MATHEMATICAL COMMUNICATION OF STUDENTS IN COMPLETING TVLES IN TERMS OF MATHEMATICAL ABILITY

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Abstrak

Pembelajaran matematika akan mencapai hasil yang memuaskan apabila dapat memenuhi semua standar pada proses pembelajarannya termasuk kemampuan komunikasi matematis. Komunikasi matematis merupakan suatu kemampuan dalam memahami permasalahan dengan memodelkannya ke dalam simbol matematika dan menjelaskan ide-ide matematika secara tertulis maupun lisan. Penelitian dengan metode kualitatif deskriptif ini bertujuan untuk mendeskripsikan kemampuan komunikasi matematis siswa yang berkemampuan matematika tinggi dan sedang di kelas X dalam menyelesaikan soal SPLTV. Teknik pengumpulan data menggunakan tes tertulis berupa soal cerita materi SPLTV dan wawancara sebagai data pendukung. Hasil penelitian menunjukkan bahwa siswa yang memiliki kemampuan matematika tinggi memenuhi semua indikator komunikasi matematis dengan benar, sedangkan siswa yang memiliki kemampuan matematika sedang memenuhi indikator komunikasi matematis dalam memahami inti permasalahan serta menyebutkan apa saja yang diketahui dan ditanya pada soal. Diharapkan guru mampu meningkatkan kemampuan komunikasi matematis siswa dengan menerapkan soal cerita yang jawabannya memiliki indikator komunikasi matematis agar siswa semakin dapat mengungkapkan ide-ide matematika baik secara tulisan maupun lisan dan mampu memenuhi semua indikator komunikasi matematis.

Kata Kunci: komunikasi matematis, SPLTV, kemampuan matematika.

Abstract

Mathematics learning will achieve satisfactory results if it can meet all standards in the learning process, including mathematical communication skills. Mathematical communication is an ability to understand problems by modeling them into mathematical symbols and explaining mathematical ideas in writing or orally. This research with descriptive qualitative method aims to describe the mathematical communication skills of students with high and moderate mathematical abilities in class X in solving TVLES questions. The data collection technique used a written test in the form of TVLES material story questions and interviews as supporting data. The results showed that students who had high mathematical ability fulfilled all indicators of mathematical communication correctly, while students who had moderate mathematical ability met the indicators of mathematical communication in understanding the core of the problem and mentioning what is known and asked in the question. It is hoped that the teacher will be able to improve students' mathematical communication skills by applying story questions whose answers have mathematical communication indicators so that students are increasingly able to express mathematical ideas both in writing and verbally and are able to fulfill all indicators of mathematical communication.

Keywords: mathematical communication, TVLES, mathematical ability.

INTRODUCTION

Mathematics is an essential language that is not only a tool for thinking, finding formulas to solve problems or concluding, but mathematics also has unlimited value in expressing various ideas clearly, thoroughly and precisely, both orally and in writing so that the information can be obtained. clearly communicated and understood by others (Aminah et al., 2018; Hendriana, Heris; Soemarmo, 2014). Communication is important in clarifying, reinforcing, modifying mathematical ideas, attitudes, and beliefs and constructing meaning when students are challenged to think and reason, and communicate ideas both in writing and orally (Alberta, 2007; Hirschfeld-Cotton, 2008).

Standard processes in mathematics learning, including problem solving, reasoning and proof,

communication, connection, and representation (NCTM, 2000). One of the goals of learning mathematics according to NCTM is learning to communicate in mathematics (mathematical communication) or commonly referred to as mathematical communication skills (Hodiyanto, 2017). NCTM (National Council of Teacher of Mathematics) recommends communication aspect competence as a fundamental that can be obtained in the mathematics learning process (Setiyawan et al., 2019). Based on the opinion of Choridah (2013), mathematical communication skills are very important to be raised so that students are actively involved in learning and eliminate students' thinking that mathematics is a difficult and scary subject.

Communication is a very important ability for students to have in learning mathematics, both elementary and middle school students are required to have good communication skills (Hendriana & Kadarisma, 2019). One of the causes of the low mathematical communication skills of students is because students are less able to communicate mathematical ideas in learning mathematics (Ariawan & Nufus, 2017). According to Baroody (Hendriana, 2014) there are five components of mathematical communication, namely representing, listening, reading, discussing, and writing.

Mathematical communication is a basic mathematical skill in mathematics and mathematics education that aims to express ideas, describe mathematical concepts clearly, and understand mathematical ideas such as the language of symbols, tables, diagrams or other media (Handayani et al., 2018; Hendriana, 2014). ; Lomibao et al., 2016). Mathematical communication is needed to communicate ideas or solve mathematical problems, both orally and in writing in mathematics learning or outside mathematics learning and involves rational justification, rules, procedural descriptions and clear statements (Prayitno et al., 2013; Yeubun et al., 2020).

Indicators of mathematical communication skills based on the NCTM (National Council of Teacher of Mathematics) cited by Ariawan & Nufus (2017) include: 1) Modeling situations using writing, either concretely, pictures, graphs, or algebraic methods; 2) Describe a mathematical idea or situation in writing; and 3) restating a mathematical description in their own language. There are several components of mathematical communication based on Azizah & Maulana (2015), namely (1) the ability to express mathematical ideas through oral, written, and explain them and describe them visually; (2) the ability to understand, interpret, and evaluate mathematical ideas both orally and in writing; (3) The ability to use terms, mathematical notations and structures to present ideas, describe relationships and model situations.

After observing the class X students at SMA Muhammadiyah 10 GKB Gresik, data were obtained, namely that there were students who had difficulty working on story questions on the TVLES (Three Variable Linear Equation System) material because they were still confused in interpreting the problems given to be converted into symbols. or mathematical drawings so as to prove that their mathematical communication skills are low. One of the materials in mathematics subjects that presents problems related to everyday life or commonly referred to as contextual problems, namely TVLES (Setiyawan et al., 2019). Researchers chose TVLES material because high school students in class X had obtained TVLES material and this material met the indicators to be studied so that the test instrument given could be analyzed for mathematical communication skills and based on research by Utami & Zukarnaen (2019) stated that students could not understand the questions in the form of questions. story so that it still needs to be emphasized in understanding math story problems, especially starting from converting questions into mathematical models to solving problems in a sequential and precise manner.

Low-ability students have not been able to find mathematical ideas in solving a problem and often have difficulty in interpreting a problem so that there are obstacles in carrying out calculations and have not been able to explain the results of their answers in a logical and coherent manner and cannot describe the situation in spoken or written form, pictures , diagrams, or other media and tend to take a long time to solve math problems (Himmah & Kurniasari, 2016; Lutfianannisak & Sholihah, 2018). Meanwhile, students with high and medium abilities (Men, 2017) can solve contextual math problems correctly because they have good categories in understanding problems, doing calculations, up to the stage of explaining and solving problems appropriately. Based on Zuhri (1998) and Nurman (2008) cited by (Anwar & Arsyad, 2019) stated that each student certainly has different abilities, especially in terms of mathematics, they will also have different mindsets, which means that mathematical abilities affect students' abilities in learning. solve a problem. Therefore, the researcher wants to know and describe students' mathematical communication based on high and medium mathematical abilities.

There are several studies that are relevant to this research. One of them is a study conducted by Lutfianannisak & Sholihah (2018) entitled "Students' Mathematical Communication Skills in Solving Functional Composition Matters in terms of Mathematical Ability". In this study, the material Composition of Functions used only one definite answer and the results showed that students with high, medium, and low

mathematics abilities only met 3 of the 4 components of the specified mathematical communication standards, while in this study there were various kinds of answers and the results showed that high-ability students meet all indicators of mathematical communication and moderate-ability students only meet one to two indicators. Another research relevant to this research is the research conducted by Kholil & Putra (2019) entitled "Students' Mathematical Communication Skills in Solving PISA Questions on Space And Shape Content". In this study, the results showed that students with high mathematics abilities almost fulfilled all indicators and students with moderate mathematics abilities only met three indicators, while in this study students with high mathematics abilities met all indicators and moderately capable students only met one to two indicators. And there is also research that is relevant to this research, namely the research conducted by Setiyawan et al. (2019) with the title "Analysis of Mathematical Communication Skills in Solving TVLES Problems (Three Variable Linear Equations System): Cases in Class X Social Studies High School Students". In this study only focused on high school students in class X Social Sciences who were distinguished based on very fluent, fluent, substandard communication skills and had one definite answer, while in this study there were various kinds of answers that made students think more broadly in completing and implementing their mathematical communication skills. and in terms of high and moderate mathematical abilities.

In this study, it will be investigated further about students' mathematical communication skills in solving TVLES story questions which are reviewed based on high and moderate mathematical abilities, where the answers to these questions have components of mathematical communication indicators that will be analyzed in this study and have various kinds of answers so that students can be more creative in answering and researchers can find out how the students' mathematical communication. Based on the explanation above, the purpose of this study is to describe the mathematical communication skills of class X high school students on TVLES material who have high mathematical abilities and moderate mathematical abilities.

METHOD

The method used in this research is descriptive qualitative. The procedures in this study include: 1) making research instruments; 2) instrument validation and testing; 3) data collection; 4) data analysis; and 5) report generation. The subjects of this study were students of class X SMA Muhammadiyah 10 Gresik which were determined by purposive sampling, which means that the subject-taking technique with a specific purpose in qualitative research

(Sugiyono, 2011), namely two students with high mathematics and two students with high mathematics skills with the aim of triangulation. Mathematical ability is the ability to think, reason, and use all the knowledge possessed in solving mathematical problems. The determination of the category of mathematical ability is based on the results of learning mathematics that have been obtained before TVLES from quiz scores, assignment scores, and daily tests. In addition, other considerations are based on students' willingness and input from mathematics teachers. The division of the category of mathematical ability also refers to the MMC (Minimum Completion Criteria) applicable at the school. Students' mathematical abilities are categorized into several levels (Men, 2017), as shown in Table 1 below.

Table 1. Math Skills Category

Score	Category
$85 \leq$ score ≤ 100	High Math Ability
$75 \leq$ score < 85	Moderate Math Ability

Source : Himmah & Kurniasari (2016)

The stages in analyzing the data in this study based Miles, et al., (2014) using triangulation analysis, namely data reduction (selecting data by eliminating unnecessary data), data presentation (presenting data based on test and interview results), and drawing conclusions (drawing conclusions from the data obtained based on the mathematical communication ability test and interviews in the form of a description of the mathematical communication of class X students who have high and moderate mathematical abilities). The instruments used in this study were written tests and interview guidelines. Written test in the form of word problem about TVLES material to determine mathematical communication skills which is named instrument 1 (MCT) in Figure 1. After the test is carried out, interviews are carried out to explore information that has not been revealed in students' answers and as reinforcement for students' reasons in answering questions from the test. that has been given in accordance with the need to obtain more in-depth data regarding students' mathematical communication skills. Figure 1 and Table 2 below are TVLES story questions and mathematical communication indicators used in this study.

At the bookstore "Sukses Jaya", Devi bought 4 books, 2 pens, and 3 pencils for IDR 26,000.00. Risa bought 3 books, 3 pens, and 1 pencil at a price of IDR 21,500. Firdha bought 3 books and 1 pencil at a price of IDR 12,500. If Rara brings IDR 50,000.00 and wants to buy all three, but with more books than the number of pens and pencils, then how many books, pens, and pencils will Rara get if she has to leave IDR 10,000

Figure 1. Mathematical Communication Test (MCT)

Table 2. Mathematical Communication Indicator

Mathematical Communication Standards	Mathematical Communication Indicator
Connecting real objects, pictures, and diagrams into mathematical ideas (A)	-Able to write and state what is known and asked on the question correctly (A1) -Able to understand the essence of the problem from the questions given (A2)
Explain mathematical ideas, situations or relations orally or in writing (B)	-Able to explain mathematical ideas, situations or relations orally and in writing in a coherent and correct manner (B1) -Able to explain the results of his work logically (B2)
Using mathematical terms, notations, or symbols based on their structure to present ideas (C)	-Able to describe problem situations and express them in the form of terms, notations, or mathematical symbols (C1) -Able to write and mention what mathematical terms, notations, or symbols are used (C2)
Draw conclusions orally and in writing (D)	-Able to answer the problem correctly according to the questions given (D1) -Able to write and restate the final conclusion correctly (D2)

Source : Kholil & Putra (2019)

RESULT AND DISCUSSION
Result

Research on mathematical communication with TVLES story problems in class X of Muhammadiyah High School 10 GKB Gresik with students with high mathematics (Subjects R and Z) and students with moderate math skills (Subjects S and V). Subjects are selected based on the results of math learning and the results of interviews with math teachers, as in table 3 below.

Table 3. Mathematics Learning Outcomes of 4 Subjects

Subjects	Score	Category
R	94	High
Z	90	High
S	83	Moderate
V	78	Moderate

Answer Results of Students with High Mathematics Ability

Subject R

The results of the answers from Subject R are as shown in Figure 2 below.
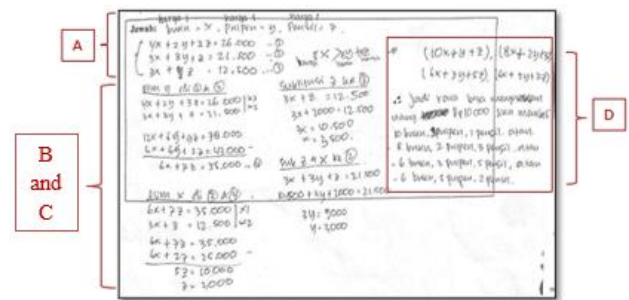

Figure 2. Result of Subject R's answer

Next, an interview was conducted with R related to the mathematical communication standard part A as follows.

P   : *Have you ever seen or worked on questions like MCT before? If ever, when?*

R1   : *Ever, while attending the Olympics during junior high school.*

P   : *What do you know and ask about the question?*

R2   : *In the question, it was known that there were three people who were buying goods with different details, then the question was how many books, pens, and pencils Rara got for a total of IDR 40,000 and the condition was that the number of books had to be more.*

P   : *What is the essence of the problem?*

R3   : *In essence, Rara wants to buy books, pens, and pencils with more books but has to leave IDR 10,000, so the total must be IDR 40,000.*

P   : *What mathematics material do you think is appropriate to solve this problem? and explain why?*

R4   : *TVLES, because it is known to three people and there are three items, it is the same as the general concept and form of TVLES that has been taught.*

Based on the results of subject R's answer in Figure 2 and the results of the interview, information was obtained that R could mention what was known and asked (R2) on the MCT question according to the A1 indicator. Subject R was also able to understand the essence of the problems given (R3 and R4) according to the A2 indicator, and had encountered questions (R1) such as MCT so that it was easier to interpret. This result fulfills the indicator stated by Kholil & Putra (2019) that students are able to understand the problem and can write and mention what is known and asked in the question.

Furthermore, the results of the interview with R are presented to find out mathematical communication in part B, which is to explain ideas, situations or mathematical relations orally or in writing to the problem of MCT as follows.

P   : *What strategy did you use to solve the MCT questions?*

R5   : *I used the TVLES concept to solve it.*

P   : *Why did you use that strategy?*

R6   : *Because from the problem it is known that there are three people and three things so I think that it is the same as three equations and three variables.*

P   : *Explain the steps you have taken!*

R7   : *First, I assume the price of 1 book with x, the price of 1 pen with y, and the price of 1 pencil with z. Then, make the equation and start*

calculating using the TVLES concept, starting with y elimination and getting a new equation. Next, eliminate again from the new equation with other equations so that the z value is obtained and do the same steps until the y and z values are obtained. After that, try the calculation starting from 10 books because in the question it is known that the condition is that the number of books must be more. Therefore, my first focus will be on the number of books and for the rest, just adjust the calculations.

Based on the results of subject R's answers in Figure 2 and the results of interviews, information was obtained that R was able to explain mathematical ideas, situations or relations verbally and in writing in a sequential and correct manner (R5, R6, and R7) in accordance with indicator B1 and was able to explain the results of his work. logically (R7) according to indicator B2. This result fulfills the indicator stated by Kholil & Putra (2019) that students are able to explain mathematical ideas both orally and in writing.

In the mathematical communication standard section C, which uses terms, notations, or mathematical symbols based on their structure to present ideas on MCT problems, the results of interviews with R are as follows.

P   : *How do you determine the first step to solving MCT questions?*

R8   : *By assuming the three items into symbols x, y, z to make it easier as has been taught through TVLES learning and look for the value or price of each item first.*

P   : *In your opinion, is there any other way to solve it?*

R9   : *Yes, because it has been explained that there are many methods of solving TVLES, not only elimination-substitutions but also using the matrix concept.*

Based on the results of subject R's answer in Figure 2 and the results of the interview, it was obtained information that R was able to describe the problem situation and stated it in the form of terms, notations, or mathematical symbols (R8 and Figure 2 parts B and C) in accordance with the C1 indicator and was able to write and state what mathematical terms, notations, or symbols are used (R8, R9 and Figure 2 parts B and C) according to indicator C2. This result fulfills the indicator stated by Kholil & Putra (2019) that students are able to describe problem situations and express them in the form of mathematical symbols.

In the mathematical communication standard section D, namely drawing conclusions orally and in writing on the MCT problem, the results of interviews with R are as follows.

P   : *What conclusion have you reached?*

R10 : There are four answers, namely Rara can leave IDR 10,000 by buying: 1) 10 books, 1 pen, 1 pencil; 2) 8 books, 2 pens, 3 pencils; 3) 6 books, 3 pens, 5 pencils; 4) 6 books, 5 pens, 2 pencils..

P : Are you sure that the conclusions you give have answered the problem? Why?

R11 : Yes, already answered. Because I have researched again and the four possibilities fulfill all.

Based on the results of subject R's answer in Figure 2 and the results of the interview, it was obtained information that R was able to answer the problem correctly according to the questions given (R10 and Figure 2 part D) and according to the D1 indicator and was able to write and re-express the final conclusion correctly (R11 and Figure 2 part D) correspond to indicator D2. This result fulfills the indicator stated by Kholil & Putra (2019) that students are able to answer the problem correctly and are able to restate the final conclusion.

Subject Z

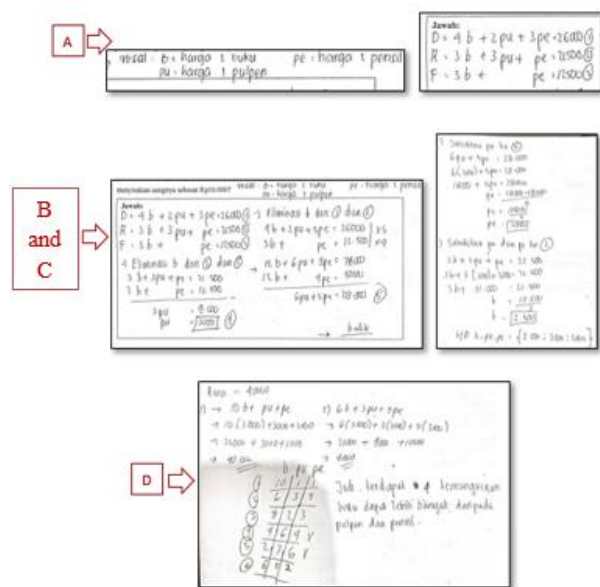The results of the answers from Subject Z are as shown in Figure 3 below.

Figure 3. Result of Subject Z's answer

Next, an interview with Z related to the mathematical communication standard part A was conducted as follows.

P : Have you ever seen or worked on questions like MCT before? If ever, when?

Z1 : Once, when I was in middle school, I took part in the Olympics.

P : What do you know and ask about the question?

Z2 : It is known that Devi bought 4 books, 2 pens, and 3 pencils for a total of IDR 26,000, Risa bought 3 books, 3 pens, and 1 pencil for IDR 21,500 and Firdha bought 3 books and 1 pencil for a total of IDR 12,500. Then, what was asked if Rara had Rp 50,000 in cash would like to buy books, pens, pencils on the condition that there were more books but the remaining IDR 10,000 had to be left.

P : What is the essence of the problem?

Z3 : Rara has to buy books, pens, pencils for a total of IDR 40,000 and the number of books must be more.

P : What mathematics material do you think is appropriate to solve this problem? and explain why?

Z4 : TVLES, because there are three items and three people so I conclude the same as the TVLES material.

Based on the results of subject Z's answer in Figure 3 and the results of the interview, information was obtained that Z could mention what was known and asked (Z2) on the MCT question according to the A1 indicator. Subject Z was also able to understand the essence of the problems given (Z3 and Z4) according to the indicators A2 and Z. He had also encountered questions (Z1) such as MCT in the Olympics so that it was easier to understand. This result fulfills the indicator stated by Kholil & Putra (2019) that students are able to understand the problem and can write and mention what is known and asked in the question.

Furthermore, the results of interviews to determine mathematical communication B are explained, namely explaining ideas, situations or mathematical relations orally or in writing to MCT problems as follows.

P : What strategy do you use to solve MCT questions?

Z5 : The strategy is to use TVLES by means of elimination and substitution to work on the problem.

P : Why did you use this strategy?

Z6 : Because it is known that there are three items and three people, so it is the same as TVLES which has three equations and three variables.

P : Explain the steps you have taken!

Z7 : For example, if the book is ma'am, the pen is pu, the pencil is pe, then list each person by converting it into the form of equations 1,2,3. Next, eliminate b from equations 2 and 3 to obtain the value of pu. Eliminate b again from equations 1 and 3 to find a new equation. After that substitution until finally obtained the value of pe and b. To calculate Rara's, a table was created starting from entering the largest number in the book column because according to the condition, there must be

more books, after that the others just adjusted the calculations or tried it out.

Based on the results of subject Z's answers in Figure 3 and the results of the interviews, information was obtained that Z was able to explain mathematical ideas, situations or relations verbally and in writing in a coherent and correct manner (Z5, Z6, and Z7) in accordance with indicator B1 and was able to explain the results of his work. logically (Z7) corresponds to indicator B2. This result fulfills the indicator stated by Kholil & Putra (2019) that students are able to explain mathematical ideas both orally and in writing.

In the mathematical communication standard part C, which uses terms, notations, or mathematical symbols based on their structure to present ideas on MCT problems, the results of interviews with Z are as follows.

P : *How do you determine the first step to solving MCT questions?*

Z8 : *Suppose it used to be for books, pencils, pens. Then, make the equation 1,2,3 to make it easier to do it and then just do the elimination of substitutions.*

P : *In your opinion, is there any other way to solve it?*

Z9 : *It seems to exist, having been told that the method of completion of TVLES is not onlyelimination and substitution, there is also by way of matrix and others.*

Based on the results of subject Z's answer in Figure 3 and the results of the interview, information was obtained that Z was able to describe the problem situation and stated it in the form of terms, notations, or mathematical symbols (Z8 and Figure 3 parts B and C) in accordance with the C1 indicator and was able to write and state what mathematical terms, notations, or symbols are used (Z8, Z9, and Figure 3 parts B and C) according to indicator C2. This result fulfills the indicator stated by Kholil & Putra (2019) that students are able to describe problem situations and express them in the form of mathematical symbols.

In the mathematical communication standard section D, which is drawing conclusions orally and in writing on MCT problems, the results of interviews with Z are as follows.

P : *What conclusion have you reached?*

Z10 : *There are four possibilities that books can be purchased more than pens and pencils, namely: 1) 10 books, 1 pen, 1 pencil; 2) 6 books, 3 pens, 5 pencils; 3) 8 books, 2 pens, 3 pencils; 4) 6 books, 5 pens, 2 pencils.*

P : *Are you sure that the conclusions you give have answered the problem? Why?*

Z11 : *yes, I've answered. Since I have recalculated from the six possibilities I tried, there are only*

four who qualify if the total must be IDR 40,000.

Based on the results of subject Z's answer in Figure 3 and the results of the interview, information was obtained that Z was able to answer the problem correctly according to the questions given (Z10 and Figure 3 part D) and according to the D1 indicator and was able to write and rephrase the final conclusion correctly (Z11 and Figure 3 part D) correspond to indicator D2. This result fulfills the indicator stated by Kholil & Putra (2019) that students are able to answer the problem correctly and are able to restate the final conclusion.

Answer Results of Students with Moderate Mathematics Ability

Subject S

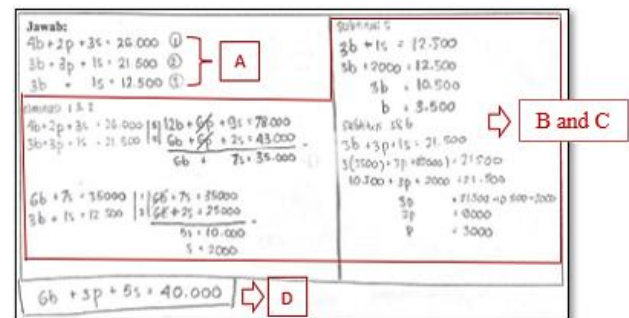The results of the answers from Subject S are as shown in Figure 4 below.

Figure 4. Result of Subject S's answer

Next, an interview was conducted with S related to the mathematical communication standard part A as follows.

P : *Have you ever seen or worked on questions like MCT before? If ever, when??*

S1 : *Never, it's a first.*

P : *What do you know and ask about the question?*

S2 : *It is known that there were three people who bought different items at the Sukses Jaya Store, then the question was if Rara bought more books than pens and pencils for shich she had to keep IDR 10,000.*

P : *What is the essence of the problem?*

S3 : *The number of books that Rara bought must be more than pens and pencils wit a total of IDR 40,000 not more or less.*

P : *What mathematics material do you think is appropriate to solve this problem? and explain why?*

S4 : *TVLES, because there are these three items.*

Based on the results of subject S' answers in Figure 4 and the results of the interviews, information was

obtained that S could mention what was known and asked (S2) on the MCT questions according to the A1 indicator. Subject S is also able to understand the essence of the problems given (S3 and S4) according to the A2 indicator. This result fulfills the indicator stated by Kholil & Putra (2019) that students are able to understand the problem and can write and mention what is known and asked in the question.

Furthermore, the results of interviews to determine mathematical communication B are explained, namely explaining ideas, situations or mathematical relations orally or in writing to MCT problems as follows.

P : *What strategy do you use to solve MCT questions?*
S5 : *Using TVLES.*
P : *Why did you use this strategy?*
S6 : *Because there are three items and three people*
P : *Explain the steps you have taken!*
S7 : *The first one is eliminated 1 and 2, then eliminated again. After that it is substituted until finally the value of each item is obtained. Then immediately try to calculate how much are the remaining 6 books so that you can buy pens and pencils, the important thing is that the total must be IDR 40,000.*

Based on the results of subject S' answers in Figure 4 and the results of interviews, information was obtained that S was able to explain mathematical ideas, situations or relations correctly (Figure 4 parts B and C) but was unable to explain verbally in sequence (S5 and S6) according to indicator B1 and less able to explain the results of his work in a logical and detailed manner (S7) in accordance with indicator B2. The results of the completion and answers based on interviews that have been conducted are in line with the research of Setiyawan et al. (2019) which states that students have not been able to explain mathematical ideas verbally and logically.

In the mathematical communication standard section C, which uses terms, notations, or mathematical symbols based on their structure to present ideas on MCT problems, the results of interviews with S are as follows.

P : *How do you determine the first step to solving MCT questions?*
S8 : *Write down the details of the items that each person buys like: Devi = 4b + 2p + 3s = 26,000 and so on. Then use elimination and substitution.*
P : *In your opinion, is there any other way to solve it?*
S9 : *There is no.*

Based on the results of subject S's answer in Figure 4 and the results of the interview, information was obtained that S was able to describe the problem situation

and stated it in the form of terms, notations, or mathematical symbols (S8 and Figure 4 parts B and C) according to the C1 indicator but still lacking in detail. because it does not show the meaning of each symbol b, p, s. Subject S also did not write down and mention what terms, notations, or mathematical symbols were used according to the C2 indicator. These results are in accordance with the research of Kholil & Putra (2019) and Lutfianannisak & Sholihah (2018) which states that students have not been able to describe problem situations in the form of mathematical symbols in detail.

In the mathematical communication standard section D, which is drawing conclusions orally or in writing on MCT problems, the results of interviews with S are as follows.

P : *What conclusion have you reached?*
S10 : *So, Rara can buy 6 books, 3 pens, and 5 pencils for IDR 40,000*
P : *Are you sure that the conclusions you give have answered the problem? Why?*
S11 : *Yes, I'm sure I've answered it. Because the total of 6 books, 3 pens, and 5 pencils is IDR 40,000.*

Based on the results of subject S's answer in Figure 3 and the results of the interview, it was obtained information that S was able to answer the problem correctly according to the questions given (S10) and according to the D1 indicator but the answer given was only one. Subject S also only wrote down but did not reiterate the final conclusion clearly (S10, S11 and Figure 4 part D) according to indicator D2. This is in accordance with the research of Kholil & Putra (2019) which states that moderately capable students are only able to write conclusions and do not reveal the final conclusions clearly.

Subject V

The results of the answers from Subject V are as shown in Figure 5 below.
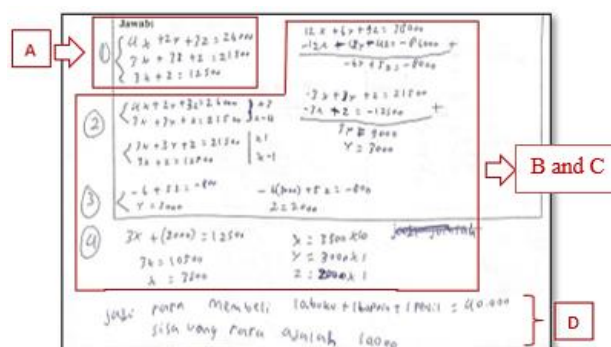

Figure 5. Result of Subject V's Answer

Next, an interview was conducted with V regarding the mathematical communication standard part A as follows.

P : *Have you ever seen or worked on questions like MCT before? If ever, when??*

V1 : *Never.*

P : *What do you know and ask about the question?*

V2 : *It is known that three people bought books, pens, pencils and they were asked how many books, pens and pencils Rara would get with the number of books more than the two if she had to leave IDR 10,000 in cash.*

P : *What is the essence of the problem?*

V3 : *Rara had to buy all three for a total of IDR 40,000 and the number of books had to be more than the number of pens and pencils.*

P : *What mathematics material do you think is appropriate to solve this problem? and explain why?*

V4 : *TVLES, because there are three items.*

Based on the results of subject V's answer in Figure 5 and the results of the interview, information was obtained that V could mention what was known and asked (S2) on the MCT question according to the A1 mathematical communication indicator but was not detailed. Subject V is also able to understand the essence of the problems given (S3 and S4) according to the A2 indicator. These results are in line with the research of Kholil & Putra (2019) which states that students are able to understand the problem and can write and mention what is known and asked in the matter.

Furthermore, the results of interviews to determine mathematical communication B are explained, namely explaining ideas, situations or mathematical relations orally or in writing to MCT problems as follows.

P : *What strategy do you use to solve MCT questions?*

V5 : *The strategy I use is elimination and substitution.*

P : *Why did you use this strategy?*

V6 : *Because it is known that there are three equations.*

P : *Explain the steps you have taken!*

V7 : *First, look for the values of x, y, z and then if all values are obtained, then try to calculate if 10 books are the results, and the rest adjust the prices of pens and pencils. And the results obtained are 10 books, 1 pen, and 1 pencil for a total of IDR 40,000 because they are asked to have the rest of the money IDR 10,000.*

Based on the results of subject V's answer in Figure 5 and the results of the interview, it was obtained information that V was able to explain mathematical ideas, situations or relations correctly (Figure 5 parts B and C)

but was unable to explain verbally in sequence (V5 and V6) according to indicator B1 and less able to explain the results of his work in a logical and detailed manner (V7) in accordance with indicator B2. The results of the completion and answers based on interviews that have been conducted are in line with the research of Setiyawan et al. (2019) which states that students have not been able to explain mathematical ideas verbally and logically.

In the mathematical communication standard section C, which uses terms, notations, or mathematical symbols based on their structure to present ideas on MCT problems, the results of interviews with S are as follows.

P : *How do you determine the first step to solving MCT questions?*

V8 : *Make an equation for each person, then calculate and obtain the values of x, y, and z.*

P : *In your opinion, is there any other way to solve it?*

V9 : *There is no.*

Based on the results of subject V's answer in Figure 5 and the results of the interview, information was obtained that V was able to describe the problem situation and stated it in the form of terms, notations, or mathematical symbols (V8 and Figure 5 parts B and C) according to the C1 indicator but still lacking in detail. because it does not show the meaning of each symbol x, y, z. Subject V also did not write down and mention what terms, notations, or mathematical symbols were used according to the C2 indicator. These results are in accordance with the research of Kholil & Putra (2019) and Lutfianannisak & Sholihah (2018) which states that students have not been able to describe problem situations in the form of mathematical symbols in detail.

In the mathematical communication standard section D, namely drawing conclusions orally and in writing on MCT problems, the results of interviews with V are as follows.

P : *What conclusion have you reached?*

V10 : *Rara can buy 10 books, 1 pen, and 1 pencil for IDR 40,000*

P : *Are you sure that the conclusions you give have answered the problem? Why?*

V11 : *Yes, I'm sure because a total of 10 books, 1 pen, 1 pencil is IDR 40,000 and according to the requirements the number of books must be more than pens and pencils.*

Based on the results of subject V's answer in Figure 5 and the results of the interview, information was obtained that V was able to answer the problem correctly according to the questions given (V10) and according to the D1 indicator, but there was only one answer given. Subject V only wrote but did not restate the final conclusion in detail (V10, V11, and Figure 5 part D) according to indicator D2. This is in accordance with the

research of Kholil & Putra (2019) which states that moderately capable students are only able to write conclusions and do not reveal the final conclusions clearly.

Discussion

In the mathematical communication standard part A, which is connecting real objects, pictures, and diagrams into mathematical ideas, information is obtained based on the answers and results from interviews with subjects R, Z, S, and V that R and Z had previously seen and worked on such problems. MCT when they were participating in the Olympics at the junior high school level, while S and V had never encountered questions like MCT before. R, Z, S, and V in this part A mathematical communication standard can all meet the indicators A1 and A2, namely being able to write and state what is known and asked in the questions correctly (R2, Z2, S2, and V2), as in In the matter, it was known that there were three people who were buying goods with different details, then the question was how many books, pens, and pencils Rara got for a total of IDR 40,000 and the condition was that the number of books had to be more. R, Z, S, and V are also able to understand the core problems of the questions given (R3, Z3, S3, and V3). This is in line with research (Isroil et al., 2017; Setiyawan et al., 2019) which states that students with high and moderate math abilities have good mathematical communication skills in connecting real objects, pictures, and diagrams into mathematical ideas.

In the mathematical communication standard part B, which is to explain mathematical ideas, situations or relations orally or in writing, information is obtained based on the results of student answers and the results of interviews with subjects R, Z, S, and V that R and D are able to explain ideas, situations or relationships mathematics both orally and in writing in a coherent and correct manner (R5, R6, R7, Z5, Z6, Z7, Figure 2 parts B and C, and Figure 3 parts B and C) according to indicator B1 and explain the results of their work logically (R7 and Z7), while subjects S and V were able to explain written mathematical ideas, situations or relations correctly (Figure 4 parts B and C and Figure 5 parts B and C) but were less able to explain verbally in sequence (S5, S6, V5, and V6) and logically (S7 and V7) according to indicators B1 and B2. This is in line with the research of Sugiarto & Budiarto (2014) which shows that students with high mathematical abilities meet the indicators of mathematical communication skills in explaining mathematical ideas, situations or relations both orally and in writing in a coherent and correct manner and able to explain the results of their work logically, while students with moderate mathematical ability are only able to explain mathematical ideas, situations or relations in writing correctly and are still unable to explain their work orally.

In the mathematical communication standard section C, which uses mathematical terms, notations, or symbols based on their structure to present ideas, information is obtained based on the results of student answers and results from interviews with subjects R, Z, S, and V that R and Z are able to describe problem situations and state it in the form of terms, notations, or mathematical symbols (R8, Figure 2 parts B and C, Z8, and Figure 3 parts B and C) according to indicator C1 and be able to write and state what mathematical terms, notations, or symbols are used (R8 , R9, Figure 2 parts B and C, Z8, Z9, Figure 3 parts B and C) according to indicator C2. Meanwhile, S and V are able to describe the problem situation and express it in the form of terms, notations, or mathematical symbols (S8, Figure 4 parts B and C, V8, and Figure 5 parts B and C) according to indicator C1 but are still lacking in detail because they are not shown. the meaning of each symbol b, p, s which is used to assume a problem. These results are in line with the research by Lutfiananissak & Sholihah (2018) which states that students with moderate abilities, namely Subjects S and V do not write and verbally mention what terms, notations, or mathematical symbols are used according to the C2 indicator.

In the mathematical communication standard section D, namely drawing conclusions orally and in writing, information is obtained based on the answers and results of interviews with subjects R, Z, S, and V that R and Z are able to answer the problem correctly according to the questions given (R10, Figure 2 section). D, Z10, and Figure 3 part D) according to the D1 indicator and able to write and rephrase the final conclusion both verbally and in writing clearly (R11, Figure 2 part D, Z11, and Figure 3 part D) according to the D2 indicator. While S and V only met the D1 indicator, namely answering the problem correctly according to the questions given (S10 and V10) but did not express the final conclusion clearly verbally (S10, S11, Figure 4 section D, V10, V11, and Figure 5 section D) according to indicator D2. The difference is that R and Z can find the solution (Figure 2 section D and Figure 3 section D) with various answers while S and V only get one answer (Figure 4 section D and Figure 5 section D) even though they both answered with the same results. different. This is consistent with research (Kholil & Putra, 2019; Lutfiananissak & Sholihah, 2018; Setiyawan et al., 2019).

The following table presents the results and discussion based on MCT questions and interviews.

Table 4. Result and Discussion of MCT and Interviewe questions

Mathematical Communication Indicator	High Mathematical Ability		Moderate Mathematical Ability	
	Subject R	Subject Z	Subject S	Subject V
-Write and state what is known and asked on the question correctly (A1) -Able to understand the essence of the problem from the questions given (A2)	Fulfil A1 and A2	Fulfil A1 and A2	Fulfil A1 and A2	Fulfil A1 and A2
-Explain mathematical ideas, situations or relations orally and in writing in a coherent and correct manner (B1) -Explain the results of his work logically (B2)	Fulfil B1 and B2	Fulfil B1 and B2	Only fulfill B1 in writing and does not fulfill B2	Only fulfill B1 in writing and does not fulfill B2
-Able to describe problem situations and express them in the form of terms, notations, or mathematical symbols (C1) -Write and mention what mathematical terms, notations, or symbols are used (C2)	Fulfil C1 and C2	Fulfil C1 and C2	Does not fulfill C1 and C2	Does not fulfill C1 and C2
-Able to answer the problem correctly according to the questions given (D1) -Write and restate the final	Fulfil D1 and D2	Fulfil D1 and D2	Only fulfill D1 and does not fulfill D2	Only fulfill D1 and does not fulfill D2
conclusion correctly (D2)				

CONCLUSION

Conclusions

Based on the results of research and discussion, it can be concluded that students who have high mathematical abilities can meet all standards and indicators of mathematical communication in solving problems in the form of story questions. Meanwhile, for students who have the ability to complete mathematics only meet mathematical communication indicators, among them, the student is able to understand the core of the problem correctly and are able to mention what is known and asked about the problem but are less able to describe the problem situation and express it in the form of terms, notations, or symbols. mathematics verbally in detail, such as not showing the meaning of each symbol written on the answer and only being able to write the final answer, not expressing the final conclusion verbally clearly according to the mathematical communication indicators in this study.

Suggestions

Thus, it is expected for teachers to provide problems or story questions whose answers have mathematical communication indicators so that students can be more accustomed to working on such questions and are able to express mathematical ideas both in writing and orally so that they can have better mathematical communication skills and are needed. further research related to improving mathematical communication skills.

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