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ANALYSIS OF STUDENTS' DIFFICULTIES IN SOLVING MINIMUM COMPETENCY ASSESSMENT QUESTIONS IN TERMS OF MATHEMATICAL COMMUNICATION SKILLS

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ABSTRACT

The minimum competency assessment is used in developing students' numeracy literacy skills to have 21st-century skills. However, students' difficulties in solving minimum competency assessment questions will cause unsatisfactory results. Therefore, it is necessary to analyze further students' difficulties in solving the minimum competency assessment questions, including mathematical communication skills. This study used qualitative research methods with descriptive analysis techniques to examine these difficulties. The data collection techniques used were observation, tests, and interviews. The research was conducted by giving students a minimum competency assessment test, and then the results were analyzed so that six research subjects were obtained. Then interviews were performed according to the guidelines that had been made for the six subjects. The results showed that subjects with high communication skill categories needed help compiling solution ideas and complete answers written by students. Then subjects in the medium category had difficulty in three indicators: linking the information given into mathematical concepts, compiling mathematical ideas, and generalizing. Meanwhile, subjects in the low category experienced difficulties in each indicator, and most did not answer the questions. So it is concluded that subjects with high communication ability categories have fewer difficulties when solving minimum competency assessment questions than subjects with medium and low levels.

Keywords: Minimum Competency Assessment, Mathematical Communication, Numeracy Literacy

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PRELIMINARY

Minimum competency assessment is an assessment used to measure the success of students based on the cognitive domain, one of which is the numeracy aspect which consists of number content, geometry and measurement, algebra, data, and uncertainty (Ayuningtyas & Sukriyah, 2020; Umar & Widodo, 2021). A minimum competency assessment measures reasoning ability when facing a problem requiring numeracy literacy skills (Hidayah et al., 2021). Because the minimum competency assessment questions include capabilities that measure students' numeracy literacy level. Therefore, the

minimum competency assessment aims to develop students' basic numeracy literacy skills to prepare students to have 21st-century skills (Megawati & Sutarto, 2021).

In Indonesia, difficulties in solving minimum competency assessment questions are still experienced by students. The difficulties experienced by students in solving minimum competency assessment questions occur when restating a concept; students do not understand the information provided, so there are difficulties when using the basic concepts of the material (Sah et al., 2023; Sulistiowati et al., 2022). In addition, students also need help interpreting problems in algebraic form into mathematical models, and some still tend to memorize formulas rather than understand the material concepts of the problems given (Sholehah & Wisudaningsih, 2022). Another difficulty is analyzing information presented in graphs, symbols, or tables (Winata et al., 2021). Therefore, a more detailed analysis of the difficulties in answering minimum competency assessment questions is needed, one of which is mathematical communication skills.

Mathematical communication skills are the ability to express mathematical ideas using terms, images, and symbols so students can communicate their ideas (Rohid et al., 2019; Shodiqin & Waluya, 2020). In addition, mathematical communication is helpful for students in expressing their thoughts to find problem-solving (Yunita & Siswanto, 2023). However, some studies reveal that this ability still needs to catch up to the importance and benefits of mathematical communication for students. It can be seen from research shows that students have difficulty in answering questions related to indicators of mathematical communication skills, namely in expressing everyday events in mathematical language, connecting graphs with mathematical ideas, and not being able to communicate their mathematical ideas or ideas in writing (Andini & Marlina, 2021; Rahmawati et al., 2019; Yanti et al., 2019). Meanwhile, another study stated that only 33% of subjects could fulfill the indicators of mathematical communication ability (Rohid et al., 2019). Therefore, mathematical communication skills can still be low, so it is also necessary to know the location of the difficulties experienced by students in solving problems that contain indicators of mathematical communication skills. One of them is a minimum competency assessment question that includes indicators of mathematical communication skills. From these indicators, it will be seen where the difficulties experienced by students in answering the minimum competency assessment questions in terms of mathematical communication skills.

Previous studies have also conducted similar research (Sah et al., 2023; Sholehah & Wisudaningsih, 2022; Sulistiowati et al., 2022). However, from these studies, research has

yet to be found that analyzes students' difficulties in solving minimum competency assessment questions regarding mathematical communication skills. Therefore, this research aims to examine this so that this research can be helpful for educators in overcoming the difficulties experienced by students in solving minimum competency assessment questions in terms of mathematical communication skills.

METHODS

This research uses qualitative research methods, with data analysis techniques using descriptive analysis. Qualitative research explores and understands an individual or group to describe existing problems (Mekarisce, 2020). The data source for this study came from interviews with students in grade XI MIPA from a school in Bekasi City and a minimum competency assessment question test. Subjects were selected based on the minimum competency assessment test given to 35 students. In determining the research subjects, the mathematical communication ability categories shown in Table 1 were used (Pangaribuan et al., 2020).

Table 1. Categories of Mathematical Communication Skill

Category	Interval
High	$x > (M + SD)$
Medium	$M - SD \leq x \leq M + SD$
Low	$x < M - SD$

Information:
x : Student scores
M : Mean
SD : Standard deviation

Based on Table 1, four students fall into the high category, 18 in the medium category, and 13 in the low category. Then two students from each category were selected to be used as research subjects, so there were six subjects in this study. Then, a semi-structured interview will be conducted with the subject. Interviews were conducted by interview guidelines based on indicators of mathematical communication skills and had been declared valid by experts.

The data collection techniques used in this study were observation, tests, and interviews. The test consists of four minimum competency assessment questions containing indicators of mathematical communication skills. Before the questions were given to students, the questions were first validated. Content validity was carried out by two mathematics education lecturers and one mathematics teacher and was declared valid. At the same time, empirical validity is done on 99 students with the help of the SPSS

application. The validity results show that all instruments meet the criteria ($r_{value} > r_{table}$) and can be declared valid, as well as the reliability results with Cronbach's alpha (.695) so that it can be said to be reliable with advanced criteria (Rahmelina et al., 2019). Meanwhile, based on the criteria for the test results of the level of difficulty and differentiating power of the questions, the results are shown in Table 2 below (Fatimah et al., 2020).

Table 2. Results of Test Level of Difficulty and Distinguishing Power of Questions

Question Number	Discriminating Power	Interpretation	Difficulty Level	Interpretation
1	.351	Enough	.76	Easy
2	.824	Excellent	.30	Medium
3	.683	Good	.12	Dificulty
4	.747	Excellent	.12	Dificulty

The analysis technique consists of data collection, reduction, presentation, and conclusion drawing (Rijali, 2019). Then each minimum competency assessment question made contains indicators of mathematical communication skills. In this study, the indicators of mathematical communication skills used are: (1) relate factual information, pictures, or tables into mathematical ideas; (2) stating an event in writing with mathematical symbols or notations; (3) compiling mathematical ideas and formulas used in solving problems; and (4) generalizing from the answers written (Ahmad & Nasution, 2018; Hendriana & Kadarisma, 2019).

RESULT AND DISCUSSION

The research results came from the minimum competency assessment test based on mathematical communication ability indicators and interviews. The following shows the difficulties of each subject in solving the minimum competency assessment questions based on the indicators of mathematical communication skills in Table 3 below.

Table 3. Test Results of Minimum Competency Assessment Questions

Category	Subject	Difficulty in Mathematical Communication Skills			
		Question Number			
		1	2	3	4
High	T-1	✓	1, 3, 4	3, 4	2, 3, 4
	T-2	✓	✓	3, 4	-
Medium	S-1	2, 4	1, 3, 4	1, 3, 4	2, 3, 4
	S-2	2, 4	1, 3, 4	-	3, 4
Low	R-1	2, 4	-	1, 3, 4	-
	R-2	2, 4	-	-	-

Information:
1,2,3,4 : Indicators of mathematical communication skill

- : Not answering the question
✓ : All indicators are complete

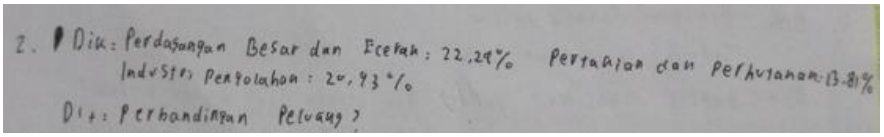
The following describes the subject's difficulties in solving minimum competency assessment problems based on the mathematical communication skill category and the results of interviews with students.

1. Difficulties of Subjects with High Category

Questions related to the minimum competency assessment questions with a total of four questions have been done by students who have high mathematical communication skill and the following review was obtained:

a. Relate factual information, pictures, or tables into mathematical ideas

Subjects in the high category were able to fulfill the first indicator for each minimum competency assessment problem given correctly. The subject could relate the known and questioned information to mathematical ideas. However, T-1 still needed to be completed to answer question number 2. When interviewed, the subject could explain the information in the problem. However, T-1 had difficulty working on problem number 2 because T-1 still needed to understand the problem, so the answers were still incomplete. This can be seen in Figure 1 below.



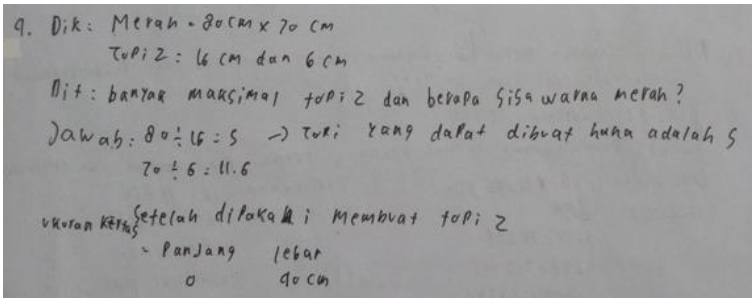
English Version:

2. Known: Wholesale and Retail trade = 22.24%
Processing Industry = 20.93%
Agriculture and Forestry = 13.81%
Asked: Probability Comparison?

Figure 1. T-1 answer to question number 2 indicator 1

b. Stating an event in writing with mathematical symbols or notations

Subject T-1 still had difficulty in question number 4, as shown in Figure 2. In the interview process, T-1 revealed that he had no problems with this indicator; it was just that the answer for the second indicator in problem number 4 was still incomplete, even though what was written was correct. Then for T-2, only able to fulfill the hands in three problems. In question number 4, T-2 did not answer the question because, from the interview results, the subject admitted that the time given was insufficient to answer the question. But overall, issues with high categories could express information or events in mathematical symbols or notations.



English Version:

4. Known : Red = 80 cm × 70 cm
Z hat = 16 cm and 6 cm

Asked : A maximum number OF Z hats and how much red is left?

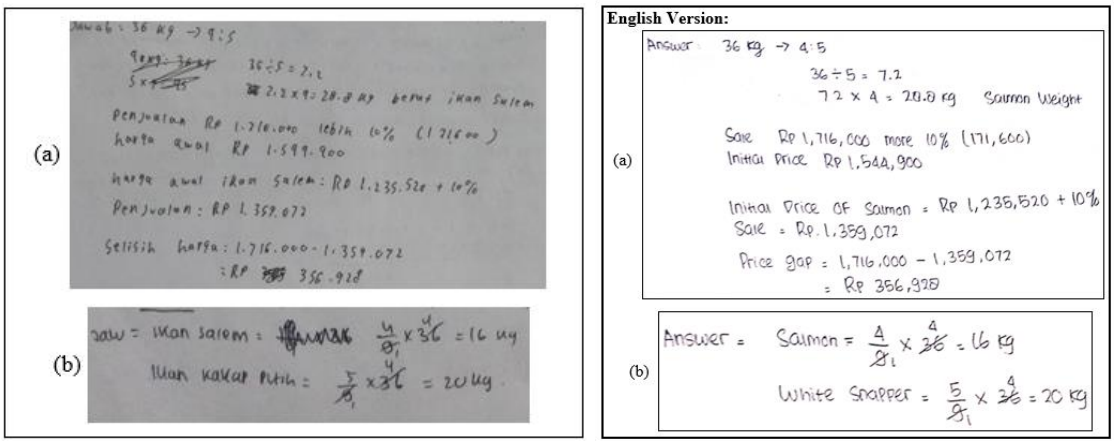
Answer : 80 ÷ 16 = 5 → Hats that Hana can make are 5
70 ÷ 6 = 11.6

Paper size after use, make a Z hat
= Length Width
0 40 cm

Figure 2. T-1 Answers to question number 4 indicator 2

c. Compiling mathematical ideas and formulas used in solving problems

Subjects with high categories could fulfill the third indicator in problem number 1. In problems 2 and 4, T-1 could not work on the problem with the appropriate mathematical formula. Then in problem number 3, which can be seen in Figure 3(a), the subject can organize ideas correctly. In solving the problem, the subject experiences errors, so the results are wrong. This is supported by the interview results, where the subject still has difficulties compiling ideas and using appropriate formulas because the material still needs to be understood. T-2 can also fulfill the indicators in problem number 2, but for problem number 3, the subject experienced confusion in making comparisons; this was confirmed through the interview process and can be seen in Figure 3(b).



English Version:

(a)
Answer : 36 kg → 4 : 5
36 ÷ 5 = 7.2
7.2 × 4 = 28.8 kg Salmon Weight
Sale Rp 1,716,000 more 10% (171,600)
Initial Price Rp 1,544,400
Initial Price OF Salmon = Rp 1,238,520 + 10%
Sale = Rp. 1,359,072
Price gap = 1,716,000 − 1,359,072
= Rp 356,928

(b)
Answer = Salmon = $\frac{4}{9_1} \times \frac{4}{36} = 16$ kg
White Snapper = $\frac{5}{9_1} \times \frac{4}{36} = 20$ kg

Figure 3. (a) Answer T-1; (b) Answer T-2

d. Generalizing from the answers written

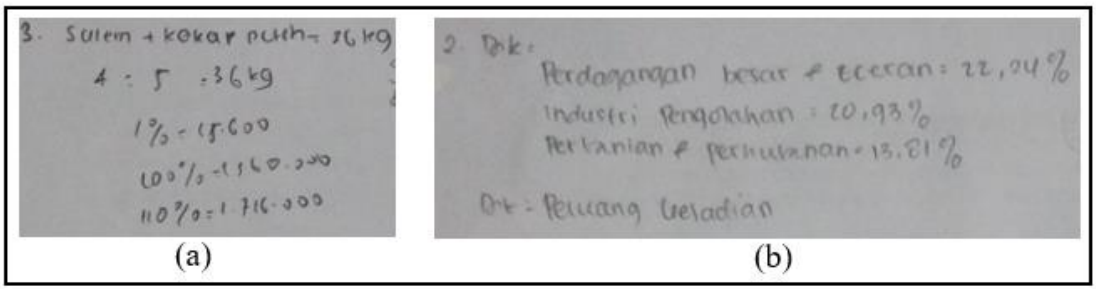
Both subjects in the high category can generalize the given problem according to what is asked, although some questions still have wrong answers.

2. Difficulties of Subjects with Medium Category

Questions related to the minimum competency assessment questions with a total of four questions have been done by students who have medium mathematical communication skill and the following review was obtained:

a. Relate factual information, pictures, or tables into mathematical ideas

Subjects in the medium category have yet to be able to solve all the problems included in the first indicator, especially in difficulties numbers 2 and 3. Based on the results of the answers of the two subjects, it can be seen that both of them have the same difficulty in question number 2, as can be seen in Figure 4(b). The subjects did not relate the information to mathematical ideas appropriately; then, there was still information that should not have been written down but was still written on the answer sheet. The interview results revealed that the subjects needed help understanding all the information, so they felt confused about relating it to mathematical ideas. Then in problem number 3, only S-1 was completed, but the subject needed help to express the comparison information into mathematical ideas correctly. This can be seen in Figure 4(a).



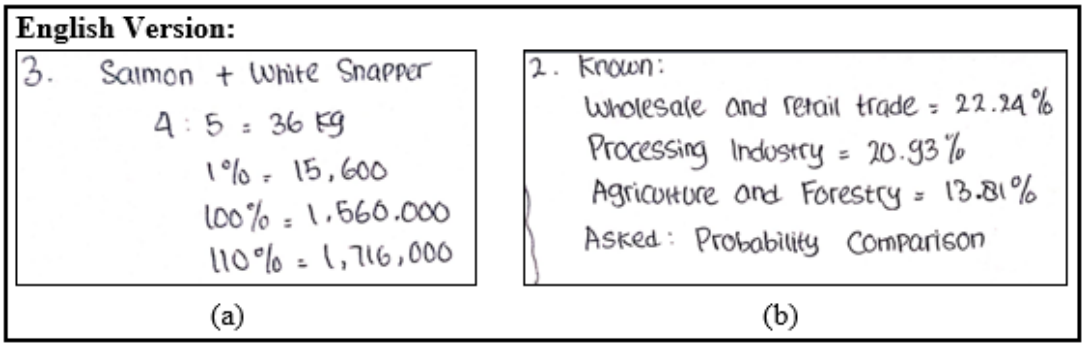


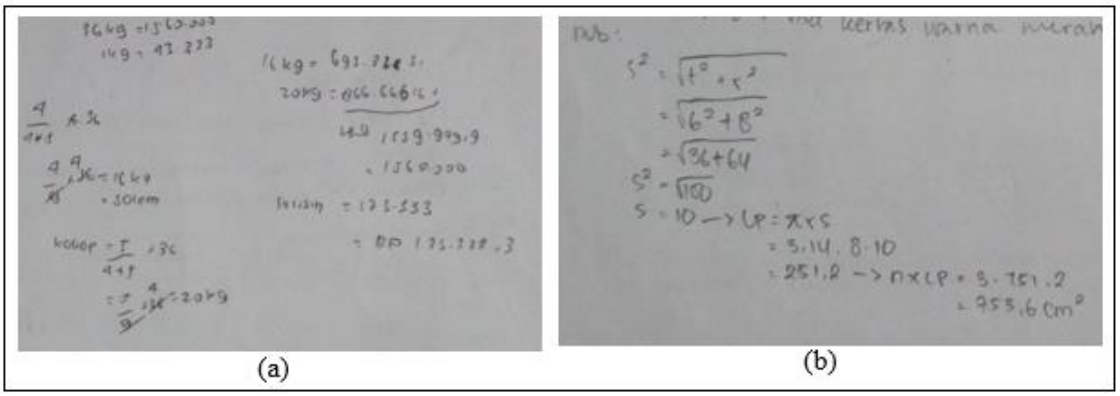
Figure 4. (a) S-1 answer to number 3; (b) S-2 answer to number 2

b. Stating an event in writing with mathematical symbols or notations

Subjects in the medium category experienced the same difficulty in question 1 for the second indicator. Judging from their answers, they needed to explain the meaning of the symbols or variables they wrote on their answer sheets. However, during the interview, they explained the importance of the symbols they wrote down. Therefore, the subjects could express events with mathematical symbols or notations.

c. Compiling mathematical ideas and formulas used in solving problems

In the third indicator, subject S-1 did not compile ideas in questions 2 and 4, then for S-2 in questions 2 and 3. Meanwhile, in question number 3 from S-1's answer, the idea shown on the answer sheet still needs to be corrected. The method written to answer this question still has errors in the calculation, which can be seen in Figure 5(a). Based on the interview results, S-1 needed clarification in explaining the solution flow from his writing. Even S-1 also mentioned that he used the elimination method, while this problem was a problem with the comparison. While in problem number 4 in Figure 5(b), the initial method used by S-2 and the results obtained in determining the cone painter line is correct. However, S-2 did not continue solving the problem and immediately concluded the problem. Based on the interview results, S-2 stated that the subject did not know the solution steps. Therefore, both subjects in this medium category still need help determining the solution that must be used. They tend to memorize formulas and need to develop their ideas in solving the problems given.



(a) (b)

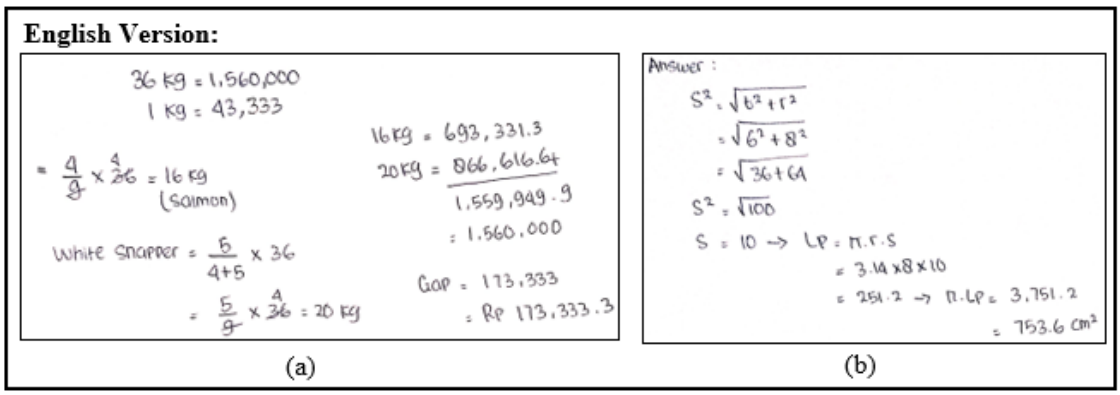


Figure 5. (a) S-1 answer to number 3; (b) S-2 answer to number 4

d. Generalizing from the answers written

In generalizing, both subjects had difficulty with all problems. Based on the results of the interviews, the two subjects revealed that the challenges experienced occurred when the process of solving the problem was not complete, so they were confused in making conclusions. Therefore, the difficulties experienced by subjects in the medium category are not using the correct language or sentences, the findings are not by what is asked, and the answers still need to be corrected. The following is shown in Figure 6, one of the subject's answers related to making generalizations from the answers written down.

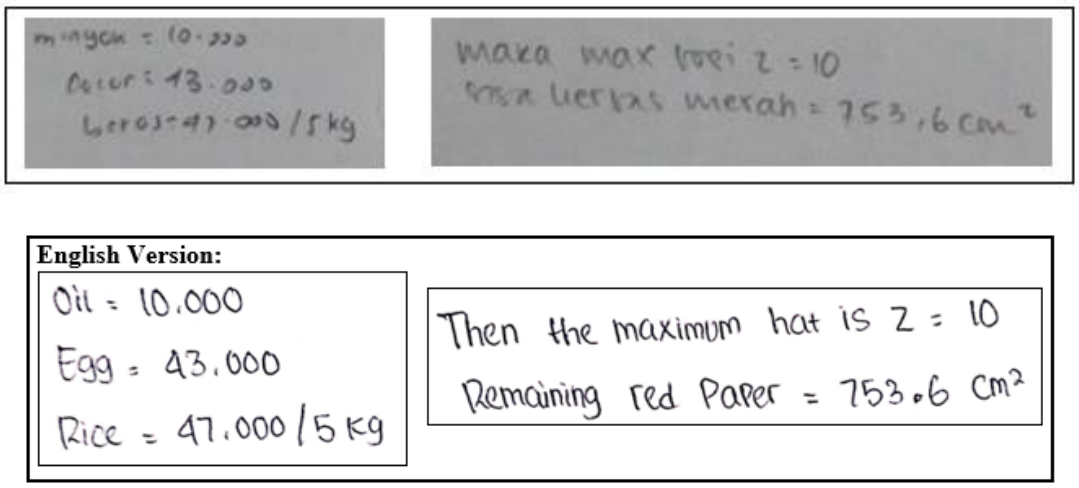


Figure 6. Indicator 4 Answers of medium category subjects

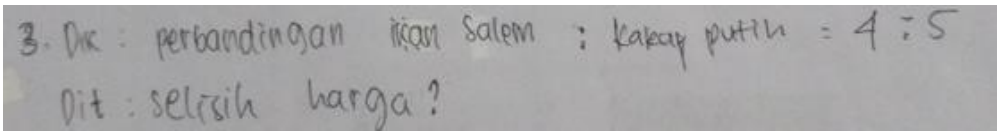
3. Difficulties of Subjects with Low Category

Questions related to the minimum competency assessment questions with a total of four questions have been done by students who have medium mathematical communication skill and the following review was obtained:

a. Relate factual information, pictures, or tables into mathematical ideas

Subjects in the low category did not experience difficulties in problem number 1 for the first indicator. Based on the results of R-1's answers, the subject could only

answer two problems, whereas the other problem was problem number 3. In problem number 3, R-1 still needs help linking information into mathematical ideas, and the test is in the form of not understanding the information given. Hence, the information written still needs to be corrected and completed. The following is R-1's answer to question number 3, which can be seen in Figure 7.



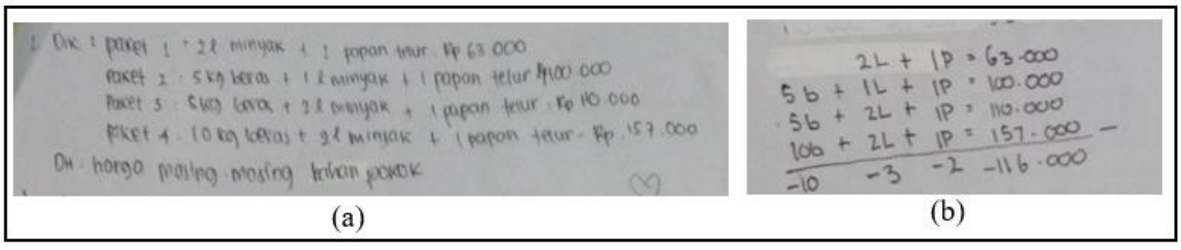
English Version:

3. Known : Comparison of Salmon : White Snapper = 4 : 5
   Asked : Price gap ?

Figure 7. R-1 answer to question number 3

b. Stating an event in writing with mathematical symbols or notations

In the second indicator, the subject has the same difficulty in question number 1, as seen in Figures 8(a) and 8(b). Subject R-1 did not make memorization using mathematical symbols or variables in solving the problem of a system of linear equations of three variables. Then for R-2, he could write symbols to express a system of linear equations, but an explanation did not accompany the signs he wrote because they used rare symbols. From the interview results, the subject did not know the characters used to solve the problem, but when asked what he wrote, the subject could explain the symbol's meaning. Therefore, the matter needed help understanding the mathematical symbols or notations used.



English Version:

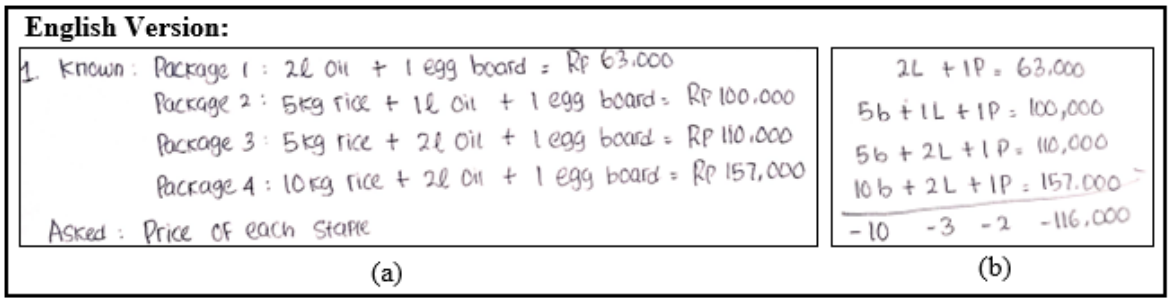
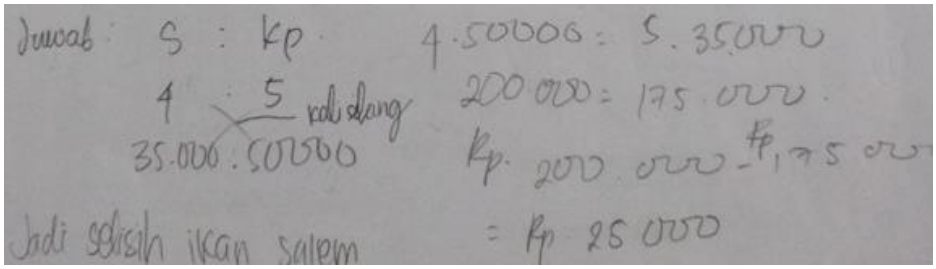


Figure 8. (a) Answer R-1; (b) Answer R-2

c. Compiling mathematical ideas and formulas used in solving problems

In compiling ideas and formulas, R-1 needed help in problem number 3 of the two problems worked on. In answer to question number 3, R-1 is wrong in using the idea that should be used. The subject uses cross-times to solve the problem, while in this problem, it should use the comparison method, which can be seen in Figure 9. Based on the interview results, the matter did not know the formula to solve the problem, so he just wrote down what he knew. Therefore, both subjects still need help compiling ideas and procedures, namely in the form of not understanding the problems given, incorrect concepts used to solve problems, and fixating on existing formulas so that they do not use their ideas in solving problems.



English Version:

Answer :

S : KP

4 : 5

35,000 : 50,000

4 x 50,000 = 5 x 35,000

200,000 = 175,000

RP 200,000 - RP 175,000

= RP 25,000

Figure 9. R-1 answer to question number 3

d. Generalizing from the answers written

In indicator 4, both subjects still had difficulties with the problems they worked on. Both subjects did not use the correct language and sentences in generalizing, then the conclusions written were still inappropriate, and the answers still needed to be corrected. The following shows the answers of low-category subjects who fulfill indicator 4 in Figure 10 below.

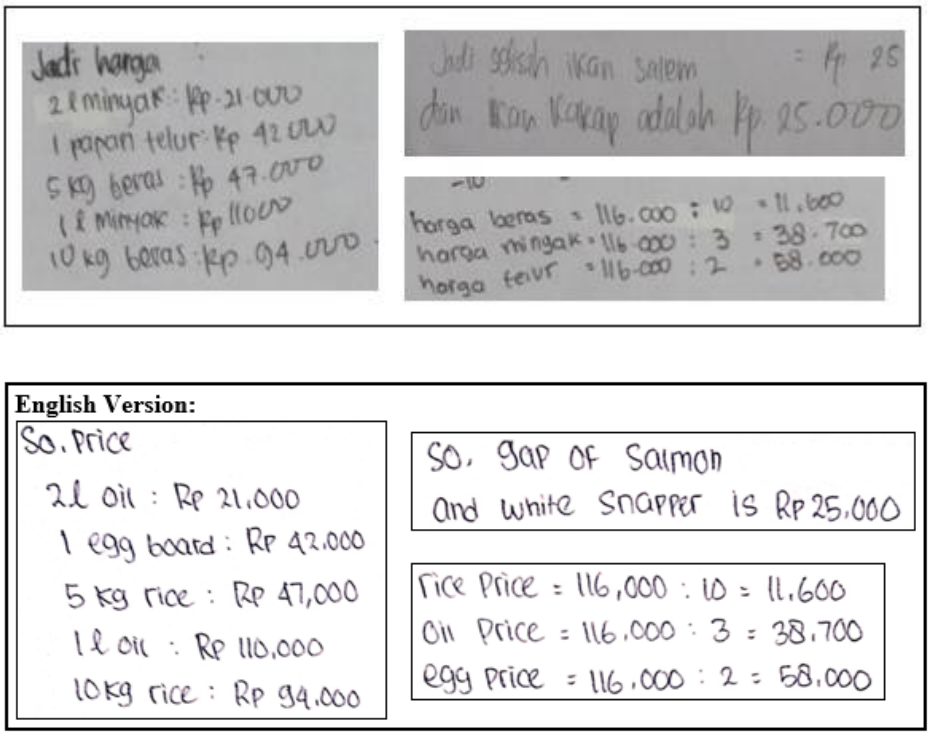


Figure 10. Indicator 4 answers of low category subjects

Based on the description above, there are differences between each subject. Subjects with high mathematical communication ability could solve problems by the indicators. In line with that, previous research also revealed that students with high mathematical communication categories had good results because they were by the indicators (Ikhsan et al., 2020). It's just that there are still difficulties in solving some problems, although the experienced challenges are only in the form of writing incomplete information.

Subjects with medium mathematical communication skills experienced difficulties, especially in linking information to mathematical ideas, composing solutions, and generalizing. As for the second indicator, namely, expressing information in mathematical symbols, the subject could do this. This aligns with a study that states that subjects with medium categories can explain mathematical ideas and characters (Linda & Afriansyah, 2022). However, in this study, the subject still needed help to link information to mathematical concepts or the first indicator. Subjects still write information that should be optional. In addition, there still needs to be complete information writing. In the third indicator, the subject's difficulty is composing ideas and formulas that must be used; the matter still needs to be corrected about the concepts used in solving the minimum competency assessment problems, especially in numbers, measurement, and geometry. In addition, matters need help to develop their ideas and memorize existing formulas. This

contradicts one study which states that the ability of students to convert mathematical problems into symbols and notations dramatically affects students' ability to solve mathematical problems (Rohid et al., 2019). As for subjects in the medium category, although they could express information in mathematical symbols, there was no influence on how they solved the problem. Then for the fourth indicator, the subject's difficulty is in generalizing or making conclusions; the subject needs help determining the appropriate sentence to write a conclusion. At the same time, they know that in making conclusions can see the information asked and the final answer. According to several studies, students have difficulties in solving mathematical communication ability problems because they have yet to understand the concepts and learning materials and have difficulty expressing their mathematical ideas (Triana et al., 2019; Wandari & Anggara, 2021). This is also in this study, where students in the medium category needed help writing information into mathematical ideas, composing solution ideas, and generalizing.

Subjects with low mathematical communication ability had difficulty in all indicators. This can be seen from the answers of students who only answered one or two minimum competency assessment questions from the four questions given. If students are not accustomed to conveying mathematical ideas from a problem, then students will experience difficulties in communicating mathematically (Sari et al., 2017). This can be seen after analyzing subjects in the low category, where each indicator of mathematical communication still has difficulties. In the first indicator, the problem experienced was a need for more understanding of the information provided, so the subject could not answer completely. Then for the second indicator, the difficulty experienced was that the subject could not explain the symbols or notations used to work on the problem. While in the third indicator, the difficulty experienced by the matter is not understanding the issues given, the concepts used in composing ideas still need to be corrected, and they tend to memorize formulas to solve problems. This is in line with research which states that the ability of students to convert mathematical problems into symbols and notations dramatically affects students' ability to solve mathematical problems (Rohid et al., 2019), where subjects with low categories in converting mathematical problems into symbols jeopardize the subject's problem-solving. In the fourth indicator, the difficulty experienced in generalizing is that the subject needs to use appropriate sentences in making conclusions. The mistakes made by low-category subjects begin when determining information into mathematical ideas and continue in solving problems until generalizing. Because if the initial process of solving

the problem experiences an error, it will impact the final result, which will also be wrong (Maulyda et al., 2020).

Based on the explanation above, it was found that subjects with high, medium, and low categories had different difficulties. The difficulties experienced occurred because the subjects still needed to be used to mathematical communication in solving minimum competency assessment problems. Students must familiarize themselves with mathematical communication, such as expressing mathematical ideas in writing (Sari et al., 2017), so difficulties in solving minimum competency assessment problems can also be anticipated. And the way to improve students' mathematical communication is by applying strategies, methods, and learning tools (Rusyda et al., 2020), especially in minimum competency assessment materials. So that students have become accustomed to numeracy literacy-based questions such as minimum competency assessment questions.

CONCLUSION

Based on the explanation above, it is found that the difficulty of students in solving minimum competency assessment questions in terms of mathematical communication skills shows the diversity of results from each subject. Therefore, the following conclusions can be drawn:

1. Students with high mathematical communication skills need help to solve minimum competency assessment problems only in compiling the solution idea. Sometimes students need to be corrected using the formula to solve the problem. The students need to be more careful in solving the problem causing the answers written still need to be completed. The subject can fulfill three out of four indicators and solve minimum competency assessment problems well.
2. The difficulties of students with medium mathematical communication skills in solving minimum competency assessment problems are in linking the information given into mathematical ideas, composing mathematical concepts, and generalizing. At the same time, subjects in the medium category have been able to express information in mathematical symbols or notations. Thus, in the medium variety, all minimum competency assessment questions given have difficulties in three indicators of mathematical communication skill compared to the high category, which can fulfill all indicators.
3. The difficulties of students who have low mathematical communication skills in solving minimum competency assessment problems cover all mathematical communication

indicators. The test links the given information into mathematical ideas, expresses information into mathematical symbols or notations, composes mathematical ideas, and generalizes. The difficulties experienced by the low category are almost the same as the medium category, but the error of solving concepts still appears in the low category. In addition, in the low-category subjects, minimum competency assessment problems were still not cracked or even not done.

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