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ANALYSIS OF STUDENTS' MATHEMATICAL COMMUNICATION SKILLS REVIEWED FROM MATHEMATICS LEARNING INTERESTS IN TWO-VARIABLE LINEAR INEQUALITY SYSTEM MATERIAL

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Abstract

This study aims to describe and analyze students' mathematical communication skills reviewed from learning interests in the material of the Two-Variable Linear Inequality System (SPtLDV). This study uses a qualitative descriptive approach. The research subjects were students in class X of SMAN 94 Jakarta who were selected using the purposive sampling technique, namely one student each with a high, medium, and low learning interest category. The instruments used included a learning interest questionnaire, a mathematical communication ability test, and a semi-structured interview. The results showed that students with high learning interest tended to have the same mathematical communication skills as students with moderate learning interests. Both are only able to meet two, namely the first and second indicators. In the third indicator, errors often occur so that students with high interest in learning and students with moderate interest in learning have quite good mathematical communication skills. Meanwhile, students who have low interest in learning tend to barely meet all indicators. Students cannot work until completion and even blank answers showing improper mathematical communication skills. Therefore, efforts are needed to increase learning interest to support students' mathematical communication skills.

Keywords: Mathematical Communication, Learning Interest, Two-Variable Linear Inequality System

INTRODUCTION

Mathematics has an important role in the world of education for the development of science (Amelia et al., 2025; Harianto & Sudatha, 2023; Nuraini et al., 2022). Mathematics is taught from elementary school onward. It aims to equip students with problem-solving, critical, and analytical thinking skills (Husan et al., 2023). According to the National Council of Teachers of Mathematics (NCTM, 2000) revealing that one of the standards in mathematics learning has mathematical communication skills. This ability needs to be possessed by students in order to be able to convey ideas orally and writing (Hodiyanto, 2017; Oktavia et al., 2025). It can help students to convey ideas and exchange thoughts in order to develop their understanding (Afifah et al., 2022; Handayani, 2021). In addition, this ability is also necessary in using symbols, pictures, graphs and algebra to solve mathematical problems (Muliani et al., 2023). Having good mathematical communication skills, it will help students to understand learning and solve mathematical problems (Na'im & Mukhlis, 2024; Tupamahu et al., 2023).

One of the aspects that affects mathematical communication skills is interest in learning (Sholihat et al., 2021). Learning interest in learning mathematics has an important role to help students develop and understand mathematical concepts (Adawiyah et al., 2022; Hidayati & Munandar, 2023). Interest in learning is a great willingness to the mind and attention to fulfill knowledge and achieve an understanding of the scientific curiosity it demands (Ndraha et al., 2022). Students who carry out activities with a feeling of interest in participating in the learning process

without encouragement from others are interested in learning (Ismawati et al., 2025; Sucipto & Firmansyah, 2021). However, not all students have a good interest in learning mathematics (Putri & Safrizal, 2023). Learning mathematics is considered difficult and scary so that it is less in demand by students, especially when the level becomes higher (Sucipto & Firmansyah, 2021).

The System of Linear Inequalities in Two Variables (SPtLDV) is a subject in the mathematics curriculum for X grade high school students. This material requires a good understanding of concepts (Jannah et al., 2025). Students are faced with contextual problems and use information to compile mathematical models as a step to determine a set of solutions in concluding mathematical problems (Lestari & Azis, 2025). However, many students find it difficult and make mistakes to complete the SPtLDV material (Muchsin et al., 2019; Siregar et al., 2024). This difficulty can be seen from errors that often occur such as the use of incorrect formulas, errors in interpreting the symbols of inequality and errors in the calculation and conversion of units (Sofa & Prabawanto, 2023).

Several studies have examined mathematical communication skills and learning interests. Mathematical communication skills based on learning styles show that only the auditory learning style meets all indicators of mathematical communication skills with HOTS-based questions (Amany et al., 2024). As for mathematical communication skills based on high, medium, and low confidence, they meet the written text indicators (Afifah et al., 2022). Furthermore, there are variations in written and oral mathematical communication skills in trigonometry material based on learning interests (Faradillah & Pratama, 2022). Written mathematical communication skills in linear equations with two variables in eighth grade junior high school differ according to learning styles, indicating that interpersonal learning styles are more effective (Pratiwi et al., 2019).

Based on the results of several previous studies, most studies have not linked mathematical communication skills and learning interests. The previous study linked mathematical communication skills to learning interests but had not been studied in SPtLDV. In addition, researchers linked mathematical communication skills to the Junior High School material of the Two-Variable Linear Equation System (SPLDV). Therefore, there has been no research that links mathematical communication skills with interest in learning high school material in SPtLDV. Thus, researchers are interested in studying students' mathematical communication skills based on learning interests in the Two-Variable Linear Inequality System (SPtLDV).

METHOD

A qualitative descriptive approach was used in this study. Qualitative descriptive obtains descriptions to find, understand and describe based on the experience of the research subject (Ferrah et al., 2023). The purpose of this study is to describe and analyze mathematical communication skills based on students' learning interests in solving problems of the Two-Variable Linear Inequality System (SPtLDV). This research was conducted at SMAN 94 Jakarta in March. The population in this study is all students of class X of SMAN 94 Jakarta even semester in the 2025/2026 school year with two research sample subjects in two classes.

The researcher determined the subjects using a modified learning interest questionnaire from the research Rahmawati et al. (2019). The researcher modified the questionnaire with the aim of adapting the needs of the researcher to the interest in learning mathematics. The questionnaire has been validated by experts, namely one mathematics education lecturer and one mathematics teacher. The researcher also conducted a trial on 193 grade X students from different schools against the research subjects who showed that all questionnaires were valid using the Alpha Cronbach formula with a coefficient of 0.877 using Microsoft Excel Office 2021. This shows the questionnaire is reliable (Ramadhani & Habibi, 2024). The indicators of interest in learning mathematics are; (1) feelings of pleasure, (2) student interest, (3) involvement in learning, (4) diligent and consistent in

doing assignments, (5) diligent, disciplined, and having a study schedule. Each indicator has positive and negative statements.

In this study, the purposive sampling in sample selection. Purposive sampling selecting samples deliberately based on relevance to the researcher's objectives (Tajik et al., 2024). Researchers selected three students based on learning interest to be interviewed by classifying one student with high learning interest, one student with moderate learning interest and one student with low learning interest. The object of this study is in the form of student answer sheets and questionnaire results that have been filled. The mathematical communication ability test was carried out using a description test with a total of three questions on the Two-Variable Linear Inequality System compiled by the researcher. This test has been validated by experts, one mathematics education lecturer and one mathematics teacher. The researcher conducted a preliminary trial on 194 grade X students from different schools against the research subjects who showed that all tests were valid using the Alpha Cronbach formula with a coefficient of 0.796 using Microsoft Excel Office 2021. This shows that the test is reliable (Ramadhani & Habibi, 2024).

The mathematical communication ability test is carried out to measure students' mathematical communication skills based on the lessons learned. Each question given has been adjusted to the following indicators and scoring guidelines for mathematical communication skills.

Table 1. Indicators and Guidelines for Scoring Mathematical Communication Skills

Indicator	Description	Score
(Drawing) Presenting a picture or diagram into a mathematical idea.	No answer	0
	Students are able to write important statements but the explanation is incomplete and incorrect	1
	Students are able to write important statements in full but are not yet correct	2
	Students are able to write important statements correctly but incomplete	3
	Students are able to write important statements completely and correctly	4
(Expression) To express a situation into language or mathematical symbols.	No answer	0
	Students are able to do calculations using mathematical symbols but are incomplete and incorrect	1
	Students are able to do calculations using mathematical symbols completely but not yet correctly	2
	Students are able to do calculations using mathematical symbols correctly but are incomplete	3
	Students are able to do calculations using mathematical symbols completely and correctly	4
(*Written Text*) Draw and explain the situation of the idea in writing.	No answer	0
	Students are able to draw graphs but are incomplete and incorrect	1
	Students are able to draw complete graphics but are not yet good	2
	Students are able to draw charts correctly but are incomplete	3
	Students are able to draw graphs completely and correctly	4

Sources: Tiffany et al. (2017)

In its development, indicators of mathematical communication skills in the form of drawing, expression, and written text were analyzed and became indicators in the latest research by Oktavia et al. (2022). The above indicators have been adjusted to the following mathematical communication ability tests.

Seorang ibu rumah tangga mempunyai 1,6 kg tepung beras dan 2,4 kg tepung terigu. Ibu ingin membuat kue jenis A dan B. Untuk setiap loyang kue A dibutuhkan tepung beras sebanyak sepersepuluh $gram$ dari persediaan tepung beras yang ada dan seperduabelas $gram$ dari persediaan tepung terigu. Untuk setiap loyang kue B dibutuhkan tepung beras sebanyak tiga per empat dari kebutuhan tepung beras kue A dan tepung terigu sebanyak satu setengah kali kebutuhan tepung terigu kue A. Ibu hendak membuat lebih dari 2 loyang kue A dan sekurang-kurangnya satu loyang kue B. Tentukan daerah himpunan penyelesaiannya.

Figure 1. Test Question Number 1

Figure 1 is question number 1 which has included three indicators of mathematical communication skills in the form of presenting mathematical ideas, stating mathematical symbols and describing and explaining the situation of ideas in writing. The question number 1 is A housewife has 1.6 kg of rice flour and 2.4 kg of wheat flour. She wants to make cakes of types A and B. For each pan of cake A, the amount of rice flour required is one-tenth of the available rice flour, while the amount of wheat flour required is three-sixteenths of the available wheat flour. For each pan of cake B, the amount of rice flour required is three-fourths of the rice flour required for one pan of cake A, and the amount of wheat flour required is one and a half times the wheat flour required for one pan of cake A. The housewife plans to make more than two pans of cake A and at least one pan of cake B. Determine the feasible solution region.

Sebuah UMKM Nusa Hampers memproduksi dua jenis paket Lebaran, yaitu Paket Premium dan Paket Ekonomis, yang masing-masing membutuhkan dua bahan utama berupa kue kering dan sirup. Jumlah ketersediaan kue kering sebanyak 4 boks dengan setiap boks berisi 30 kotak dan ketersediaan sirup sebanyak 10 boks dengan setiap boks berisi 10 botol. Setiap paket premium membutuhkan $\frac{1}{40}$ kotak dari ketersediaan seluruh kotak kue kering dan membutuhkan $\frac{1}{100}$ botol dari ketersediaan seluruh botol sirup. Paket ekonomis membutuhkan $\frac{1}{3}$ kotak kue kering dari kebutuhan kotak paket premium dan membutuhkan sirup dua kali kebutuhan botol dari paket premium. Tentukan daerah himpunan penyelesaiannya.

Figure 2. Test Question Number 2

Figure 2 is question number 2 which includes three indicators of mathematical communication skills in the form of presenting mathematical ideas, stating mathematical symbols and describing and explaining the situation of ideas in writing. The question number 2 is a business (UMKM) called Nusa Hampers produces two types of Lebaran packages, there are the Premium Package and the Economy Package, each of which requires two main materials, namely cookies and syrup. The available supply consists of 4 boxes of cookies, with each box containing 30 cookie containers, and 10 boxes of syrup, with each box containing 10 bottles. Each Premium Package requires $\frac{1}{40}$ of the total available cookie containers and $\frac{1}{100}$ of the total available syrup bottles. Each Economy Package requires $\frac{1}{3}$ of the cookie containers required for one Premium Package and twice the number of syrup bottles required for one Premium Package. Determine the feasible solution region.

Seorang penjahit memiliki persediaan kain wol sepanjang 4 meter dan kain satin dengan satu meter lebih panjang dari kain wol. Dari kain tersebut akan dibuat dua model baju. Dari kedua jenis kain tersebut, ia membuat dua model baju pesta. Untuk membuat satu baju pesta model I, diperlukan kain wol sebanyak $\frac{1}{2}$ dari persediaan dan kain satin $\frac{1}{5}$ dari persediaan. Sementara itu, baju pesta model II membutuhkan kain wol $\frac{1}{4}$ dari persediaan dan kain satin dua kali lebih panjang dari kain wol nya. Tentukan daerah himpunan penyelesaiannya.

Figure 3. Test Question Number 3

Figure 3 is question number 3 which includes three indicators of mathematical communication skills in the form of presenting mathematical ideas, stating mathematical symbols and describing and explaining the situation of ideas in writing. The question number 3 is A tailor has a supply of 4 meters of wool fabric and satin fabric that is one meter longer than the wool fabric. Using these materials, the tailor will produce two models of party dresses. To make one Model I party dress, the tailor needs wool fabric equal to $\frac{1}{2}$ of the available wool fabric and satin fabric equal to $\frac{1}{5}$ of the available satin fabric. Meanwhile, one Model II party dress requires wool fabric equal to $\frac{1}{4}$ of the available wool fabric and satin fabric that is twice the amount of wool fabric required for Model II.Determine the feasible solution region.

The three questions were given to the research subjects. The results of the test are then analyzed by the researcher in accordance with the researcher's objectives.

The researcher selected, simplified, and grouped the questionnaire data based on three categories, namely high, medium, and low learning interest, which was then given a mathematical communication ability test. Relevant and related data is analyzed further. The analysis was carried out with semi-structured interviews with the aim of digging deeper information in accordance with the guidelines but still being flexible (Ruslin et al., 2022).

Data are presented in the form of descriptive descriptions, tables, interviews and documentation to analyze the characteristics of students' mathematical communication skills. The presentation of data is carried out based on indicators of mathematical communication ability so that researchers can explain systematically and in depth.

The researcher obtained conclusions through the interpretation of the results of the data analysis. Furthermore, verification was carried out using triangulation techniques and time by comparing data on written test results and interviews. This aims to avoid data bias so that a valid and in-depth picture of students' mathematical communication skills is obtained (Ulviani & Aba, 2025).

RESULTS AND DISCUSSION

The learning interest questionnaire was distributed to 64 students in class X of SMAN 94 Jakarta who came from two classes through the Google Form platform. Next, the researcher analyzed the scores obtained by each student. The results of the analysis showed that there were 22 students who had a high interest in learning, 40 students who had a moderate interest in learning and 2 students who had a low interest in learning. The researcher selected subjects with one student having a high interest in learning, one student with moderate learning interest and one student with low learning interest.

Table 2. Research Subject Categories

Number	Name	Subject Code	Score	Categories
1.	KR	S17	72	Height
2.	MRH	S8	52	Medium
3.	NBR	S35	26	Low

Table 2 shows the subjects selected by the researcher with their adjusted classification. The researcher then administered a three-question mathematical communication ability test.

Students answer the mathematical communication ability test given to the number 1 with indicators presenting mathematical ideas, stating mathematical symbols and describing and explaining the situation of ideas in writing. The following is the result of answer number 1 from S17.

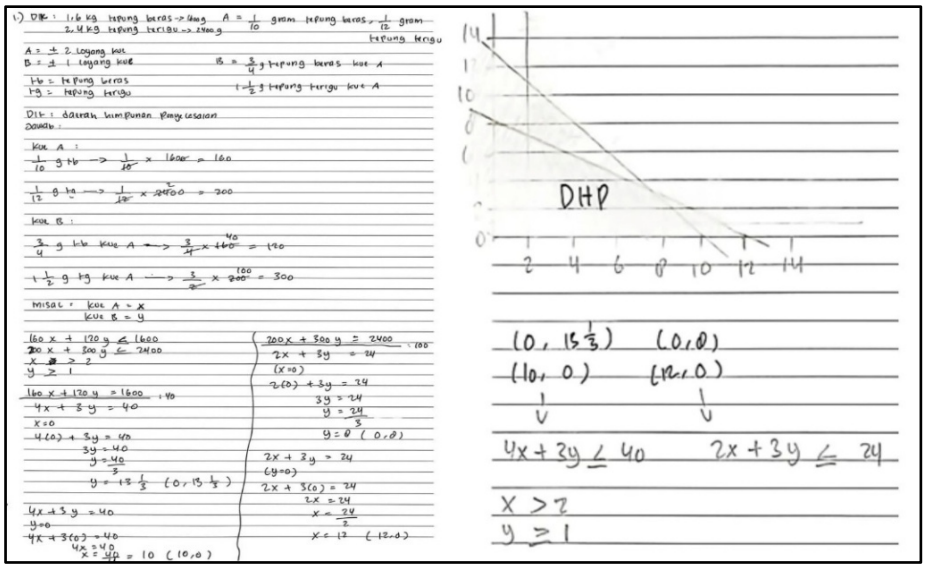

Figure 4. Answer S17 Number 1

Figure 4 is the result of answer number 1 from S17 with a high interest in learning, the answers is a rice flour available 1600 g and heat flour available 2400 g. Cake A need $\frac{1}{10}$ of the available rice flour is 160 g and wheat flour $\frac{3}{16}$ of the available wheat flour is 200 g. Cake B need rice flour $\frac{3}{4}$ of the rice flour required for cake A is 120 g and heat flour $\frac{3}{2}$ of the wheat flour required for cake A is 300 g. Let x is number of Cake A and y is number of Cake B pans. From the rice flour supply is $160x + 120y \leq 1600$ or $4x + 3y \leq 40$. From the wheat flour supply is $200x + 300y \leq 2400$ or $2x + 3y \leq 24$. The graph shows the feasible solution region, which is the intersection of all the inequalities above. Then continued by the researcher for an interview.

R: *What information do you get when reading the questions?*

S17: *There is information about rice flour and wheat flour, so the housewife has 1.6 kilograms of rice flour and 2.4 kilograms of wheat flour, now to make cake type A, she needs* $\frac{1}{10}$ *gram of rice flour from the stock if the rice flour is* $\frac{1}{12}$ *gram from the stock. For cake B, she needs* $\frac{3}{4}$ *of the rice flour in cake A, while the wheat flour is 1 and a half times the requirement of the wheat flour in cake A, the mother makes two pans of cake A and 1 pan of cake B, find the a determine area of the collection*

R: *So how do you solve this problem?*

S17: *First, change it from kilograms to grams, cake A* requires $\frac{1}{10}$ *rice flour so* $\frac{1}{10}$ *multiplied by mother's rice flour supply becomes 160, for wheat flour* $\frac{1}{12}$ *multiplied by 2400 becomes 200. For cake B, it needs it from cake A's supply so it is multiplied by the results of cake A. To find the set region, use an example, for example, cake type A is x, cake B is y, so use the inequality calculation of two variables, because it has been assumed that both are rice flour but the variables are different*

160x+ 120y is less than 1600 rice flour that mother has, then 200x + 300y is less than 2400 so 200 is cake A's wheat flour and 300 is cake B wheat flour, now this 2400 is mother's initial supply, there is an additional x more than 2 and y more than 1 because it is in the problem, then we calculate it simplified. Because this is looking for a point for the line we use x which is 0 so 4 times 0 becomes 0 plus 3y = 40 so y is equal to 40 divided by 3 is $13\frac{1}{3}$ *so the point is x is 0 and y is* $13\frac{1}{3}$*. For the second one, it is the same as before, only replaced by y which is 0, so 4x plus 3 times 0 equals 40 so 4x = 40 then x is 40 divided by 4 equals 10 so the point x is 10 and y is 0. Because there are two equations, now we also do the same thing as before. Because the point has been found, we make a picture and there are four points, besides that there is also x more than 2 and also y more than 1, to determine the DHP of the line and shading, now from there we know the DHP.*

R: *Okay, thanks for the explanation.*

Based on the results of the interviews and test answers above, S17 is able to identify problems, present ideas, state the situation into mathematical symbols, to draw and explain ideas in writing well and correctly. On the other hand, students who are able to present mathematical ideas in writing and orally can determine the conclusion at the end of the answer that the student has good mathematical communication skills (Rahmah & Hidayati, 2024). This shows that S17 meets all indicators of mathematical communication ability. Students who have all indicators show good mathematical communication skills (Oktavia et al., 2025). Furthermore, the answers by S35 with moderate learning interest are as follows.

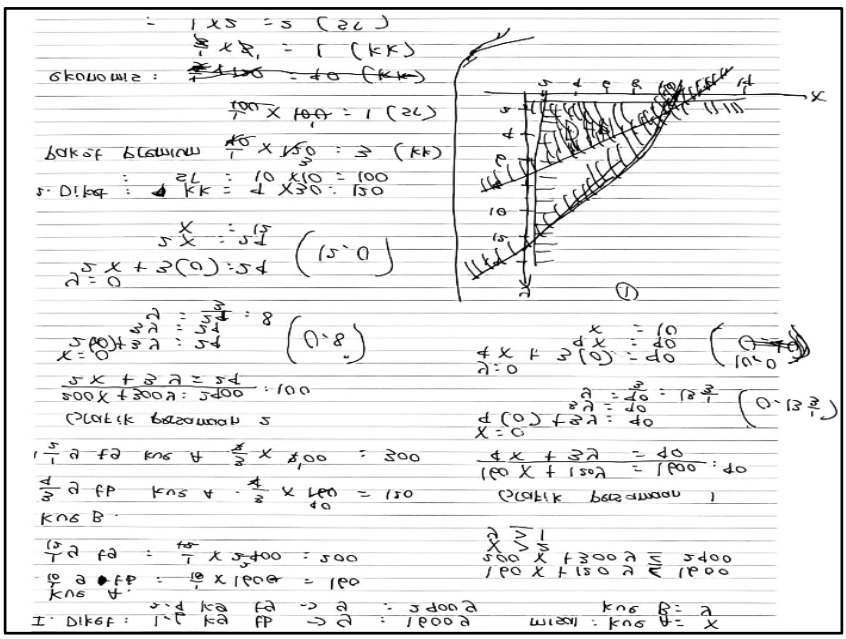

Figure 5. Answer S35 Number 1

Figure 5 is the result of answer number 1 by S35 with moderate learning interest, the answers is given 1.6 kg of rice flour is 1600 g and 2.4 kg of wheat flour is 2400 g. Let x is Cake A and y is Cake B. The Cake A need rice flour required 160 g and wheat flour required is 200 g. The Cake B need rice flour required is 160 g and wheat flour required is 200 g. Let x is Cake A and y is Cake B. From the rice flour supply is $160x + 120y \leq 1600$ or $4x + 3y \leq 40$. From the wheat flour supply is $200x + 300y \leq 2400$ or $2x + 3y \leq 24$. The graph shows the feasible solution region, which is

the intersection of all the inequalities above.

Then continued by the researcher for an interview.

R: *What information do you think you got from question number 1?*

S35: *The first one is 1.6 kg of rice flour and 2.4 kg of wheat flour, want to make cake A, need* $\frac{1}{10}$ *of the rice flour supply, so 1.6 uses* $\frac{1}{10}$ *gram and* $\frac{1}{12}$ *gram of wheat flour, then for cake B, need* $\frac{3}{4}$ *of cake A, we use it again for cake B, then* $1\frac{1}{2}$ *times the wheat flour needed for A, so* $1\frac{1}{2}$ *of what is needed for A, we use it in B but* $1\frac{1}{2}$ *more.*

R: *Okay, then what is this question?*

S35: *Is asked to make more than 2 cake pans A and at least 1 pancake B, we determine the solution.*

R: *Determine the area of the settlement set, then how do you solve this problem?*

S35: It is known that 1.6 and 2.4 kilograms, I changed it to grams multiplied by 1000 to 1600 grams and 2400 grams, then I make it two cakes A and cake B, cake A needed $\frac{1}{10}$ *I multiplied it from the total of 1600 to 160 rice flour, then the wheat flour is* $\frac{1}{12}$ *I multiplied the total rice flour 2400 to 200, well, for example, cake A is x and cake B is y, cake B is the same as finding cake A but a little different because cake B is multiplied by cake A the results are 120 and 300, well, because cake A is x and cake B is y so we look for 160x + 120y less than or equal to 1600 then 200x + 300y less than 2400, well, x must be more than 2 and y must be more from 1. Then make a graph of this equation 160x+120y=1600 to reduce it both divided by 40 so 4x+3y=40 now x is likened to 0 so 4 times 0 plus 3y equals 40 then 3y = 40 then y is 40 divided by 3 equals* $13\frac{1}{3}$*, so we get the DHP* $(0.13\frac{1}{3})$*. Then we imagine that y is equal to 0 so 4x is equal to 40 then x is equal to 10 so* $(10,0)$*, now the graph of the second equation is like the one before to find cake B, use 2x+3y=24, so the DHP is* $(0,8)$ *and* $(12,0)$*, Now this picture is adjusted to the results that have been obtained so for example if it is less than that I will lower it, we take 0 from the bottom point and the two top ones in the middle I draw a line then I move it up, now the point is the DHP is the one that passes through that line.*

R: *Okay, thanks for the explanation, but* (0.8) *or* (0.12) *it's not called DHP but it determines the axis point, you know?*

S35: Oh yes, got it ma'am

Based on the results of the interviews and test answers above, S35 is able to understand problems, present ideas and use mathematical symbols well even though they are not good at drawing and explaining the situation of ideas in writing. It can be seen that the graph made is not made straight so that the intersection points that meet are not suitable so that it affects the area of the settlement set. However, the S35 is able to explain the steps in creating a graph. Students who can explain an idea or step but the graph is not made correctly show a category that is fairly good in mathematical communication skills (Tyaningsih et al., 2020). Furthermore, the results of the answers by S8 with low interest in learning.

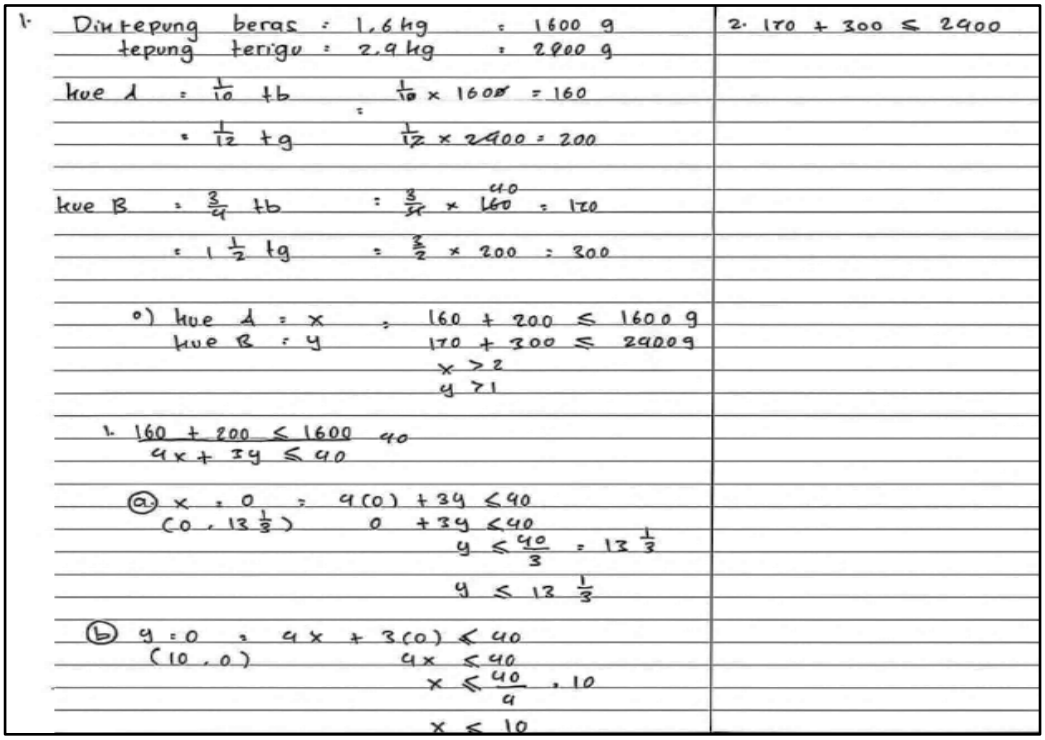

Figure 6. Answer S8 Number 1

Figure 6 is the result of answer number 1 by S8 who has a low interest in learning, the answers is given rice flour is 1.6 kg equal 1600 g and wheat flour is 2.4 kg equal 2400 g. The Cake A need 160 g of rice flour and 200 g of wheat flour. The Cake B need 120 g rice flour and 300 g wheat flour. From the rice flour supply is $160x + 120y \leq 1600$ or $4x + 3y \leq 40$. From the wheat flour supply is $200x + 300y \leq 2400$ but uncomplete it until illustrating the graph of the solution set area. Then continued by the researcher for an interview.

R: *What information do you think you get when reading the questions?*
S8: *This housewife has 1.6 kg of rice flour and 2.4 kg of wheat flour and wants to make two types of cakes, cake A and cake B, and cake A requires 10 grams and cake B requires $\frac{3}{4}$ of the rice flour from cake A, so the mother wants to make more than 2 trays of cake A and 1 cake B and I was asked to determine the solution set.*
R: So how do you model into a mathematical form?
S8: But I doubt to answer it ma'am
R: In your answer is why rice flour cake A has to be multiplied by 1600?
S8: When I read it the questions I remember, but now I forget ma'am
R: So why do you write x is cake A and y is cake B?
S8: Forget ma'am
R: You write x greater than two and y greater than one, why?
S8: Forget ma'am
R: Then do you know what the answer to this question will be?
S8: It should be a picture ma'am, but I forgot to draw.
R: Correct, but why don't you draw?
S8: Because I still confused ma'am

Based on the interview results and the answers above, S8 was able to identify problems in the questions and was able to present ideas in mathematics in writing in the form of cake $A = x$ and cake $B = y$. In addition, S8 was able to express it in mathematical symbols although it was incomplete so that S8 could not solve problems in drawing and explaining the situation of ideas in writing. Students who were unable to solve problems in mathematical communication skills were

categorized as not good so that action was needed so that students could apply what they had learned (Bastian et al., 2024). This shows that the S8 only meets one indicator. Students who only meet a few indicators and cannot explain that mathematical communication skills are not good (Rahmawati et al., 2023).

Furthermore, number 2 with indicators presents mathematical ideas, states mathematical symbols and describes and explains the situation of the idea in writing. The following are the results of answer number 2 from S17 with high interest in learning.

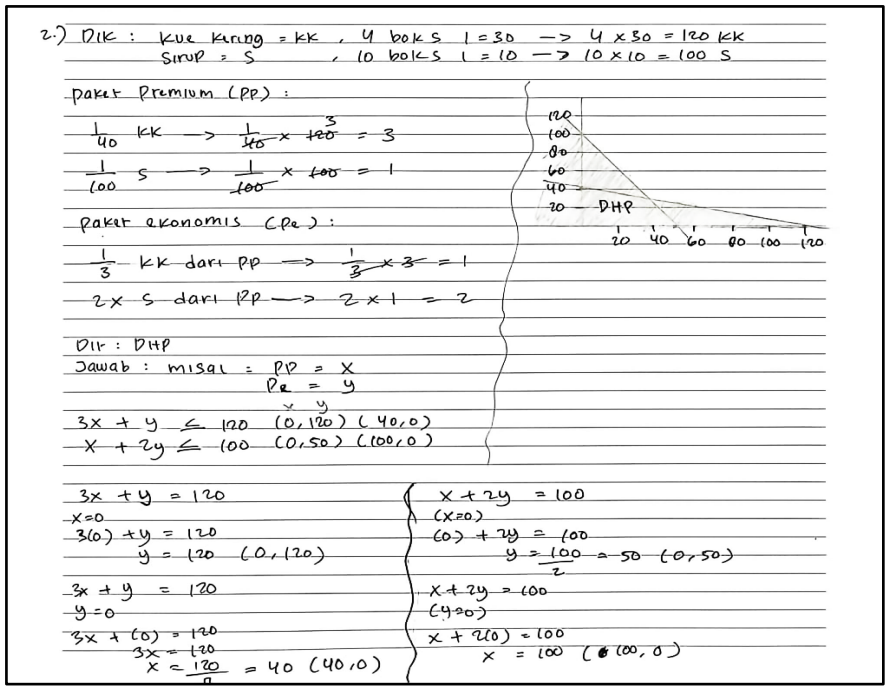

Figure 7. Answer S17 Number 2

Figure 7 is the result of answer number 2 by S17 who has a high interest in learning, the answers is given cookies 120 cookie containers and syrup 100 syrup bottles. Premium package consists of 3 cookie containers and 1 syrup bottle. For economy package 1 cookie containers and 2 syrup bottle. Let x is number of Premium Packages and y is number of Economy Packages. The system of inequalities is $3x + y \leq 120$ the intercepts of $(0,120)$ and $(40,0)$. The system of inequalities is $x + 2y \leq 100$ the intercepts of $(0,50)$ and $(100,0)$. The graph shows the feasible solution region but not true, the error occurred in determining the axis point. Then continued by the researcher for an interview.

R: *Next for number two, is it the same as number one?*

S17: *In my opinion, it's just that the information is different, this is number two as much as me but more specific to the content like how much of the pastry is and how much syrup is in it*

R: What about to model mathematically?

S17: The method is the same as number one but the stock availability must be calculated first, from the information, one box of cookies contains 30 boxes, so because there are 4 boxes, so 4 times 30 is equal to 120, then for syrup, each box has 10 bottles because there are 10 boxes, so 10 times 10 is 100. Then calculate each package, premium package and economy package. Next, suppose x is the premium package and y is the economy package. Just like number one, we group cookies from the economy package and premium package, as well as syrup, then less than because it is less than the stock, then the method is like number one to determine the point which is multiplied by 0, then find 4 points after getting it, then the

lines are to show the DHP

R: The calculation is good and correct but when transferred to the image it is wrong, can you identify what is wrong?

S17: x and y are reversed, x should be on the x axis but instead it is on y

R: Then why did you write it like this?

S17: Careless and in a hurry

Based on the interview results and test answers above, S17 was able to understand the problem, present it in mathematical terms, and express the situation in mathematical symbols. Furthermore, S17 was able to draw and explain the idea in writing, although not yet well. S17 was able to calculate and determine the axis points correctly, but an error occurred in the transformation process from the axis points to the graph form in the form of an inverted x and y axis. Students who experienced errors in the transformation stage caused errors in the next stage (Haryati et al., 2016). This shows that S17 only meets two indicators. Students who meet almost all indicators show fairly good mathematical communication skills (Rahmawati et al., 2023). Furthermore, the answers to S35 with moderate learning interest are as follows.

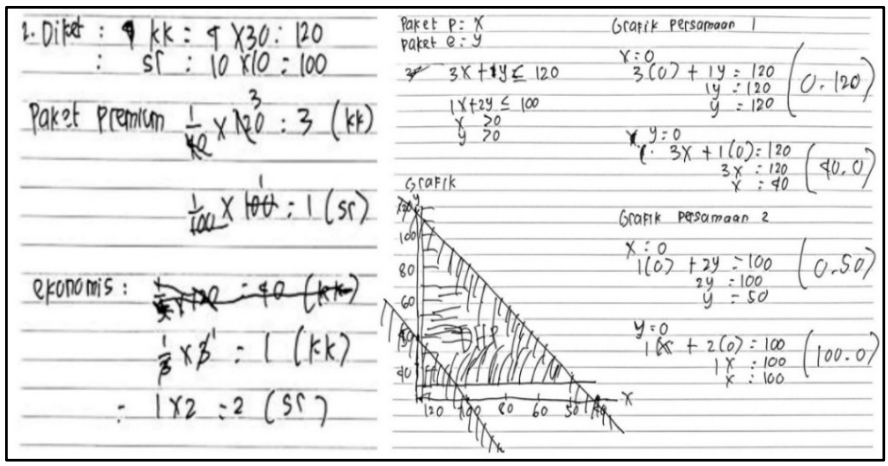

Figure 8. Answer S35 Number 2

Figure 8 is the result of answer number 2 by S35 who has an interest in learning, the answers is given 120 cookie containers and 100 syrup bottles. The premium package is 3 cookie containers and 1 syrup bottles. The economy package 1 cookie containers and 2 syrup bottles. Let x is number of Premium Packages and y is number of Economy Packages. The system of inequalities is $3x + y \leq 120$ the intercepts of $(0,120)$ and $(40,0)$. The system of inequalities is $x + 2y \leq 100$ the intercepts of $(0,50)$ and $(100,0)$. The graph shows the feasible solution region but not true, the error in the sequence of numbers on the x-axis. The other error in the graph, there are equations $x = 1$ and $y = 1$ that should not exist since there are no conditions in the problem. Then continued by the researcher for an interview.

R: What if number 2 the information do you get?

S35: Having 4 boxes of dry cakes, each box contains 40 boxes and also has 10 boxes of syrup, each box contains 10 bottles. Well, there are packages, namely premium packages and economy packages than the question is to determine the area of the solution set

R: Yes, then why did you write it 4×30?

S35: Because he has 4 boxes, form the 4 boxes he also has 30 boxes, so it's 4×30 equal to 120, same as like syrup ma'am

R: For the premium package, why do you write $\frac{1}{40}$ multiplied by 120?

S35: Because the premium package requires $\frac{1}{40}$, so I multiply it by 120 get 3, then the syrup is $\frac{1}{100}$ multiplied by

100 to get 1, the same for the economy package too ma'am, but the economy package is taken from the needs of the premium package, ma'am

R: Like number one earlier, why do you suppose package p with x and package e with y?

S35: What you explained earlier, because it was to determine the axis point, ma'am

R: Why did you write it $3x + y \leq 120$ *and* $x + 2y \leq 100$ *not* $3 + 2 = 120$*?*

S35: 120 is the result of all the boxes that have been calculated earlier, so 3x+y must be less than 120 so the other one is also the same

R: Why did you write 3x+y not just 3 + 1?

S35: Because what has been likened to package p with x and package e with y

R: To determine the graph of this equation, why do you multiply it by 0?

S35: To find the axis point and determine the DHP ma'am

R: But the picture is not quite right, can you identify where the mistake is?

S35: x ma'am, should be 40 to 120, not 120 to 40, which makes the line arrangement wrong.

R: Why did you write it like that?

S35: I wasn't focused enough, ma'am, and I was in a hurry so I made a mistake.

Based on the results of the interviews and answers above, S35 is able to identify problems, present ideas and state them into mathematical symbols. In addition, the S35 is also able to draw and explain ideas in writing although it is not good because there is a mistake in the drawing process on the coordinate number. There are still many students who experience conceptual errors in writing coordinates (Fitriyah et al., 2020). This shows that the S35 only meets two of the three indicators. If the student meets almost all indicators, it shows fairly good mathematical communication skills (Rahmawati et al., 2023). Furthermore, the S8 answers with low learning interest.

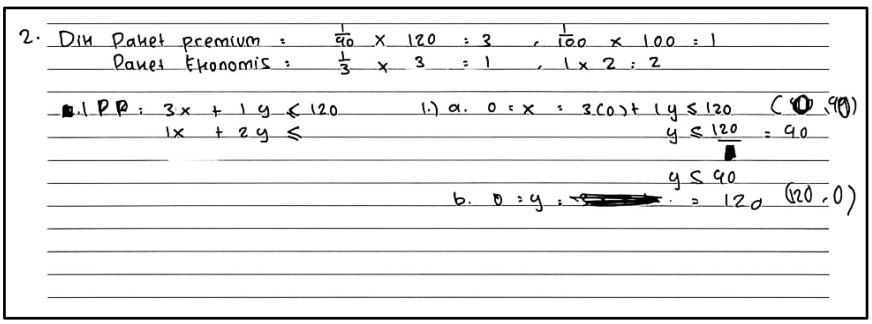

Figure 9. Answer S8 Number 2

Figure 9 is the result of answer number 2 by S8 who has a low interest in learning the answers is given the premium package is 3 cookie containers and 1 syrup bottles. The economy package 1 cookie containers and 2 syrup bottles. The system of inequalities is $3x + y \leq 120$ the intercepts of $(0,40)$ and $(120,0)$ is not true and the second of system inequalities cannot be solved. The graph is uncompleted. Then continued by the researcher for an interview.

R: *So for number two, what the information do you get from the question?*

S8: UMKM make two types of Eid packages, premium packages and economic packages, each of these packages contains syrup and cookies, then there are 4 boxes of cookies, each box contains 30 boxes, then there are 10 boxes of syrup, each box contains 10 bottles, then each premium package is 1/40 a box of cookies and requires 1/100 bottles of the availability of all syrup bottles, then the economic package requires $\frac{1}{3}$ *a box of cookies and requires syrup twice the need for bottles from the premium package, then I was asked to determine the area of the solution set*

R: Why you wrote $\frac{1}{40}$ *times 120 and*

$\frac{1}{100}$ *times 100?*

S8: Because it's in the question, sis, each box has 30, so 30 times four, then 10 times 10, ma'am

R: Then you write x and y also, what does this mean?

S8: I forget ma'am

R: Then your answer is only half, why don't you continue until the end?

S8: Because I've given up, ma'am, and my friends don't know anymore.

Based on the results of the interview and the answers above, S8 was only able to identify problems in the questions. However, S8 is not able to present into mathematical ideas and uses mathematical symbols so it cannot draw and explain the situation of the idea in writing. Students who are unable to solve problems to show mathematical communication skills that are categorized as not good (Bastian et al., 2024). This shows that the S8 does not meet all indicators. Students who find errors in all indicators show not good mathematical communication skills (Tyaningsih et al., 2020).

Furthermore, the number three with the indicator presents the mathematical idea, states the mathematical symbols and describes and explains the situation of the idea in writing. The following are the results of answer number 3 by S17 with high interest in learning.

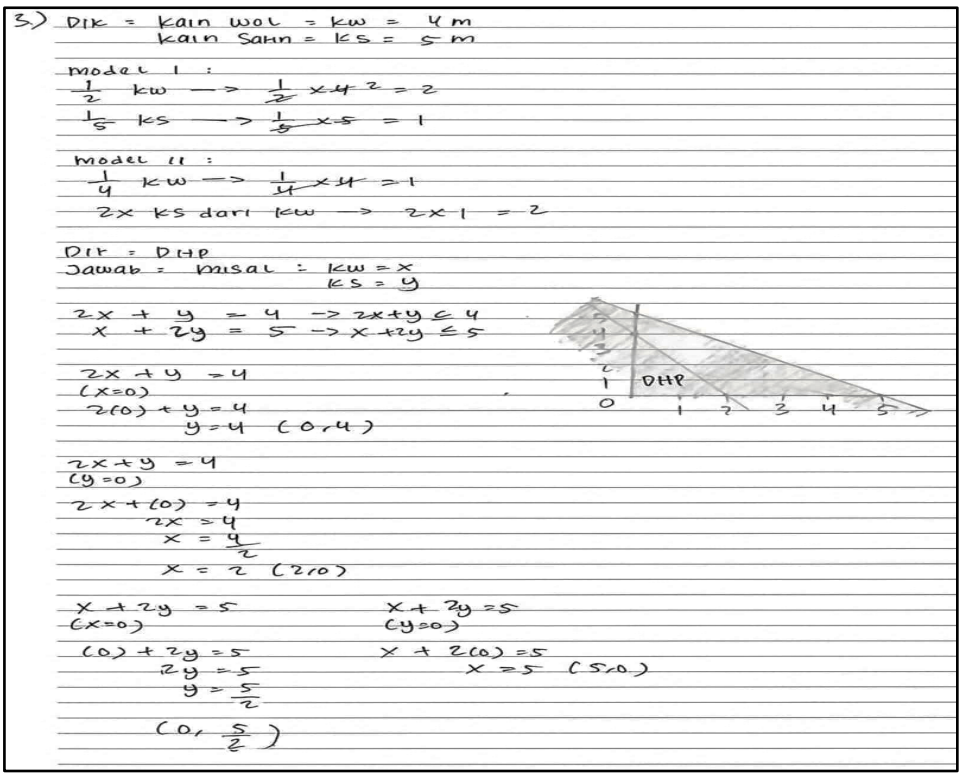

Figure 10. Answer S17 Number 3

Figure 10 is the result of answer number 3 by S17 who has a high interest in learning, the answers is given 4 meters of wool fabric and 5 meters of satin fabric. Model I need 2 meters of wool fabric and 1 meter of satin fabric. Model II need 1 meter of wool fabric and 2 meters of satin fabric. Let x is number of model I dresses and y is number of model II dresses. The system of inequalities is $2x + y \leq 4$ the intercepts of $(0,4)$ and $(2,0)$. The system of inequalities is $x + 2y \leq 5$ the intercepts of $(0,\frac{5}{2})$ and $(5,0)$. The graph shows the feasible solution region but not true, the error occurred in determining the axis point at $(0,\frac{5}{2})$ instead of $(0,5)$ when it should be at $(0,2\frac{1}{2})$. Then continued by the researcher for an interview.

R: *Next for number 3, can you explain what you wrote and what information was obtained?*

S17: For number 3, the same as number two, it is not known how wide it is, there is only information on the length of the wool and satin fabrics. For model I, $\frac{1}{2}$ of the wool fabric is needed from its availability, so multiplied by 4 the result is 2 while the satin fabric requires $\frac{1}{5}$ of its availability, so multiplied by 5 the result is 1, then for model II, $\frac{1}{4}$ of the availability is needed, so multiplied by 4 while the satin fabric is twice the satin fabric model I, so 2 times 1 is 2, then the method is still the same as the previous questions, let x and y then the point is assumed to be 0 first x then y after that it is calculated then obtained at the points then combined then shaded then the DHP is found out where

R: Here the picture is not correct but from the calculation it is good but there is something that is not correct, pay attention to what you wrote 0,$\frac{5}{2}$ can it still be simplified?

S17: A mixed fraction, ma'am?

R: Yes, how much?

S17: So $2\frac{1}{2}$

R: Correct, the point in 5 should be between 2 and 3 because the result is $2\frac{1}{2}$ not 5, understand?

S17: Understand

Based on the interviews and the results of the answers above, S17 was able to identify problems, present into mathematical ideas and express mathematical symbols properly and correctly. In addition, S17 is able to draw and explain ideas in writing even though it is not good. S17 is not thorough at the stage of determining the axis point which results in an error at the end of the answer, namely it does not simplify the division so that it is not correct in determining the area of the settlement set. Incomplete calculations make students fail to write the final conclusion so that errors occur at the end of the answer (Nopiana & Ratnaningsih, 2023). This shows that S17 only meets two of the three indicators. Students who meet almost all indicators show fairly good mathematical communication skills (Rahmawati et al., 2023). Furthermore, the answer by S35 with moderate learning interest.

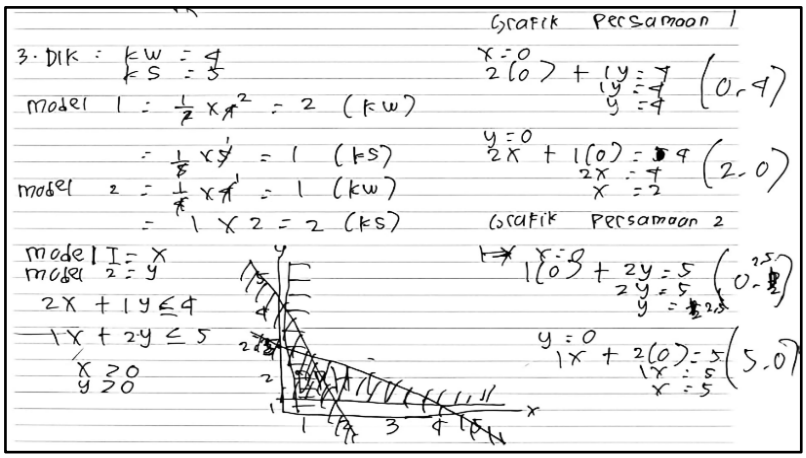

Figure 11. Answer S35 Number 3

Figure 11 is the result of answer number three by S35 who has an interest in learning, the answers is given 4 meters of wool fabric and 5 meters of satin fabric. Model I need 2 meters of wool fabric and 1 meter of satin fabric. Model II need 1 meter of wool fabric and 2 meters of satin fabric. Let x is number of model I dresses and y is number of model II dresses. The system of inequalities is $2x + y \leq 4$ the intercepts of $(0,4)$ and $(2,0)$. The system of inequalities is $x + 2y \leq 5$ the intercepts of $(0,\ 2.5)$ and

$(5,0)$. The graph shows the feasible solution region but not true. The error occurs in the graph, there are equations $x = 1$ and $y = 1$ that should not exist since there are no conditions in the problem. Then continued by the researcher for an interview.

R: *From question number 3, what information do you think you got?*
S35: So a tailor has 4 meters of wool fabric and one meter longer satin fabric than the wool fabric, one meter longer means 5 meters of satin fabric, so he wants to make two models of clothes, the first is a party dress from $\frac{1}{2}$ of the wool fabric stock and $\frac{1}{5}$ of the satin fabric stock which is 5 meters. While the second model of clothes is $\frac{1}{4}$ of the stock and twice as long as the wool fabric, so determine the solution set ma'am
R: Why $\frac{1}{2}$ multiplied by 4?
S35: Because of the need for wool fabrics
R: Right, then why suppose x and y?
S35: That's because it's an axis ma'am
R: Then why is there a distance in your picture between the line of inequality and the line y and x?
S35: Because what I know is that it x is more than 0 and more than 0 it does not have the bottom and left but in the middley
R: If x is more than 0, it should stick to the x line with the shading upwards, and the same goes for y, but for question number one, what is the difference between number three and number two?
S35: Because in number one there is a condition like more than two
R: Correct, do you understand?
S35: Understand ma'am

Based on the interview and the results of the answers above, S35 is able to identify problems, present ideas and state mathematical symbols well. In addition, S35 is able to draw and explain the situation of ideas in writing in determining the area of the solution set although it is not good as shown by the distance between the shading and the x and y axis. Students tend to make many errors in conceptual coordinates, one of which is the error in determining and using the formula (Fitriyah et al., 2020). This shows that the S35 only meets two of the three indicators. Students who almost meet all indicators show fairly good mathematical communication skills (Rahmawati et al., 2023).

Furthermore, answer number 3 by S8 with low interest in learning. However, S18 did not fill in answer number 3 so the researcher continued to conduct an interview.

R: *There are three questions given, why don't you do number 3?*
S8: *Because I haven't finished number two, so why do I have to continue with number 3*
R: *For this material, do you understand?*
S8: *It's hard ma'am*
R: *But what do you think the questions given are like?*
S8: *The teacher at school has taught me, but I'm not used to being given story questions, so I get confused and have to read them*
R: *If you read the question again, what information do you get from number 3?*
S8: *A tailor has a supply of wool fabric 1 meter long and satin fabric 1 meter longer than the wool fabric so the satin fabric is 5 meters from the wool fabric, then the fabric wants to be made into two models of party dresses, one dress requires wool fabric as much as $\frac{1}{2}$ of the stock and satin fabric $\frac{1}{5}$ of the stock, meanwhile the second model of party dress requires wool fabric $\frac{1}{4}$ of the stock and satin fabric twice as long as the wool fabric, determine the area of the solution set*
R: *So, do you understand the problem in the question?*
S8: *Yes ma'am, I have to read the in details*
R: *Okay, keep up the good work studying*
S8: *Yes ma'am*

Based on the interview and the results of the answers above, S8 did not answer test number 3. This shows that the S8 does not meet all indicators. Students who blank

answers or do not answer questions are behaviors learned helplessness in educational psychology, that is, having a belief no matter how hard your efforts are still unsuccessful (Hawrot & Zhou, 2024). In addition, students who do not meet all indicators show poor mathematical communication skills (Tyaningsih et al., 2020). However, S8 was only able to identify problems verbally when the questions were read again. Students who are able to analyze and understand information orally but are unable to write down information state that students' mathematical communication skills are not good (Ramadayanti & Supiat, 2024).

CONCLUSION

Based on the research results, it can be concluded that students with a high interest in learning tend to have the same mathematical communication skills as students with a moderate interest in learning. Both are able to fulfill the first indicator, namely presenting ideas in mathematics, and the second indicator, namely expressing them in mathematical symbols. However, in the third indicator, namely drawing and explaining the situation of ideas in writing, errors or mistakes often occur at the drawing stage. Therefore, students with a high interest in learning and students with a moderate interest in learning have quite good mathematical communication skills. Students with a low interest in learning tend to almost not fulfill all indicators of mathematical communication skills. Students are unable to work to completion and even leave answers blank, indicating poor mathematical communication skills. Researchers hope that further research can examine other factors that influence mathematical communication skills besides learning interest, such as self-confidence, mathematics anxiety, learning motivation or mathematical representation skills.

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