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STUDENTS' MATHEMATICAL COMMUNICATION: COVID-19 PROBLEM-SOLVING EXPERIENCE AMONG HIGH ACHIEVERS

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ABSTRACT

Mathematical communication skills are the ability to convey mathematical ideas, strategies, and solutions to solve mathematical problems, both written and verbal. The community must express ideas to solve mathematical problems in daily life or tell essential information, such as the news related to COVID-19. This research is a descriptive qualitative study that aims to describe the written and oral mathematical communication skills of 10th-grade students, especially high achievement students, working on a PISA-like problem in the COVID-19 context. The selection of subjects in this study used purposive sampling with the subjects of 3 high achievement students in ten grade. Subjects are selected based on the average daily test scores. Data collection was conducted by mathematical communication test using PISA liked problem uncertainty and data context about hand sanitizer and interview. The triangulation technique analyzed the result of test and interview data. The results showed that students with high achievement have high mathematical communication skills. Students with high achievement can present mathematical ideas orally and in writing, interpret and evaluate the strategy, the results obtained, and use terms, mathematical notation, and math symbols. Thus, high achievement students can communicate and solve problems in the context of COVID-19. This research provides new information about the mathematical communication of students with high mathematical abilities, so it can be one of the teacher's guidelines for determining appropriate learning to improve students' mathematical communication.

Keywords: COVID-19 context, high achievement students, mathematical communication.

How to cite

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INTRODUCTION

One of the skills that must be developed and possessed in the 21st century is communication skills (Chasanah et al., 2020). By communication, a person can convey information to others (Azizah et al., 2020). Information can be received correctly or not, depending on communication skills. A person's low communication skills can result in information not being conveyed or adequately causing misunderstandings.

In Mathematics, communication skills also hold an important role. Communication skills are essential in learning mathematics because they can help students understand math problems and solve them by expressing mathematical ideas in mathematical language. These skills has become one of the aims of learning mathematics. As stated in the 2013 curriculum, a copy of Attachment III of the Minister of Education and Culture Indonesia (2014) number 58 states that the purpose of learning mathematics is to communicate ideas with tables, symbols, diagrams, or other representations to clarify the situation.

The ability of students to write down information in the form of symbols, tables, diagrams, or other interpretations, conveying back information obtained orally or in writing, is called Mathematical communication ability (Nasution & Hayati, 2020). Mathematical communication skills are the ability of students to express mathematical problems into mathematical terms and solve the problems (Utami et al., 2021). Based on Kostos & Shin (2010), students' mathematical communication helps students develop problem-solving skills, correct misconceptions in mathematics, and develop mathematical thinking. Mathematical communication skills are included in thinking mathematically (National Council of Teachers of Mathematics, 2000). It shows that communication is an inseparable aspect of mathematics and mathematical thinking.

Mathematical communication skills are needed in daily life since the community must express ideas to solve mathematical problems in everyday life. In addition, one must understand, use, express, and convey important information in this world, often presented in a table, diagram, and mathematical model. For instance, is the information related to COVID-19. The number of infected people is presented in the diagram, and the rate of recovery and mortality is often said in percentage. The public needs to understand this, and it is hoped that every community can disseminate the information to the surrounding community.

A person needs to have good mathematical communication skills to disseminate mathematical information. It means that the person who conveys the information needs to construct his understanding first, then share his understanding and ideas in his mind orally and in writing to be used as material for reflection and discussion with others to solve existing problems (Dewi & Biladina, 2021). In line with The NCTM's theory that in preparing the student to master basic communication skills, students need to 1) strengthen mathematical thinking skills with mathematical abilities, 2) communicate mathematics clearly and correctly to others, 3) evaluate and analyze other people's mathematical strategies, 4) use the language of mathematics to express mathematical ideas (NCTM, 2000). Students are said to have a good communication skills if they have (1) the skills of expressing mathematical ideas through oral, written, and demonstrating and visualizing them; (2) skills to understand, interpret, and evaluate mathematical ideas and conclusions drawn either orally or in other visual forms; (3) skills in using terms, mathematical notation to present ideas, describe relationships, and model situations (NCTM, 2000). Further, Sumarmo (2000) states students are expected to meet the following criteria for mathematical communication skills, namely: a) expressing pictures, diagrams, real situations into language, symbols, mathematical models; b) explaining ideas, situations, and mathematical relationships, both verbally and in writing; c) write, discuss, and listen, about mathematics; and d) reading meaningful written mathematical representations. Furthermore, based on Sukmawati & Siswono (2021), to make students have high mathematical communication skills, students must meet the following requirements, namely : (1) state mathematical ideas both orally or in writing, present and depict them visually, (2) Understand and evaluate mathematical ideas both orally and in writing, (3) Use mathematical terms or notation and their structures to present ideas. In conclusion, mathematics communication skills include reading or understanding mathematical information and the ability to use and convey the information.

Unfortunately, students' mathematical communication skills are generally low (Cahyani, 2019; Pangaribuan et al., 2020; Rustam & Ramlan, 2018). In the Programme for International Student Assessment (PISA), mathematical communication skills are included in levels 5 and 6 in the PISA assessment, yet the 2015 PISA results show that Indonesian students' scores for levels 5 and 6 are low, only ranging from 0 - 0.6% (OECD, 2016). The low mathematics communication skills is shown not only by low achievement students but also by high achievement. Rohid et al. (2019) state that students with high math abilities cannot convey reasons systematically, logically, and clearly to the chosen strategy and conclusions drawn. Even mathematics pre-service teachers do not demonstrate mathematical communication skills in problem-solving (Pentang et al., 2021). However, Kholil & Putra (2019) and Pertiwi et al. (2020) argue that students with high math abilities can convey reasons systematically, logically, and clearly to the chosen strategy and conclusions drawn. Thus, further research is still needed to determine the mathematical communication skills of high-achieving students.

Furthermore, several previous studies have examined the mathematical communication of high school students in terms of mathematical abilities (Kholil & Putra, 2019; Rohid et al., 2019; Rustandi & Firmansyah, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Octaviani & Aini, 2021; Wati et al., 2020). There has been no research on the mathematical communication of 10th-grade students on solving problems in COVID-19. Thus, this research focuses on describing the mathematical communication skill of ten grade students with high achievement in mathematics in solving problems related to COVID-19. The results of this study can give additional information on how high achievement students' mathematical communication skills in solving issues related to COVID-19. It can be a reference for answering the pros-cons of the communication skills of high achieving students and a base for the teacher to plan mathematical learning enhancing the students' mathematical communication skills.

METHODS

The research method used is descriptive qualitative. Rukajat (2018) states that qualitative research collects data through interviews and observations by obtaining information. The research aims to describe the mathematical communication skills of 10th-grade students who have high achievement in working on COVID-19 context problems.

Three subjects were chosen to get more convincing research results and make it easier to draw conclusions. The three subjects were selected by purposive sampling. The selected subjects are students with high math abilities, as seen from the results of the average daily test scores of more than 85 (Nurutami et al., 2018), and the math teacher's recommendation. High math abilities were selected because they can solve non-routine problems (Sulfiah et al., 2018); thus, students' mathematical communication ability can be portrayed. Tenth grade students were chosen because the subjects selected by PISA to measure their ability to work on reading, math, and science and measure mathematical communication skills were 15-year-old students. Fifteen years in Indonesia is the same as a 10^{th} grade.

The instruments used in this study are mathematical communication test sheets about making hand sanitizer called Q1 (Figure 1).

Pay attention to the poster on how to make hand sanitizer beside!

To make one bottle-sized one liter of hand sanitizer, materials are required on the table beside. How many bottles of hand sanitizer can be made if you have 3000 ml of ethanol, 200 ml of hydrogen peroxide, 100 ml of glycerol, and 5 liters of aquades?

Materials	Type	Size
Ethanol	96 %	833 ml
Hydrogen peroxide	3 %	41,7 ml
Glycerol	98 %	14,5 ml
Aquades		1000 ml

source : cnbcindonesia.com

Figure 1. Mathematical communication test instrument (Q1) adapted from Ambarita & Zulkardi (2020)

The problem of making hand sanitizer was chosen because the public needs to understand during the COVID-19 pandemic to save expenses. The hand sanitizer problem was adapted from Ambarita & Zulkardi (2020). The hand sanitizer problem has been valid and practical based on the results of validation (Ambarita & Zulkardi, 2020). The researcher also used interview guidelines to make it easier for the researcher to determine what should be discussed and asked to the subjects.

Sugiyono (2017) states that data collection techniques can be done by observation, interviews, and a combination of the data collection technique. Steps employed in this study are as follows: 1) determine subjects with high mathematical abilities using the results of the average daily test scores, 2) collecting students' mathematical communication test results by giving mathematical communication test sheets, 3) conducting interviews to complement the data obtained from test results students' mathematical communication.

The data analysis technique consisted of mathematical communication analysis, and interview analysis was analyzed using the triangulation technique based on Miles et al. (2014). The mathematical communication indicators used in this research are adopted by Sukmawati & Siswono (2021), as shown in Table 1.

Table 1. Mathematical communication indicators

Indicators	Description	Score
State mathematical ideas both orally or in writing, present and depict them visually (I-1)	Convey what is known and asked in writing or orally.	0-2
Understand and evaluate mathematical ideas both orally and in writing (I-2)	Explain the strategy in solving math problems in writing or orally. Summarizing and evaluating the strategy and results obtained in writing or orally.	0-4
Use mathematical terms or notation and their structures to present ideas (I-3)	Use mathematical notation and symbols to present ideas related to the problem.	0-4

Source: Sukmawati & Siswono (2021)

Indicators are stated mathematical ideas both orally or in writing, present and depict them visually, understand and evaluate mathematical ideas both orally and in writing, Use mathematical terms or notation and their structures to present ideas. Data was carried out by (1) data reduction, removal of unnecessary information from test results and interview results, and then organizing them, (2) presentation of data, the presentation of the data in this study is described in the form of a description of the mathematical communication test result of ten grade students in solving COVID-19 problems, (3) draw conclusion, conclusions were drawn from data analysis results which are described in the form of a description of students' mathematical communication and category of mathematical communication students in solving COVID-19 problems. To categorize students' mathematical communication skills, from the range 1-100, it is divided into four equal fields according to Table 2.

Table 2. Mathematical communication categories

Score	Category
$0 \leq x \leq 25$	Very low
$25 < x \leq 50$	Low
$50 < x \leq 75$	High
$75 < x \leq 100$	Very high

Source: Sukmawati & Siswono (2021)

To calculate the mathematical communication score, the formula is as follows.

$$grade = \frac{total\ score\ of\ all\ indicators\ for\ each\ subject}{maximum\ sore\ of\ all\ indicators}\ x\ 100$$

RESULT AND DISCUSSION

Based on the average value of students' daily tests and recommendations from the mathematics teacher, three subjects with high mathematics abilities were obtained, namely E, A, and L. The average daily test scores of the subjects were shown in Table 3.

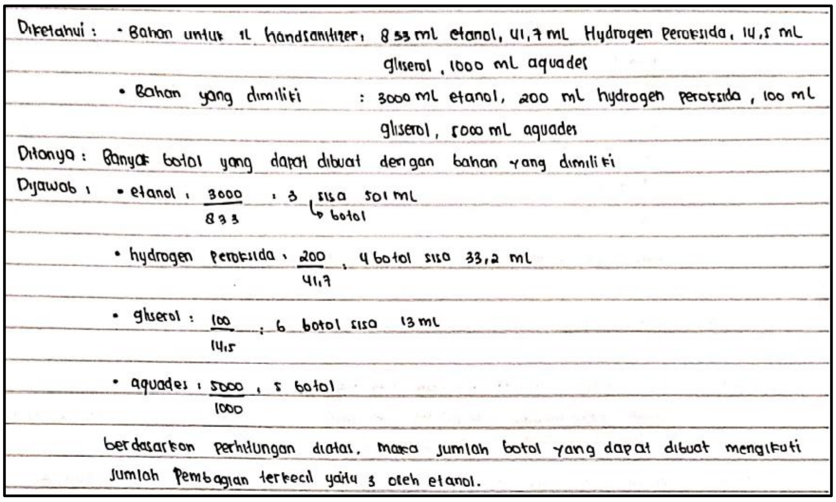
Table 3. Subject's math average score E, A, and L

Research subject	Score	Level
E	92	High
A	90	High
L	88	High

The following are the results and discussion of students' mathematical communication.

Subject 1 (E)

The E' answer in Figure 2.


Diketahui : • Bahan untuk 1L handsanitizer: 833 ml etanol, 41,7 mL Hydrogen Peroksida, 14,5 mL gliserol, 1000 mL aquades

• Bahan yang dimiliki : 3000 mL etanol, 200 mL hydrogen peroksida, 100 mL gliserol, 5000 mL aquades

Ditanya : Banyak botol yang dapat dibuat dengan bahan yang dimiliki

Dijawab : • etanol : $\frac{3000}{833}$: 3 botol sisa 501 mL

• hydrogen peroksida : $\frac{200}{41,7}$: 4 botol sisa 33,2 mL

• gliserol : $\frac{100}{14,5}$: 6 botol sisa 13 mL

• aquades : $\frac{5000}{1000}$: 5 botol

berdasarkan perhitungan diatas, maka jumlah botol yang dapat dibuat mengikuti jumlah pembagian terkecil yaitu 3 oleh etanol.

Known = material for 1 L hand sanitizer = 833 ml ethanol, 41,7 ml hydrogen peroxide, 14,5 ml glycerol, 1000 ml aquades

owned materials = 3000 ethanol, 200 ml hydrogen peroxide, 100 ml glycerol, 5000 ml aquades

Asked = how many bottles can be made from the materials I have

I-1

Answer : ethanol = $\frac{3000}{833}$ = 3 bottle leftover 501 ml

hydrogen peroxide = $\frac{200}{41,7}$ = 4 bottle leftover 33,2 ml

glyserol = $\frac{100}{14,5}$ = 6 bottle leftover 13 ml

aquades = $\frac{5000}{1000}$ = 5 bottle

based on the calculation above, the number of bottles that can be made following the smallest number of divisions is 3 bv ethanol.

I-2

Figure 2. E' result

It shows that E uses numbers and division operations to deliver the ideas used. E wrote down what is asked and known in the problem and then developed the strategy used, namely dividing the composition of the ingredients she has with the composition of the ingredients needed for one bottle of hand sanitizer. After that, E chose the smallest division result among the results found and rounded it down. E can also conclude what is obtained wholly and correctly.

The following is an interview excerpt between the researcher (R) with E to determine E's ability to present ideas orally.

R *: What's known and asked in the problem Q1?* **(I-1)**
E *: Known the ingredients for the hand sanitizer and known the ingredients I have, asked for many bottles made from the owned material.* **(I-1)**

Based on the results of E's work in Figure 2 code I-1 and interview excerpt, E can explain what information is on the problem and what is asked on the problem orally and in full writing so that E can fulfill indicator I-1. Some relevant research (Disasmitowati & Utami, 2017; Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020) state that students with high mathematical abilities can perform written and oral mathematical communication at the stage of understanding the problem wholly and accurately.

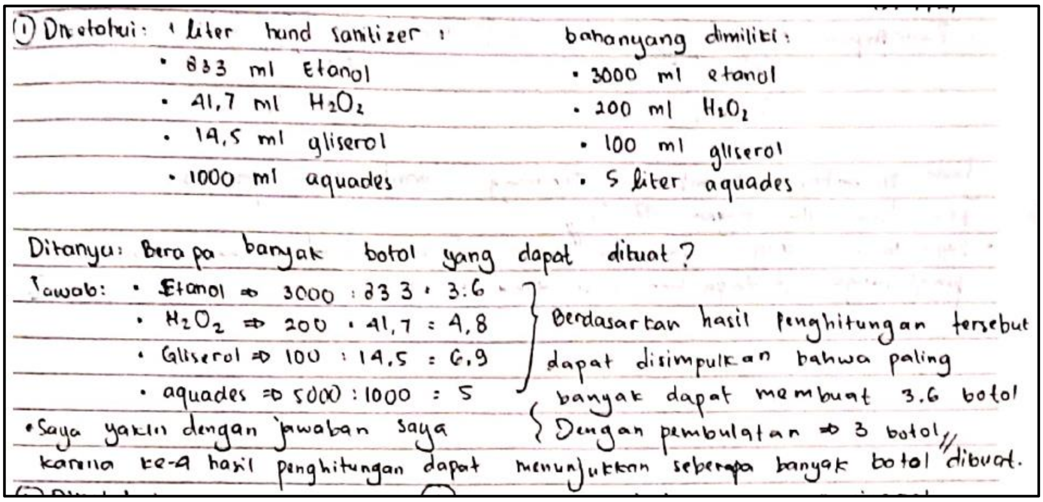
The following is an interview excerpt between the researcher (R) and E to determine E's ability to understand and evaluate mathematical ideas orally.

R *: How did you solve it?* **(I-2)**
E *: Divide the available materials with the materials needed to know how much hand sanitizer can be produced from the smallest division.* **(I-2)**
R *: Why did you use that strategy?* **(I-2)**
E *: Because this strategy is the easiest, in my opinion.* **(I-2)**
R *: Are you sure of your conclusion? Why?* **(I-2)**
E *: Actually, I'm not sure because the result of the smallest division is 3 with the remaining 501ml, and I think the hand sanitizer that can be produced is 3½ bottles. I decided to choose three bottles because if 3½ bottles, it isn't full.* **(I-2)**

Based on the results of E's work in Figure 2 code I-2 and interview excerpt, E can explain the strategy in solving math problems orally and in writing wholly and correctly. E can evaluate the results obtained associated with the given problem thoroughly and clearly, even though E is unsure of the answer. E can conclude the results obtained with three bottles, the correct answer. However, E can't explain a reasonable reason for the processes and procedures to solve the problem. E just chose that strategy because that is the most uncomplicated strategy. E confused between 3 bottles or 3,5 bottles. Finally, E decided on three bottles with a reasonable reason, that if E chose 3.5 bottles, the bottle was not full. Because E can explain the strategy clearly and evaluate the result but can't explain a reasonable reason for the procedures used, E can be implied by the indicator I-2. In line with the research result of Rohid et al. (2019), this research result states that students with high mathematical abilities can solve the problem but got difficulties expressing reasonable reasons for the procedures used orally. On the other hand, this result was contrary with some research (Disasmitowati & Utami, 2017; Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020) that state students with high mathematical abilities can explain the reasonable reason for the procedures used orally and students with high mathematical abilities can use mathematics symbols to solve problems. Based on the results of E's work that used numeric symbols and division operations to present ideas, it can be implied that E can use mathematical terms or notations to give ideas. E can fulfill indicator I-3.

Subject 2 (A)

The A' answer in Figure 3 is as follows.



Known = 1 L hand sanitizer
833 ml ethanol,
41,7 ml H_2O_2,
14,5 ml glycerol,
1000 ml aquades

owned materials:
3000 ml ethanol
200 H_2O_2
100 ml glycerol
5000 ml aquades

Asked = how many bottles can be made from the materials I have

I-1

I-2

Answer : Ethanol = 3000 : 833 = 3,6
H_2O_2 = 200 : 41,7 = 4,8
Glycerol = 100 : 14,5 = 6,9
Aquades = 5000 : 1000 = 5

Based on the results of the calculation, it can be concluded that at most can make 3.6 bottles by rounding down 3 bottles.

I am sure with my answer because the four calculation results can show how many bottles are made.

Figure 3. A' result

Figure 3 shows that A use numbers and division operations to show the ideas used. A wrote down what is asked and known in the problem and then developed the strategy used, namely dividing the composition of the ingredients she has with the composition of the ingredients needed for one bottle of hand sanitizer. After that, A chose the smallest division among the results found and rounded it down. E can also conclude what is obtained wholly and correctly. The following is an interview excerpt between the researcher (R) with A to determine A's ability to present ideas orally.

R : *What is known and asked in the problem Q1*? **(I-1)**

A : *Asked to count how many bottles of hand sanitizer can be made if the number of ingredients is generally known and the amount of ingredients available is also known.* **(I-1)**

The following is an interview excerpt between the researcher (R) with A to determine A's ability to understand and evaluate mathematical ideas orally. Based on the results of A's work in Figure 3 code I-1 and interview excerpt, A can explain what information is on the problem and what is asked on the problem orally and in full writing to fulfill indicator I-1. This research result is in line with some research (Disasmitowati & Utami, 2017; Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020) state that students with high mathematical abilities can perform written and oral mathematical communication at the stage of understanding the problem wholly and accurately.

R : *What is your strategy for solving Q1?* **(I-2)**

A : *Divide the number of materials available by the number of ingredients in general. Then conclude the answer by looking for the smallest answer*. **(I-2)**

R : *Why did you use that strategy?* **(I-2)**

A : *Because I think that strategy is the fastest.* **(I-2)**

R : *Are you sure of your conclusions? Why?* **(I-2)**

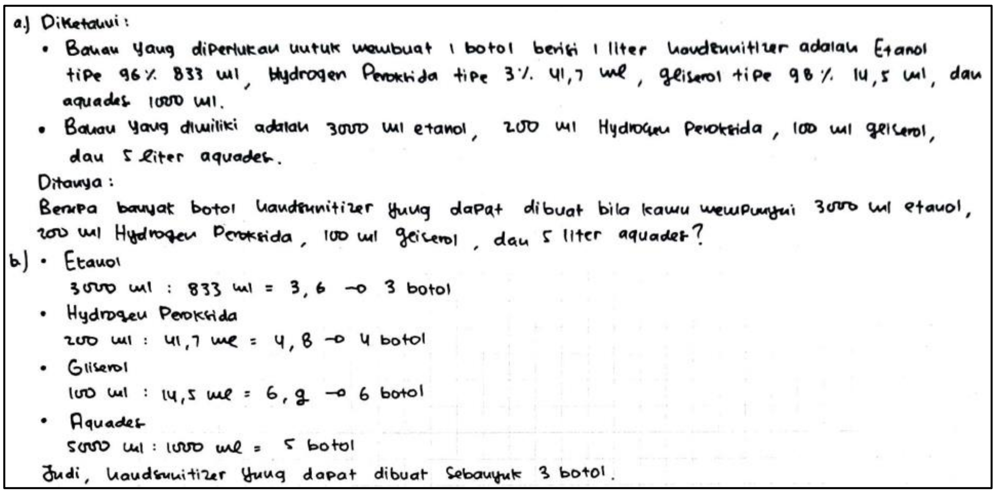
A : *Yes, I am sure. with my answer because all four calculation results can show how many bottles were made, and I checked my calculation.* **(I-2)**

Based on the results of A's work in Figure 3 code I-2 and interview excerpt, A can explain the strategy in solving math problems orally and in writing wholly and correctly. A can conclude the results obtained with three bottles, the correct answer. A can't explain a reasonable reason for the processes and procedures used to solve the problem. A just chose that strategy because that strategy is the fastest. A can evaluate the results obtained associated with the given problem. A was sure of the answer because A had rechecked her calculations. Because E can explain the strategy clearly and can evaluate the result but can't explain thoroughly a reasonable reason for the procedures used, It can be implied that A quite by the indicator I-2. In line with the research result of Rohid et al. (2019), this research result states that students with high mathematical abilities can solve the problem but got difficulties expressing the reasonable reason for the procedures used orally. On the other hand, this result was contrary to some research (Disasmitowati & Utami, 2017; Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020). They state that students with high mathematical abilities can explain the reasonable reason for the procedures used orally.

Based on the results of E's work that used numeric symbols and division operations to present ideas, it can be implied that E can use mathematical terms or notations to present ideas. E can fulfill indicator I-3. This research result is in line with some research (Disasmitowati & Utami, 2017; Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020) state that students with high mathematical abilities can use mathematics symbols to solve problems.

Subject 3 (L)

The L' answer in Figure 4 is as follows.


a.) Diketahui :
• Bahan yang diperlukan untuk membuat 1 botol berisi 1 liter handsanitizer adalah Etanol tipe 96% 833 ml, Hydrogen Peroksida tipe 3% 41,7 ml, gliserol tipe 98% 14,5 ml, dan aquades 1000 ml.
• Bahan yang dimiliki adalah 3000 ml etanol, 200 ml Hydrogen Peroksida, 100 ml gliserol, dan 5 liter aquades.
Ditanya :
Berapa banyak botol handsanitizer yang dapat dibuat bila kamu mempunyai 3000 ml etanol, 200 ml Hydrogen Peroksida, 100 ml gliserol, dan 5 liter aquades?
b.) • Etanol
3000 ml : 833 ml = 3,6 → 3 botol
• Hydrogen Peroksida
200 ml : 41,7 ml = 4,8 → 4 botol
• Gliserol
100 ml : 14,5 ml = 6,9 → 6 botol
• Aquades
5000 ml : 1000 ml = 5 botol
Jadi, handsanitizer yang dapat dibuat sebanyak 3 botol.

Known =
- The ingredients needed to make 1 bottle containing 1 liter of hand sanitizer are ethanol 96% type 833 ml, hydrogen peroxide 3% type 41,7 ml, glycerol 98% type 14,5 ml, and aquades 1000 ml.
- owned materials are 3000 ml ethanol, 200 hydrogen peroxide, 100 ml glycerol, 5000 ml aquades

Asked = how many bottles of hand sanitizer can you make if you have 3000 ml ethanol, 200 hydrogen peroxide, 100 ml glycerol, 5000 ml aquades?

I-1

- Ethanol
  3000 : 833 = 3,6
- H_2O_2
  200 : 41,7 = 4,8
- Glycerol
- 100 : 14,5 = 6,9
- Aquades = 5000 : 1000 = 5

so I can make 3 bottles of hand sanitizer.

I-2

Figure 4. L' result

Figure 4 shows that L used numbers and division operations to show the ideas used. L wrote down what is asked and known in the problem and then developed the strategy used, namely dividing the composition of the ingredients she has with the composition of the ingredients needed for one bottle of hand sanitizer. After that, L chose the smallest division result among the division results found and rounded it down. L can also conclude what is obtained correctly. The following is an interview excerpt between the researcher (R) and L to determine L's ability to present ideas orally.

R : *What is known and asked about problem Q1?* **(I-1)**
L : *The question is, how many bottles of hand sanitizer can be made if you have 3000 ml of ethanol, 200 ml of hydrogen peroxide, 100 ml of glycerol, and 5 litres of aquades? What is known is the ingredients needed to make one bottle containing 1 litre of hand sanitizer and the ingredients I have.* **(I-1)**

The following is an interview excerpt between the researcher (R) and L to determine L's ability to understand and evaluate mathematical ideas orally. Based on the results of L's work in Figure 2 code I-1 and interview excerpt, L can explain what information is on the problem and what is asked on the problem orally and in full writing to fulfill indicator I-1. This research result in line with some research (Disasmitowati & Utami, 2017; Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020) that states that students with high mathematical abilities can perform written and oral mathematical communication at the stage of understanding the problem accurately and completely.

R : *How did you solve problem Q1?* **(I-2)**
L : *The materials owned are divided by the materials for making hand sanitizers, then the most negligible value I made as to the answer. If there is a comma, I will round it down.* **(I-2)**
R : *Why did you use that strategy?* **(I-2)**
L : *Because that's the easiest way, in my opinion.* **(I-2)**
R : *Are you sure of your conclusions? Why?* **(I-2)**
L : *Sure, because I think the strategy or method I use is correct.* **(I-2)**

Based on the results of L's work in Figure 4 code I-2 and interview excerpt, L can explain the strategy in solving math problems orally and in writing correctly and completely. L can conclude the results obtained with three bottles, the correct answer. L can't explain a reasonable reason for the processes and procedures used to solve the problem. L can't evaluate the results obtained associated with the given problem. A just said that the strategy she was using was right, without a reasonable reason why she was sure of her answer. It can be implied that L is entirely by the indicator I-2. In line with Rohid et al. (2019), this research result states that students with high mathematical abilities can solve the problem but have difficulties expressing the reasonable reason for the procedures used orally and can't evaluate the results obtained. On the other hand, this result was contrary with some research (Disasmitowati & Utami, 2017; Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020). It states that students with high mathematical abilities can explain the reasonable reason and evaluate the result of mathematical ideas

Based on the results of E's work that used numeric symbols and division operations to present ideas, it can be implied that E can use mathematical terms or notations to present ideas.

E can fulfill indicator I-3. This research result is in line with some research (Disasmitowati & Utami, 2017; Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020) that states students with high mathematical abilities can use mathematics symbols to solve problems.

The following are the results of the analysis of students' mathematical communication skills in COVID-19 based on Table 2 which are summarized in Table 4.

Tabel 4. Mathematical communication skills result

Mathematical Communication indicators	E	A	L	Total	Score	Category
State mathematical ideas both orally or in writing, present and depict them visually (I-1)	2	2	2	6	100	very high
Understand and evaluate mathematical ideas both orally and in writing (I-2)	3	3	2	8	66,7	high
Use mathematical terms or notation and their structures to present ideas (I-3)	4	4	4	12	100	very high
Total	9	9	8			
Score	90	90	80			
Category	very high	very high	very high			

Based on the results of E, A, and L's work and an excerpt of interviews with E, A, and L in solving Q1 problems, in-state mathematical ideas both orally or in writing, present and depict them visually or the I-1 indicator. All students have a very high ability to identify problems. The three subjects can explain what is known and ask in full. Based on Table 4, which gets a total score of 2 for each subject in the I-1 indicator, we can conclude that students with high math abilities have very high abilities in representing mathematical ideas orally and in writing and representing them. This result research in line with some research (Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020) that states students with high mathematical abilities can perform written and oral mathematical communication at the stage express mathematical ideas accurately and completely.

In understanding and evaluating mathematical ideas orally and in writing or I2 indicator, all subjects can work on the procedure towards a mathematical solution in a complete way, with smooth answers and correct calculations. Still, all students can't explain a reasonable reason for the processes and procedures used to solve the problem. All subjects can interpret mathematical results with fluent answers and by the context, but one subject cannot fully explain the correct conclusions. Based on Table 4, which gets a score of 3 for E and A and score 2 for the I-2 indicator, we can conclude that students with high math abilities have high abilities to understand and evaluate mathematical ideas both orally and in writing. This result research in line with some research (Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020). It states that students with high mathematical abilities can evaluate mathematical ideas both orally and in writing, even though, they must be trained to be accountable for the strategies they use and the conclusions they get.

Using mathematical terms or notation and their structures to present ideas or the I-3 indicator, all subjects can use mathematical terms or notations to present ideas. Subjects use numeric symbols and division operations to present ideas. Based on Table 4, which gets a total score of 4 for each subject in the I-3 indicator, we can conclude that students with high math abilities have very high abilities in using mathematical terms or notation and their structures to present ideas. This result research in line with the resulting research (Kholil & Putra, 2019; Ma'rifah et al., 2020; Pertiwi et al., 2020; Tahmir et al., 2020; Wati et al., 2020). It states that students with high math abilities can use mathematical terms or notation and their structures to present ideas.

Generally, the high achievers have shown mathematical communication and problem-solving skills given non-routine problems. It conforms to Kholil & Putra (2019) dan Pertiwi et al. (2020), where students with high mathematics academic backgrounds could communicate their solutions and answers in solving problems. Provided with the students' academic records, teachers can infer that high achievers in mathematics can perform mathematical communication skills effectively when dealing with problem-solving. Nevertheless, the current study refutes (Rohid et al., 2019) that students with good mathematical backgrounds have less mathematical communication skills. Indeed, it must be noted that grades do not always entail efficiency, particularly with mathematical communication and problem-solving. Since communication is an integral part of solving non-routine problems (Pentang et al., 2020), teachers must work on this skill among their students to help them problem-solve while maintaining a reputable academic background.

CONCLUSION

The results of this research provide new information about the mathematical communication of students who have high mathematical abilities, so it can be one of the teacher's guidelines in determining appropriate learning to improve students' mathematical communication. Based on the results and discussion, it can be concluded that students with high achievement have high mathematical communication skills and can fulfill all indicators of mathematical communication in this study as follows : (1) can present mathematical ideas orally and in writing completely and clearly, (2) can interpret and evaluate the results obtained in writing, but less in the express reasonable reason for the procedures used orally, (3) can use terms, mathematical notation, and math symbol. This research result pro with statements that students with high mathematics academic backgrounds could communicate their solutions and answers in solving problems. Students with high achievement students can communicate and solve problems in the context of COVID-19. The limitation in this research is that it only uses three subjects and in the context of Covid-19 only. It is recommended that further research use more subjects and a variety of contexts.

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