translation:
Is known: Stars: B
Eraser: P
Pencil: PE
Books: BU
Bag: T

Figure 2. Results of D1's Work on Problem Identification

In Figure 2, respondents wrote down the information they knew and asked about. In its presentation, it uses mathematical symbols, namely b (book), p (eraser), pe (pencil), bu (book), and bag (t). Respondents also wrote what was asked in mathematical notation, namely, "1t=...b?". Based on the results of the interview, the respondent was able to explain everything written well.

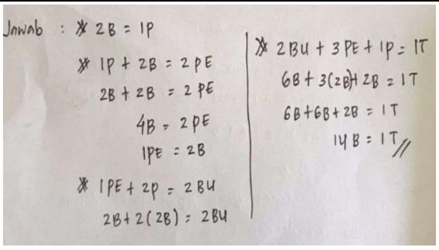
R : *Can you understand the problem well?*
D1 : *Yes, sir. I wrote down the information that was known and asked about the problem.*
R : *What can be written?*
D1 : *I use mathematical notation or symbols to represent all information.*
R : *What is the essence of the problem question?*
D1 : *In this problem, how many books can one bag be expressed.*



Translation:
2B = 1P
1P + 2B = 2PE
1PE + 2P = 2Bu
2BU + 3PE + 1P = 1T

Figure 3. Results of D1's Work on Problem Identification

The next stage carried out by respondents was to create a mathematical model from the information obtained in the previous stage. In making mathematical models, respondents used previously written mathematical notation. As seen in Figure 3, respondents wrote four different mathematical model equations. This was done by the respondent to make it easier to solve the problem. Figure 3 also proves that respondents can write well and clearly when using mathematical models.



Translation:

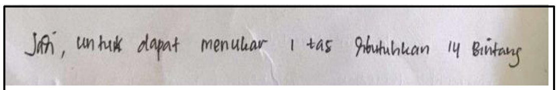
❖ 2B = 1P	2BU + 3PE + 1P =1T
❖ 1P + 2B = 2PE	6B + 3(2B) + 2B = 1T
2B + 2B = 2PE	6B + 6B + 2B = 1T
4B = 2PE	14B = 1T
1PE = 2B	
1PE + 2P = 2Bu	
❖ 1PE + 2P = 2BU	
2B + 2(2B) = 2BU	

Figure 4. Results of D1's Work on The Algorithm

In writing down the solution steps, respondents used several methods to find the correct answer according to what was asked. First, the respondent wrote the equation "2b = 1p". Second, with the substitution method, the first equation is substituted into the following equation. This process is carried out continuously until the respondent finds the final equation, namely 14b = 1t. If you look closely at the answers in Figure 4, the respondents divided the settlement process into four different and sequential parts. This can be seen from the symbols used by respondents to indicate each part. The following is an interview with respondents related to writing completion steps.

R : *Are you sure the answer is correct according to the main question?*
D1 : *Yes, sir.*
R : *In your opinion, the answers written are detailed and precise?*
D1 : *Yes, sir. I wrote it sequentially and in detail.*
R : *In Figure 3, you can see that you have written the process into several parts. Why?*

D1 : Yes, sir, to make it easier to answer. Each part is related and is carried out to obtain the correct answer.



Translation:

So, to be able to exchange one bag, you need 14 stars.

Figure 5. Results of D1's Work on Evaluation

The final stage of the subject is to review the definitive answer and write a sentence that describes the conclusion. In Figure 5, respondents reported the findings obtained. This conclusion is based on what is asked in the problem. These sentences are also written in their language, meaning there are no standard sentences for writing conclusions. In the interview, the parts corrected by the respondent were explored.

R : Do you collect answers immediately after finishing work?

D1 : No, sir. Because there was still time, I re-corrected each part.

R : What was checked?

D1 : Mathematical notation, solution steps, and final answer.

R : Are you used to doing that?

D1 : Yes, sir, if there is still time.

As shown by students in the high self-confidence category who are able to solve problems correctly, mathematical communication has a position in problem solving so it is important for students to have because in the process in addition to being able to explain the ideas obtained, students are also able to develop an understanding of concepts accompanied by their analysis (Aulia et al., 2021). Someone with self-confidence will be able to communicate their ideas clearly and correctly. Ideas can be conveyed appropriately if someone has confidence in their abilities (Darling-Hammond et al., 2020; Paroqi et al., 2020).

Students with high self-confidence achieve all mathematical communication processes, starting from identification, representation, algorithms, and evaluation. Students begin the communication process by writing down all the information they know and ask for, using symbols to represent the information obtained, using mathematical rules to solve problems, and checking all the solution steps and the final results. These results are supported by Hanifah et al. (2020) that students who have high self-confidence appropriately and correctly fulfill all aspects of mathematical communication. In this research, it was stated that students could use mathematical symbols to describe information and apply mathematical concepts in solving problems. In addition, Fay et al. (2022) support that students with high self-confidence can relate mathematical symbols and information to a mathematical model. Furthermore, students provide feedback through conclusions and re-examining ideas for solving problems. This is related to the representation and evaluation stages.

B. Medium Self-Confidence Category

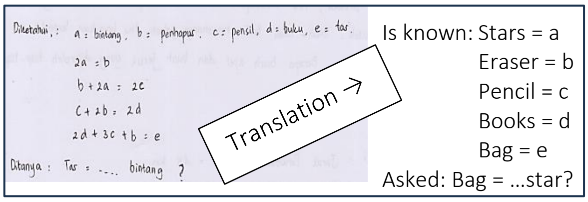


Figure 6. Results of D2's Work on Problem Identification

Figure 6 explains the initial stage carried out by respondent D2, namely writing down the information they know and

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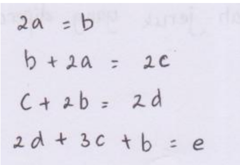
asking. Respondents wrote down information related to tags, erasers, pencils, books, and bags. Apart from that, the main questions related to loads and Bintang are also written down. Based on the results of interviews with respondents, it was explained that the information was taken from the problem given, looking at some information that could be used to solve the problem.

R : Can you understand the problem given? Explain.

D2 : Yes, sir, I understand the problem. I can write down all the information in the problem and then write down the main question. Later, this information will be used to answer questions.

R : Do you usually write down all the information and questions asked, as in Figure 6?

D2 : Yes, sir, the goal is to make it neat and easy to read.



Translation:
2a = b
b + 2a = 2c
c + 2b = 2d
2d + 3c + b = e

Figure 7. Results of D2's Work on Problem Representation

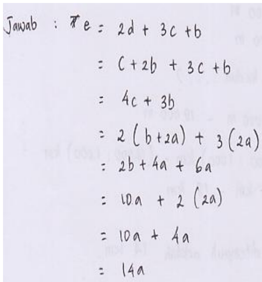
Respondents used the symbols a, b, c, d, and e to describe stars, erasers, pencils, books, and bags, respectively. Next, respondents compiled a mathematical model based on existing information. This can be seen in Figure 7. Respondents wrote four different equations using mathematical symbols. If you look closely, these four equations are related. In their interviews, respondents explained the reasons for compiling mathematical models to make it easier to solve problems in the form of stories or contextual problems. A lot of information can be presented in mathematical sentences that are easy to understand and short. The following is the explanation.

R : Can you please explain the reason for making a mathematical model?

D2 : The reason is to make it easier to solve problems through story/contextual questions. Much information can be shortened into mathematical sentences without reducing its true meaning.

R : Do you usually use mathematical models like that?

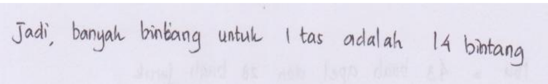
D2 : Yes, sir, usually for questions in the form of descriptions or stories, it is easier to make a mathematical model.



Translation:
Answer:
e = 2d + 3c + b
= c + 2b + 3c + b
= 4c + 3b
= 2 (b + 2a) + 3 (2a)
= 2b + 4a + 6a
= 10a + 2 (2a)
= 10a + 4a
= 14a

Figure 8. Results of D2's Work on The Algorithm

In writing their answers, respondents directly present their solution ideas. In contrast to the responses from respondents in the high self-confidence category, respondent D2 did not divide the completion process into certain parts but wrote directly in one series. This condition is shown now in Figure 8. Respondents used the substitution method and then operated it to arrive at the final result. The answer obtained also uses the mathematical symbol "e = 14a". Solution ideas are presented in neat, systematic, and precise writing.



Translation:
So, the number of stars for one bag is 14 stars.

Figure 9. Results of D2's Work on Evaluation

The final stage carried out by respondent D2 was to re-check the answer and provide a simple conclusion. Respondents checked the entire results of their work, starting from writing mathematical notation, the methods used, and the steps to complete them. This is usually done by respondents if there is still time available. In the end, a simple conclusion is also given with its sentence pattern, as in Figure 9. This is done to ensure that the answer is what was asked. The following is an excerpt from the interview.

R : After you complete the answer, what do you do next?

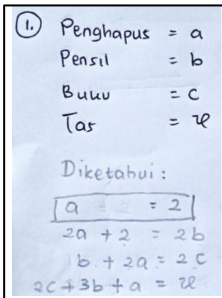
D2 : I'll correct it again, sir. Coincidentally, there was still time, so I fixed it starting from the mathematical notation, the use of the solution method, and every step.

R : Are you used to writing the conclusion when answering a problem?

D2 : Yes, sir, I did this to ensure that the answer was by the main question.

Students in the medium self-confidence category also carried out the same activity. All the information obtained and the main questions are presented as mathematical symbols. In this case, it is related to the identification stage. The representation, algorithm, and evaluation stages can be done correctly and precisely. This is because students have a good level of self-confidence. Research by Andriyani et al. (2022) supports that good self-confidence has an impact on good self-esteem. As a result, mathematical communication skills can be achieved optimally and precisely. The findings of the study also state that students' confidence can improve mathematical communication as shown by the fulfillment of indicators of mathematical communication ability. Self-confidence has an impact on a person's self-esteem so that the achievement of communication skills will be easier to achieve, as was the case with the research of Riawati et al. (2020). Self-confidence will make it easier to convey an idea or concept comprehensively and clearly, be able to provide rational arguments and be able to apply a concept in solving problems convincingly.

C. Low Ability Student Category



Translation:
Eraser = a
Pencil = b
Books = c
Bag = x

Is know:
a = 2
2a + 2 = 2b
b +2a = 2c
2c + 3b + a = x

Figure 10. Results of D3's Work on Problem Identification

Figure 10 shows the results of respondent D3's work at the initial stage, namely problem identification. Respondents write down all the information obtained from the problem. They used the symbols a, b, c, and x to represent an eraser, pencil, book, and bag, respectively. Apart from that, respondents could also explain the core questions contained in the main problem. In his confession, the respondent explained that what was asked was the number of stars that needed to be exchanged for a bag. The following are the results of interviews with respondent D3.

R : Can you understand the problem?

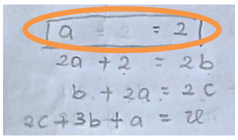
D3 : Yes, sir, I can understand.

R : What is the first thing you do after looking at the problem?

D3 : I assume the variables eraser, pencil, book, and bag, respectively, with symbols a, b, c, and x.

R : What is the central question of the problem given?

D3 : Asked to calculate the number of stars needed to get a bag.



Translation:
a = 2
2a + 2 = 2b
b + 2a = 2c
2c + 3b + a = x

Figure 11. Results of D3's Work on Problem Representation

The next step is to construct a mathematical model based on the information obtained previously. Respondents could write four different equations that represented all the information provided. However, two initial equations must be corrected, as shown in Figure 11. The first equation, “a = 2,” does not match the symbol. The information states that one eraser = 2 stars, but the respondent wrote two erasers. This, of course, causes the following process to have an incorrect value. These errors are discovered through interviews with respondents and can be confirmed as correct answers. Below is evidence of interviews conducted with respondents regarding solutions at the problem representation stage.

R : Where did you write the four equations above?

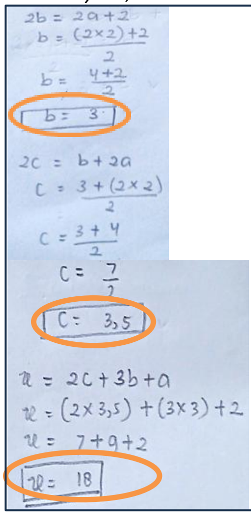
D3 : Based on the information I obtained from the problem given.

R : Try looking at the two initial equations. Are you sure you're right?

D3 : Yes, sir, I should have used another symbol to represent the star in the first equation so that I could write a = 2s where s is the star. In the second equation, I mistranslated the information. It should be one eraser, not two erasers. The correct equation is a + 2s = 2b.

R : Are you sure where the error was?

D3 : Yes, sir, I already know the mistake. Thank you, sir.



Translation:
2b = 2a + 2

$$b = \frac{(2x2)+2}{2} = \frac{4+2}{2} = 3$$

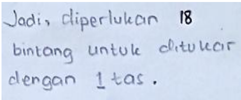
2c = b + 2a

$$c = \frac{3+(2x2)}{2} = \frac{4+3}{2} = \frac{7}{2} = 3.5$$

x = 2c + 3b +a
x = (2 x 3.5) + (3 x 3) + 2
x = 7 + 9 +2
x = 18

Figure 12. Results of D3's Work on The Algorithm
Figure 12 proves respondents could

Figure 12 proves respondents could obtain various values b, c, and x. If you look closely at the completion process, three different parts can be written by respondents, which are sequential. Respondents were able to use basic algebra operations well and use the substitution method to find the answer. However, the final answer obtained is wrong. This is because, in the previous stage, the respondent made a mistake in writing the mathematical model equation so that the next step would have the wrong value. However, when respondents were asked to correct their steps from the start, they were able to rewrite their answers correctly.



Translation:
So, it takes 18 stars to be transmitted with one bag.

Figure 13. Results of D3's Work on Evaluation

The final stage carried out by respondent D3 was to recheck the answers and write a definitive conclusion. In Figure 13, respondent D3 wrote a sentence stating the decision obtained. This emphasizes that the problem-solving process has been completed, and the answer is obtained. When respondents were asked to rewrite the solution steps from the beginning, respondents were also able to rewrite the conclusions using their discussion. Another activity carried out by respondents is rechecking their final answers. In this case, the respondent could not check each step in detail but only checked the definitive answer because the time was limited. The following are the results of the interview.

R : Do you usually write a conclusion at the end of your answer?

D3 : Yes, sir, I aim to confirm I found the answer.

R : What do you usually do after finishing work?

D3 : If there is still time, I will correct all the answers carefully. However, in solving this problem, the time was limited, so I only fixed the final result, meaning I still needed to reach the completion steps.

Students in the low self-confidence category need help understanding the information correctly. This results in students' understanding of rewriting information in the form of mathematical symbols to be incorrect. This finding is supported by research by Nafisah et al. (2021) that students in the low self-confidence category cannot use mathematical symbols correctly and clearly. The idea to be conveyed through symbols or notation needs to be conveyed correctly. This is due to students' need for understanding in managing the information obtained. Students must also learn to use mathematical symbols to convey problem-solving ideas. These results are supported by research by Ismail et al. (2023) by testing mathematical communication skills, data was obtained that the average student could not use mathematical symbols to express mathematical ideas. Research by Tyas et al. (2022) also supports that students who have low self-confidence still needs to fully explore the information used in solving problems. The use of symbols still needs improvement, resulting in errors in writing each completion step. A person's skill in conveying ideas communicatively is an essential part of learning mathematics.

IV. Conclusion

The process of mathematical communication based on self-confidence consists of problem identification, representation, algorithm, and evaluation stages. The findings of the study show that the student category is high in self-confidence can write the stages of mathematical communication completely and correctly. Students are able to identify known information and determine the core of the problem. Students can translate information through mathematical symbols, use detailed mathematical rules, and provide conclusions according to the

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essence of the question. At the algorithm stage, students write down the solution steps in detail and correctly. These characteristics can also be found in the work results of students in the medium self-confidence category. Students can write correctly each stage of mathematical communication.

Students in the low self-confidence category have differences in achieving each stage of the mathematical communication process. Students of this category are unable to meet the entire stage of mathematical communication. The first two stages, namely the identification and representation of the problem, cannot be done properly. Errors in identifying known and queried information and difficulty in presenting information into mathematical symbols or notation. This has an impact on errors in using mathematical concepts in problem solving. Because the process and answers written are wrong, the conclusions given are also wrong. The first two stages of the mathematical communication process are identification and representation as important points in problem solving.

This research is only limited to the study of mathematical communication. Based on the description above, it can be studied in depth regarding students' mathematical representation abilities. The results of this research show that it is related to mathematical representation that students are still found to be fluent in using symbols or mathematical notation to describe information, so this condition becomes an attraction for future research.

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