

# Infinity

*by* Muhtarom Muhtarom

---

**Submission date:** 28-Jan-2021 02:12PM (UTC+0700)

**Submission ID:** 1496103522

**File name:** 1951-6603-1-ED.docx (481.32K)

**Word count:** 6474

**Character count:** 34919

1 **PROFILE OF PROSPECTIVE TEACHERS'**  
2 **MATHEMATICAL COMMUNICATION ABILITY**  
3 **REVIEWED FROM ADVERSITY QUOTIENT**

4 **Muhtarom<sup>1\*</sup>, Adelia Dian Pratiwi<sup>2</sup>, Yanuar Hery Murtianto<sup>3</sup>**  
5 <sup>1,2,3</sup>Program Studi Pendidikan Matematika, Universitas PGRI Semarang  
6  
7

**Article Info**

**Article history:**

**Keywords:**

adversity quotient  
student communication skills

**ABSTRACT**

Communication skills are a very important aspect that needs to be possessed by students who want to succeed in their studies, where students' mathematical communication can organize mathematical thinking both orally and in writing. While AQ is an intelligence in facing difficulties, a student must be able to face the difficulties that exist in them. This study aims to determine the profile of mathematical communication skills of prospective mathematics prospective teacher in terms of adversity quotient. This study was conducted on mathematics education students at the 6<sup>th</sup> semester of Universitas PGRI Semarang. This research is a descriptive qualitative study. Subjects taken from 57 respondents were 3 students in the category of climbers, campers, and quitters. Data collection is done by written tests and interviews. Indicators of mathematical communication skills that used in this study include drawing, writing, and mathematical expression. The results showed that subject climbers are able to meet all the indicators of mathematical communication skills and can be said to be good. Subject campers tend to be able to meet all indicators of mathematical communication skills, have the power of communication in indicators drawing and can be quite good. Quitters subject tends not to be able to meet all the communication indicators, the subject does not answer the problem in the drawing indicator, and the writing and mathematical expression indicators are still wrong.

**10**

**Corresponding Author:**

Muhtarom  
Mathematics Education,  
Universitas PGRI Semarang,  
Jl. Sidodadi Timur No. 24, Dr. Cipto Semarang, Indonesia.  
Email: [muhtarom@upgris.ac.id](mailto:muhtarom@upgris.ac.id)

**How to Cite:**

Muhtarom, M., Pratiwi, A. D., and Murtianto, Y. H. (2021). Mathematics communication skills profile of prospective mathematics teachers reviewed from Adversity Quotient. *Infinity*, X(X), XX-XX.

8  
9 **1. INTRODUCTION**

10 The 21st century is a century marked by the occurrence of a massive transformation  
11 from an agrarian society to an industrial society and continues to a knowledgeable society  
12 (Soh, Arsad, & Osman, 2010). Life in the 21st century requires a variety of skills that must  
13 be mastered by someone, education <sup>1</sup> becoming increasingly important to ensure students  
14 have learning and innovation skills, skills to use technology and information media, and can  
15 work, and survive using life skills <sup>2</sup> (Wijaya, Sudjimat, Nyoto, & Malang, 2016).

16 Scott (2015) states in the International Commission on Education for the Twenty-  
17 first Century proposes four visions of learning, namely knowledge, understanding,  
18 competence for life, and competence to act. In addition to this vision, four principles known

1 as the four pillars of education are formulated, namely learning to know, learning to do,  
2 learning to be and learning to live together. Fridanianti, Purwati & Murtianto (2018) state  
3 that strengthening character education in schools must be able to foster student character to  
4 be able to think critically, creatively, be able to communicate, and collaborate, who are able  
5 to compete in the 21st century. This is in accordance with the four competencies that students  
6 must have in the 21st century which is called 4C, namely critical thinking and problem  
7 solving, creativity, communication skills, and the ability to work together.

8 Communication is one of the skills in Learning to do, oral and written  
9 communication skills contribute to career development in the 21st century. The results of an  
10 analytical study conducted by Wardhani & Rumiati (Salam, 2017), the cause of the low  
11 mathematics achievement of Indonesian students in the 2015 TIMSS results is due to the  
12 weakness of Indonesian students in working on questions that require several abilities, one  
13 of the abilities needed is the ability to communicate in mathematics. This can be caused by  
14 student confusion in presenting ideas or ideas in the form of symbols, graphs, tables or other  
15 media to clarify math problems. The results of the 2018 PISA assessment (Nugrahanto &  
16 Zuchdi, 2019) show that the mathematical abilities of students in Indonesia are still low. One  
17 of the low mathematical abilities is mathematical communication skills, this can be caused  
18 by student confusion in presenting ideas or ideas in the form of symbols, graphs, tables or  
19 other media to clarify mathematical problems. Ulfa, Buchori & Murtianto (2017) stated that  
20 in general the process of learning mathematics in the classroom is teacher-centered. This is  
21 in line with Hampson, Patton & Shanks (2011) who state that high-quality teachers are those  
22 who have a strong influence on student achievement.

23 The ability to communicate in learning activities is said to be good if the ability of a  
24 teacher and lecturer to create a communicative climate, where between lecturers and students  
25 or teachers with students as subjects are actively involved in learning activities, both verbally  
26 and nonverbally, in other words this communicative climate as a vehicle for the  
27 implementation of learning in accordance with the design and achieving learning objectives  
28 (Son, 2015). It would be better if the provision of mathematical communication skills is  
29 integrated in every lecture. To realize good students' mathematical communication skills  
30 given by the teacher, trained or prepared since becoming prospective teacher. Son (2015)  
31 also adds, of course it is not effective and efficient if prospective mathematics teacher  
32 students only get a theory of mathematical communication in a subject without getting  
33 enough opportunities to practice it, it would be better if the provision of mathematical  
34 communication skills is integrated in every lecture. Hapsari, Nizaruddin & Muhtarom (2019)  
35 state that teachers play a very important role in improving the quality of learning and learning  
36 outcomes that will be achieved by students before going to a higher level.

37 Many students still have imperfect mathematical communication skills. Paradesa &  
38 Ningsih (2017) states that the ability of students in the aspect of mathematical  
39 communication seen from the ability to provide mathematical evidence in the form of facts  
40 and data is still experiencing difficulties. If it is related to the problem of mathematical  
41 communication skills, the type of intelligence can be used, namely Adversity Quotient(AQ).  
42 AQ is often identified with fighting power against adversity. AQ is considered to be able to  
43 support student success in increasing achievement motivation.

44 Many studies have been conducted to see the effect of AQ, including: Hidayat,  
45 Herdiman, Aripin, Yuliani & Maya (2018) who try to improve AQ and student teacher  
46 student mathematical creative reasoning, stating that AQ has a positive influence on the  
47 development of students' mathematical creative reasoning abilities prospective teacher.  
48 Kartika & Yazidah (2019) also tried to analyze the ability of mathematical proof in real  
49 analysis courses based on AQ, stating that climbers' students are more able to compile direct  
50 evidence than quitters and campers students. Paramita (2017) also conducted research on

1 mathematical communication skills in terms of AQ through the application of the SCSS  
2 learning model in students class VIII, showing that quitters tend not to be able to meet all  
3 indicators of mathematical communication skills, campers subject tends to be able to fulfill  
4 two indicators, namely the ability to state a situation to in mathematical language and the  
5 ability to visualize mathematical ideas, the climbers subject was able to fulfill all indicators.  
6 Yuniarti (2015) also conducted research on the analysis of the results of the diagnostic  
7 assessment of mathematical communication skills in Osborn learning based on AQ, and the  
8 results showed that the quitter category student subjects had not been able to fulfill almost  
9 every mathematical communication indicator, the camper category was quite capable in  
10 several indicators of mathematical communication, and the climber category.

11 Based on the above explanation that AQ has a significant effect in determining the  
12 success of students' mathematical communication skills, therefore the mathematical  
13 communication skills of students who have high AQ or students with climbers level will be  
14 different from the mathematical communication skills of students who have AQ at the  
15 campers and quitters level. Thus the purpose of this study is to determine and investigate in  
16 depth the AQ profile of prospective mathematics teacher students on mathematical  
17 communication skills.

## 18 2. METHOD

19 The method used in this research is descriptive qualitative research method using  
20 written and oral data. Because when the research was being carried out, it was during the  
21 Covid-19 pandemic, social distancing, and work from home, so this research was carried out  
22 online, where the AQ questionnaire was filled out via google form, and a written test of  
23 mathematical communication was carried out via the WhatsApp group video call, while  
24 interviews were conducted via Whatsapp call. The subjects defined in this study were 3  
25 students at 6<sup>th</sup> semester of the Mathematics Education Study Program of the Universitas  
26 PGRI Semarang class of 2017 including one student with AQ quitters, one student with AQ  
27 campers, and one student with AQ climber. This study used purposive sampling. Sugiyono  
28 (2016) states that purposive sampling is a technique of sampling data sources with certain  
29 considerations, with the consideration that the person we choose is considered to know best  
30 about what we expect, making it easier for researchers to explore the object or social situation  
31 under study.

32 The instruments used in this study included the AQ questionnaire, the mathematical  
33 communication skills test sheet, and the interview guide. The AQ questionnaire for sixth  
34 semester mathematics education students was given to two classes via google form and  
35 obtained 57 respondents. The AQ questionnaire instrument was adapted by Stoltz (2000)  
36 and has been validated by one counseling lecturer and three mathematics lecturers at the  
37 Universitas PGRI Semarang. This questionnaire was conducted to select 3 students with the  
38 categories quitters (MM), campers (KAL), and climbers (NDC). In this study, the climber  
39 subject was taken with the highest questionnaire score in the climbers category, the camper  
40 subject was taken with the middle questionnaire score in the campers' category, and the  
41 quitter subject was taken with the lowest questionnaire score in the quitters' category.

42 After determining each subject in the AQ category, then an online written test was  
43 carried out through the WhatsApp video call group for students who had the intelligence of  
44 quitters, campers, and climbers. The questions given consist of one story item on calculus  
45 material, which has been validated by three mathematics lecturers. Indicators of  
46 mathematical communication skills used include: 1) Writing, which is to provide answers  
47 using your own language or problems using writing and algebra, listening to, discussing and  
48 writing about mathematics, and being able to explain ideas or situations from a picture or  
49 graphic with words itself in writing. 2) Drawing, namely reflecting real objects, pictures, and

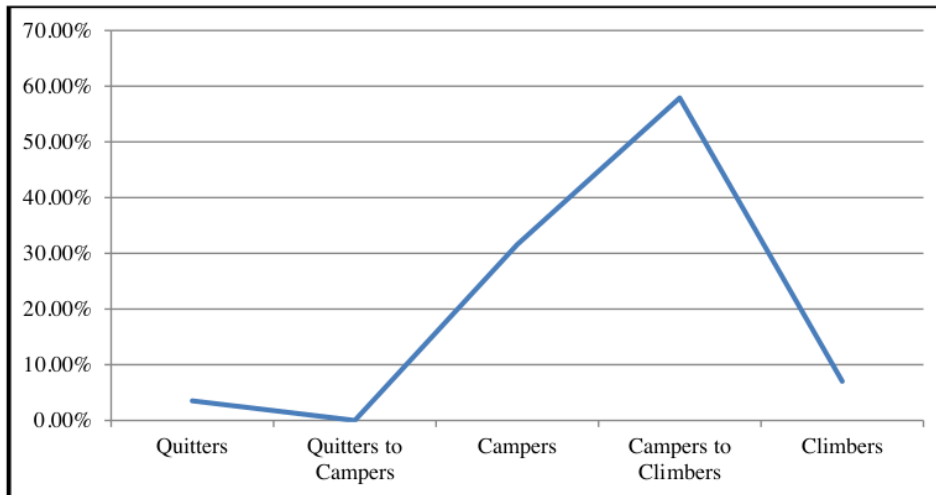
1 diagrams into mathematical ideas and vice versa, and expressing a situation with pictures or  
 2 graphs. 3) Mathematical expressions, namely expressing mathematical concepts by  
 3 expressing everyday events in mathematical language or symbols, and expressing a situation  
 4 in the form of a mathematical model. Before conducting the interview, the researcher  
 5 checked back one by one the answers of each subject and checked the location of the truth  
 6 and error in each indicator of mathematical communication.

7 Interviews were conducted online via WhatsApp calls to get more in-depth  
 8 information about the mathematical communication forms possessed by these students. The  
 9 interview instrument was validated by three mathematics lecturers. The interviews were  
 10 conducted for approximately 10-20 minutes. To maintain the validity of the data in this  
 11 study, triangulation was used. The triangulation used was method triangulation. After  
 12 obtaining the results of the analysis of the written test answers and the interview data  
 13 analysis, then a comparison is made to determine whether the data obtained is valid or not.  
 14 And the result states that all data for climbers, campers, and quitters subject can be said to  
 15 be valid.

16 **3. RESULTS AND DISCUSSION**

17 **3.1. Results**

18 The first step was to determine the students as categories climbers, campers, and  
 19 quitters. From the AQ questionnaire that has been distributed, it was obtained from 57  
 20 respondents that 3.51% of students with AQ quitters, 0% of students with AQ quitters to AQ  
 21 campers, 31.58% of students with AQ campers, 57.89% of students with AQ campers to AQ  
 22 climbers, and 7.02% of students with AQ climbers as in the following Figure 1.  
 23

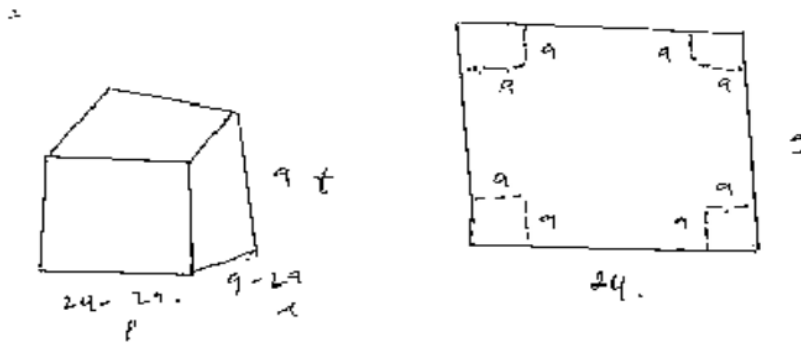


24 **Figure 1.** Graph of the Number of Students for Each AQ

25  
 26  
 27 After selecting 3 students with the categories climbers, campers, and quitters, then  
 28 the three students were given questions on communication skills tests and interviews.  
 29 Instruments used for mathematical communication skills include drawing, writing, and  
 30 mathematical expression.  
 31  
 32

1 **3.1.1. NDC Subject**

2 The NDC subject fulfills following the indicators of mathematical communication  
 3 drawing skills as shown in Figure 2. NDC subject can state the problem in the form of an  
 4 image correctly and accurately and provide information on the length, width, and height of  
 5 the problem in the question.



6

7

**Figure 2.** Answers to drawing the NDC subject

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

Based on the results of the interviews conducted, the NDC subject is able to meet the indicators of mathematical drawing communication skills and can smoothly explain problems into the form of images correctly and accurately and is able to smoothly explain the length, width, and height of the drawings he has made in his answer sheet. An excerpt from the interview with the NDC subject is presented as follows:

Researcher : What steps do you take?

NDC : This is what is asked for the maximum volume, so the first thing to do is to draw a square first, there are 4 edges, so all of them are cut, so it turns out to be a picture that is  $24-2a$  in length,  $9-2a$  in width and a height.

The NDC subject fulfills following the indicators of mathematical communication writing skills as shown in Figure 3. NDC subjects can use mathematical language appropriately and correctly, and are able to explain ideas or situations from images that have been made previously in their own words in writing. The subject takes his own side in written form, the subject considers the side of the square which is cut off with the symbol "a", and also write an explanation in determining the interval "a" correctly.

Dikisahkan sisi persegi dipotong idenya adalah a.  
 Maka panjang =  $24-2a$ , lebar =  $9-2a$  dan tinggi a.  
 Volume maksimal diperoleh dengan  $U' = 0$ .  
 Untuk interval a adalah  $0 < a < 4,5$ ,  
 karena tinggi = a maka  $a < 0$   
 $lebar = 9 - 2a = 0$   
 $9 = 2a$   
 $4,5 = a$ .

24

25

**Figure 3.** Answers to writing the NDC subject

1 Based on the results of the interviews conducted, the NDC subject is able to meet the  
 2 indicators of writing mathematical communication skills and can explain fluently an idea or  
 3 situation from a previously made image and can also explain the example of the square side  
 4 used, and be able to state and explain how to determine the interval to meet the volume  
 5 maximum sought. Here are excerpts of interviews with the subject NDC:

6 Researcher : Yes... Then after that?

7 NDC : So after that, suppose the square side is cut identically is "a", then the length is  
 8  $24-2a$ , the width is  $9-2a$  and the height is "a".

9 Researcher : Then how to determine the maximum volume how?

10 NDC : To determine the maximum volume with  $V' = 0$

11 Researcher : Yes... continue?

12 NDC : To determine the a interval it is  $0 < a < 4.5$

13 Researcher : The reason?

14 NDC : You see, so there is a value, sis, the height is a, then the "a" is less than 0.

15 Researcher : Where did you determine the 4.5 from?

16 NDC : That's from the width, the width is  $9-2a = 0$ , we move the segment so  $9/2 = a$ ,  
 17 so  $4.5 = a$ .

19 The NDC subject fulfills the following indicators of mathematical communication  
 20 mathematical expression skills as shown in Figure 4. NDC subjects can state mathematical  
 21 solutions in writing clearly and precisely, are able to use mathematical symbols and perform  
 22 calculations or get complete and correct solutions. The subject is able to determine the length  
 23 of the shape she has previously made with the values  $24 - 2a$ , and for the width  $9 - 2a$ , and  
 24 the height a. Then the subject is able to write the volume formula used with  $V = p.l.t$ , the  
 25 subject is also able to apply the first derived properties with  $V' = 0$  and is able to determine  
 26 the value "a" that meets the maximum volume sought, and performs calculations correctly  
 27 both in calculating the initial volume, determine the equation  $V'$ , find the value of a, and  
 28 determine the maximum volume.

$$\begin{aligned}
 V &= p \times l \times t \\
 &= (24-2a)(9-2a)(a) \\
 &= (24-2a)(9a-2a^2) \\
 &= 4a^3 - 66a^2 + 216a \\
 V' &= 0 \\
 12a^2 - 152a + 216 &= 0 \quad :12 \\
 a^2 - 11a + 18 &= 0 \\
 (a-2)(a-9) &= 0 \\
 a=2 \quad \vee \quad a=9 \\
 \downarrow \\
 (TM)
 \end{aligned}$$

$$\begin{aligned}
 V_{\text{maks}} &= p \times l \times t \\
 &= (24-2a)(9-2a)(a) \\
 &= (24-2(2))(9-2(2))(2) \\
 &= (24-4)(9-4)(2) \\
 &= (20)(5)(2) \\
 &= 200 \text{ cm}^3
 \end{aligned}$$

29  
 30 **Figure 4.** Answers to mathematical expression the NDC subject

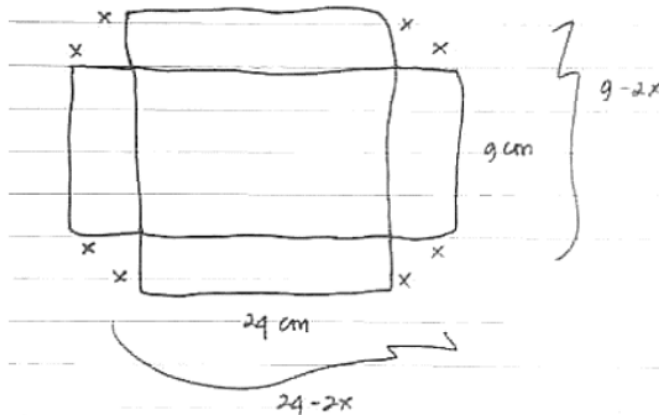
31 Based on the results of the interviews conducted, the NDC subject is able to meet the  
 32 indicators of mathematical expression and can explain mathematical solutions clearly and  
 33 precisely, and is able to explain mathematical calculations and correct answers. An excerpt  
 34 from the interview with the NDC subject is presented as follows:

35

- 1 Researcher : What do you do after that?  
 2 NDC : I determine the volume first, the volume formula is p.l.t, now enter the length  
 3 is  $24-2a$ , the width is  $9-2a$ , the height is  $a$ , after that we operate the volume, the  
 4 result is  $4a^3 - 66a^2 + 216a$  .  
 5 Researcher : Then what is the next step?  
 6 NDC : So after that, determine the maximum volume with  $V'=0$ , now determining  $V''=$   
 7  $0$ , we will derive it from the result of the volume which was  $12a^2 - 132a +$   
 8  $216 = 0$ , so continue to divide by 12, now the result is it is equal to 2 or a is  
 9 equal to 9, now for  $a = 9$  it does not meet.  
 10 Researcher : Why not fulfill that for what reason?  
 11 NDC : Because the interval was less than 4.5.  
 12 Researcher : How do you continue to determine the maximum volume?  
 13 NDC : Now the maximum volume uses the formula, which is length times width times  
 14 height, now we enter the one that is known to be  $24-2a$  in length,  $9-2a$  in width,  
 15 the height is "a". That's what  $V''= 0$  has already been obtained which is equal  
 16 to 2, continue to be added to the formula so the maximum volume is  $200\text{cm}^3$  .

17 **3.1.2. KAL Subject**

18 The KAL subject fulfills the following indicators of mathematical communication  
 19 drawing skills as shown in Figure 5. KAL subjects can state the problem in the form of an  
 20 image correctly and precisely and are able to provide information on the length, width, and  
 21 height of the problem in the question.



22  
 23 **Figure 5.** Answers to drawing the KAL subject

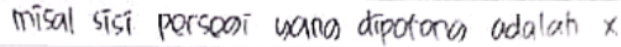
24 Based on the results of the interviews conducted, the subject of KAL is able to meet  
 25 the indicators of mathematical communication skills of drawing and can explain problems  
 26 into the form of images correctly and accurately and is able to explain the length, width, and  
 27 height of the drawings he has made. An excerpt from the interview with the NDC subject is  
 28 presented as follows:

29 Researcher : Explain the picture that you have made.

30 KAL : You draw it, the length is 24, now the width is 9, cut into a square, for example,  
 31 the square is  $x$ , the right and left square is 2, so  $24-2x$  is the length, now the  
 32 width is the same, it makes  $9-2x$ , keep making the height earlier was the  $x$ .  
 33



1 It is clearly Figure 6 shows that the results of the written work of the KAL subject on  
 2 the indicators of mathematical communication writing skills. KAL subject can use  
 3 mathematical language correctly, and is able to explain ideas or situations from images that  
 4 have been previously made in their own words in written form but are still incomplete. The  
 5 KAL subject takes the cut side of the square with the symbol "x". However, the KAL subject  
 6 did not specify the interval of "x".

7  misal sisi persegi yang dipotong adalah x

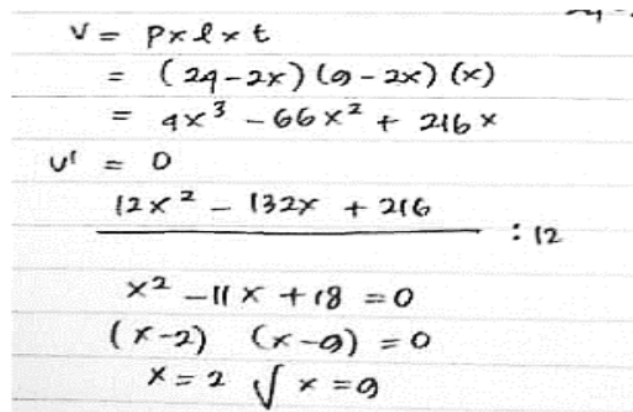
8 **Figure 6.** Answers to writing the KAL subject

9 Based on the results of the interviews conducted, the KAL subject was able to meet  
 10 the indicators of writing mathematical communication skills and was able to explain ideas  
 11 or situations from images that had been previously made but were still incomplete, because  
 12 the KAL subject only explained for example the cut side of the square, namely x, but had  
 13 not explained the interval from x itself. An excerpt from the interview with the NDC subject  
 14 is presented as follows:

15 Researcher : Explain the picture that you have made.

16 KAL : You draw it, the length is 24, now the width is 9, cut it into a square, let's say  
 17 that a square is x.

18  
 19 It is clearly Figure 7 shows that the results of the written work of the KAL subject on  
 20 the indicators of mathematical communication expression skills. The subject of KAL can  
 21 clearly state mathematical solutions in writing, can use mathematical symbols, and perform  
 22 calculations but is still incomplete. The subject is able to determine the length of the shape  
 23 he made previously with the values  $24 - 2x$ , and for the width  $9 - 2x$ , and the height a. Then  
 24 the KAL subject is able to write the volume formula used with  $V = p.l.t$  and its calculations,  
 25 the subject is also able to apply the first derivative with  $V' = 0$ , but the KAL subject cannot  
 26 determine the maximum volume of the given problem.

27 

$$\begin{aligned}
 V &= p \times l \times t \\
 &= (24 - 2x)(9 - 2x)(x) \\
 &= 4x^3 - 66x^2 + 216x \\
 V' &= 0 \\
 12x^2 - 132x + 216 & \quad : 12 \\
 x^2 - 11x + 18 &= 0 \\
 (x - 2)(x - 9) &= 0 \\
 x = 2 \quad \vee \quad x = 9
 \end{aligned}$$

28 **Figure 7.** Answers to mathematical expression the KAL subject

29 Based on the results of the interviews conducted, the KAL subject is able to meet the  
 30 indicators of mathematical expression communication skills and can explain the solution,  
 31 but the KAL subject cannot determine the maximum volume of the given problem, the  
 32 subject has tried to calculate the maximum volume but the result is negative, this is because

1 the subject did not previously specify the x interval. An excerpt from the interview with the  
 2 NDC subject is presented as follows:  
 3 Researcher : After you draw, what steps do you take?  
 4 KAL : Finding the volume.  
 5 Researcher : How?  
 6 KAL : Use that formula, it means that the length times the width times the height, put  
 7 in  $(24-2x)(9-2x)(x)$ . Now the result is  $4x^3 - 66x^2 + 216x$ , now it's lowered.  
 8 Researcher : Continue  
 9 KAL : The result means  $12x^2 - 132x + 216$ .  
 10 Researcher : Then what is the next step?  
 11 KAL : That can be simplified, so it's  $x^2 - 11x + 18$ .  
 12 Researcher : Continue  
 13 KAL : So you get  $x = 2$  or  $x = 9$ .  
 14 Researcher : Then after that?  
 15 KAL : So I just got there, sis.  
 16 Researcher : Why is the deck just that way?  
 17 KAL : The problem was that I tried to enter it, but the results were both negative.  
 18 Researcher : That means what you are doing only up to here?  
 19 KAL : Yes, Miss. It means that the maximum volume has not been obtained. It hasn't  
 20 reached the final result value.

21 **3.1.3. MM Subject**

22 The subject of MM did not fulfill the mathematical communication indicators of  
 23 drawing in solving the problem. Subject did not present the data or information from the  
 24 question in the form of an image. MM subject could not write an explanation of the answer  
 25 to the problem mathematically and did not use mathematical language or symbols  
 26 appropriately and correctly. Figure 8 showed that MM subject is less able to express  
 27 mathematical solutions in writing, and perform calculations but is wrong, because the MM  
 28 subject solves the problem not with the volume block formula but by using the rectangular  
 29 formula and the determination of the length and width values is still wrong.

Jawab :  $p \times l$   
 $= 24 \text{ cm} \times 9 \text{ cm}$   
 $= 216 \text{ cm}^2$

30

31 **Figure 8.** Answers to mathematical expression the MM subject

32 Based on the results of the interviews conducted, the MM subject is not able to meet  
 33 the indicators of mathematical communication skills in mathematical expression and the  
 34 MM subject explains mathematical solutions according to the answer sheet but the answer  
 35 is still wrong, the MM subject is also still hesitant in answering what shapes roughly  
 36 correspond to the problem in question. An excerpt from the interview with the NDC subject  
 37 is presented as follows:

38 Researcher : What is the next step after you know what was being asked?  
 39 MM : I multiplied the length times the width.  
 40 Researcher : What do you think it is up to?  
 41 MM : Square  
 42 Researcher : Square? Square or shape?  
 43 MM : Square ... rectangle.

1 Researcher : Then you count the volume of the rectangle how it is?  
2 MM : Length by width. The maximum volume is 216 cm<sup>2</sup>.

3 Data were also collected through in-depth interviews with the subjects of climbers  
4 (NDC), campers (KAL), and quitters (MM). Written test results data were compared with  
5 interview data to obtain valid data. From the research results written tests and interviews  
6 conducted by climbers subjects met all indicators of mathematical communication skills  
7 used, campers subjects tended to be able to meet all indicators of mathematical  
8 communication skills used, while quitters subjects were unable to meet all indicators of  
9 mathematical communication skills used.

### 10 **3.2. Discussion**

11 From the results of the tests and interviews, the researcher observed that the data  
12 obtained was sufficient, so the written test and interview were not continued to the next  
13 stage. From the analysis of written tests and interviews of mathematical communication  
14 skills, the following results are obtained:

#### 15 **3.2.1. Mathematics prospective teacher with AQ climbers**

16 Based on the results of the description and analysis of the written test results, the  
17 prospective teacher with the AQ climbers category can meet all indicators of mathematical  
18 communication skills used by the researcher, including drawing, writing, and mathematical  
19 expression. Prospective teacher with AQ climbers are able to express and describe  
20 mathematical ideas in the form of pictures, AQ climbers are able to provide answers using  
21 their own language or problems using writing and algebra, and are able to explain ideas or  
22 situations from an image or graph with own words in written form. Prospective teacher with  
23 AQ climbers is able to state a situation in the form of a mathematical model, and is able to  
24 perform mathematical calculations correctly.

25 This is in line with Nartani, Hidayat, and Sumiyati (2015) improving the  
26 communication skills of mathematics indicated by students are able to express ideas or ideas  
27 with mathematics verbally sentence, students are actively involved in discussions about  
28 math, students can formulate definitions and generalizations about the math, students can  
29 formulate a definition of mathematics by using its own words. Mathematical communication  
30 skills are shown by students being able to express ideas or ideas with mathematical sentences  
31 verbally, students are actively involved in discussions about mathematics, students can  
32 formulate definitions and generalizations about mathematics, students can formulate  
33 mathematical definitions using their own words. This is also in line with Ansari (2012) who  
34 states that drawing communication skills are reflecting real objects, drawings and diagrams  
35 into mathematical ideas, writing is stating and explaining a mathematical drawing or model  
36 into a mathematical idea form, mathematical expression is express a situation or  
37 mathematical idea into a symbol or mathematical model and solve it. It can be concluded  
38 that the prospective teacher AQ climbers is able to meet all indicators of mathematical  
39 communication skills of drawing, writing, and mathematical expression. Stoltz (2000) states  
40 that the subject of climbers is a group of people who always try to reach the peak of success,  
41 are ready to face any obstacles, and always raise themselves to success.

42 This research is in line with the research of Paramita (2017), Kartika & Yazidah  
43 (2019), and Yuniarti (2015). In Paramita's research (2017) which states that the climbers  
44 subject is able to meet all indicators of mathematical communication skills including the  
45 ability to state a situation in mathematical language, the ability to describe mathematical  
46 ideas visually, the ability to explain mathematical ideas in writing, and the ability to evaluate  
47 mathematical ideas in writing. In Kartika & Yazidah's research (2019), which states that

1 climbers students are more able to compile direct evidence than quitters and campers  
 2 students. In research Yuniarti (2015) also states that the climber category is capable of almost  
 3 all indicators of mathematical communication.

4 **3.2.2. Mathematics prospective teacher with AQ campers**

5 Based on the results of descriptions and analysis of written test results, prospective  
 6 teacher with the AQ campers category tend to be able to meet all indicators of mathematical  
 7 communication skills used by researchers, including drawing, writing, and mathematical  
 8 expression. Prospective teacher with AQ campers are able to state, express and describe  
 9 mathematical ideas in the form of images. AQ campers tend to be able to provide answers  
 10 in their own language or problems using writing and algebra, and are able to explain ideas  
 11 or situations from an image or graphic In their own words in written form. Prospective  
 12 teacher with AQ campers tend to be able to state a situation in the form of a mathematical  
 13 model, but have not been able to complete it completely in finding the maximum volume  
 14 value requested in the problem. This is in line with Nartani, Hidayat, and Sumiyati (2015)  
 15 improving the communication skills of mathematics indicated by students are able to express  
 16 ideas or ideas with mathematics verbally sentence, students are actively involved in  
 17 discussions about math, students can formulate definitions and generalizations about the  
 18 math, students can formulate a definition of mathematics by using its own words. This is  
 19 also in line with Ansari (2012) who states that drawing communication skills are reflecting  
 20 real objects, drawings and diagrams into mathematical ideas, writing is stating and  
 21 explaining a mathematical drawing or model into a mathematical idea form, mathematical  
 22 expression is express a situation or mathematical idea into a symbol or mathematical model  
 23 and solve it.

24 It can be concluded that the AQ campers tends to be able to meet all indicators of  
 25 mathematical communication skills of drawing, writing, and mathematical expression. Stoltz  
 26 (2000) stated that campers are a group of people who still have the **desire to respond to**  
 27 **existing challenges, but do not reach the peak of success and easily give up on what has been**  
 28 **achieved**. Stoltz (2000) also adds that campers do not fully exploit their potential, campers  
 29 have a limited ability to change, especially major changes, campers live with the belief that  
 30 after several years or after making a number of efforts, life should be relatively free of  
 31 difficulties.

32 In this study, new things were found because the subject of AQ campers tended to  
 33 meet all indicators of mathematical communication skills of drawing, writing, and  
 34 mathematical expression. This is not in line with previous research conducted by Paramita  
 35 (2017) and Yuniati (2015). In Paramita's (2017) research which states that campers tend to  
 36 be able to fulfill two indicators, namely the ability to express a situation in mathematical  
 37 language and the ability to visualize mathematical ideas only, and in Yuniarti's (2015) study  
 38 which states that the camper category is quite capable in several communication indicators.  
 39 Mathematically and the category of campers make process errors and conclusion errors.

40 **3.2.3. Mathematics prospective teacher with AQ quitters**

41 Based on the results of descriptions and analysis of written test results, the  
 42 prospective teacher with the AQ quitters category cannot meet all indicators of mathematical  
 43 communication skills used by researchers, including drawing, writing, and mathematical  
 44 expression. AQ quitters is not able to meet all indicators of mathematical communication  
 45 skills of drawing, writing, and mathematical expression. Stoltz (2000) states that quitters are  
 46 **a group of people who prefer to avoid and reject opportunities, easily give up, give up easily,**  
 47 **tend to be passive, and are not enthusiastic about reaching the peak of success.** Stoltz (2000)  
 48 also adds that quitters have limited abilities in facing adversity, quitters tend to resist change

1 and claim its every success, or to avoid it and actively walk away from it. This is in line with  
 2 Supardi (Azzura, 2017) that the subject of quitters tends to think that the difficulties that  
 3 arise will continue to occur, so that they are constantly overshadowed by obstacles that often  
 4 arise, every difficulty, the cause is also considered something that will continue to appear  
 5 again in the future. It is proven in this study that the quitters subject is not able to meet all  
 6 the indicators requested by the researcher.

7 This study is in line with the research of Paramita (2017), and Yuniarti (2015). In  
 8 Paramita's research (2017) which states that quitters are not able to fulfill all indicators of  
 9 mathematical communication skills, including the ability to express a situation in  
 10 mathematical language, the ability to visualize mathematical ideas, the ability to explain  
 11 mathematical ideas in writing, and the ability to evaluate mathematical ideas in writing .  
 12 Yuniarti's research (2015) also states that the quitter category has not been able to meet  
 13 almost every mathematical communication indicator and almost all types of errors occur in  
 14 the quitters category. This is consistent with the results of this study where the quitters  
 15 subject is not able to meet all indicators of mathematical communication skills including  
 16 drawing, writing, and mathematical expression.

17 The results of this study finally produce a summary of the understanding of  
 18 mathematical communication skills of prospective mathematics teachers in terms of AQ, as  
 19 shown in the following Table 4.

20 **Table 4.** Summary of Mathematical Communication Skills

No	Aspect	Indicator	Category		
			AQ Climbers	AQ Campers	AQ Quitters
1.	<i>Drawing</i>	The ability to express, express and describe mathematical ideas in the form of pictures, graphs or visual mathematical models.	Fulfilled	Fulfilled	Not Fulfilled
2.	<i>Writing</i>	The ability to provide answers using your own language or problems using writing and algebra, and to explain an idea or situation from a picture or graphic in your own words in written form.	Fulfilled	Fulfilled	Not Fulfilled
3.	<i>Mathematical Expression</i>	The ability to express mathematical concepts by expressing everyday events in mathematical language or symbols, and expressing a situation in the form of a mathematical model	Fulfilled	Almost Fulfilled	Not Fulfilled

21 Table 4 shows that the results of the study show that the subjects of prospective  
 22 mathematics teachers who have AQ climbers and AQ campers are able to meet all indicators  
 23 of mathematical communication skills, indicators of mathematical communication skills  
 24 used include drawing, writing, and mathematical expression, while the subject of  
 25

1 mathematics prospective teacher. Those who have AQ quitters are not able to meet all  
2 indicators of mathematical communication skills, indicators of mathematical  
3 communication abilities used include drawing, writing, and mathematical expression. The  
4 results of each individual in communicating the problems obtained are in accordance with  
5 their AQ. This is in line with Syarifah, Sujatmiko, and Setiawan (2017), mathematical  
6 communication is the process of expressing mathematical ideas and understanding verbally,  
7 visually, and in writing, using numbers, symbols, pictures, graphs, diagrams, and words.  
8 someone. The results of this study are also in line with Nopiyani, Turmudi & Prabawanto  
9 (2016), mathematical communication is the ability to express mathematical ideas or ideas  
10 either in writing or in pictures. This is also in line with Murtafiah (2016) that mathematical  
11 communication is the ability to express mathematical ideas through speech, writing,  
12 demonstrations, and visually depicting them in different types for each person.

#### 13 4. CONCLUSION

14 Based on the results of research and discussion that has been done with the subject  
15 of climbers, the conclusion is that students are able to solve problems using mathematical  
16 communication properly and correctly. Of the three indicators of communication the subject  
17 is able to meet all the indicators of mathematical communication used. The subject of  
18 campers is quite capable of solving mathematical communication problems properly and  
19 correctly, but there are calculations in resolving incomplete problems. Of the three indicators  
20 of communication the subject tends to be able to meet all the indicators of mathematical  
21 communication used. The subject of quitters has not been able to solve problems using  
22 mathematical communication properly. Of the three stages of communication, the subject  
23 tends not to be able to meet all the indicators of mathematical communication used. Based  
24 on the results and conclusions of this study, the following suggestions can be made: to  
25 examine more deeply about mathematical communication with the factors that influence  
26 students. In addition, it is also based on conducting further research using other types of data  
27 based on the findings in this study.

#### 28 REFERENCES

- 29 Ansari, B. (2012). *Komunikasi matematik dan politik*. Banda Aceh: Yayasan Pena.
- 30 Azzura, L. (2017). *Hubungan antara Self Efficacy dengan Adversity Quotient pada siswa*  
31 *kelas XI SMKN 3 Medan (Doctoral Dissertation)*. Medan: Universitas Medan.
- 32 Fridanianti, A., Purwati, H., & Murtianto, Y. H. (2018). Analisis kemampuan berpikir kritis  
33 dalam menyelesaikan soal aljabar kelas VII SMP N 2 Pangkah ditinjau dari gaya  
34 kognitif reflektif dan kognitif impulsif. *Aksioma: Jurnal Matematika dan Pendidikan*  
35 *Matematika*, 9(1), 11-20.
- 36 Hampson, M., Patton, A., & Shanks, L. (2011). *Ten ideas for 21st century education*.  
37 London: Innovation Unit.
- 38 Hapsari, V. S., Nizaruddin, N., & Muhtarom, M. (2019). Kemampuan representasi  
39 matematis siswa SMP pada mata pelajaran bangun ruang sisi datar. *Imajiner: Jurnal*  
40 *Matematika dan Pendidikan Matematika*, 1(6), 267-278.
- 41 Hidayat, W., Herdiman, I., Aripin, U., Yuliani, A., & Maya, R. (2018). Adversity Quotient  
42 (AQ) dan penalaran kreatif matematis mahasiswa calon guru. *Jurnal Elemen*, 4(2),  
43 230-242.

- 1 Kartika, E. D., & Yazidah, N. I. (2019). Analisis kemampuan pembuktian matematis pada  
2 mata kuliah Analisis Real berdasarkan Adversity Quotient. *Jurnal Pendidikan*  
3 *Matematika*, 3(2), 152-157.
- 4 Murtafiah, W. (2016). Kemampuan komunikasi matematika mahasiswa calon guru  
5 matematika dalam menyelesaikan masalah persamaan diferensial ditinjau dari  
6 gender. *Jurnal Math Educator Nusantara: Wahana Publikasi Karya Tulis Ilmiah Di*  
7 *Bidang Pendidikan Matematika*, 2(1), 31-41.
- 8 Nartani, C. I., Hidayat, R. A., & Sumiyati, Y. (2015). Communication in mathematics  
9 contextual. *International Journal of Innovation and Research in Educational*  
10 *Sciences*, 2(4), 284-287.
- 11 Nopiyan, D., Turmudi, T., & Prabawanto, S. (2016). Penerapan pembelajaran matematika  
12 realistik berbantuan geogebra untuk meningkatkan kemampuan komunikasi  
13 matematis siswa SMP. *Mosharafa: Jurnal Pendidikan Matematika*, 5(2), 45-52.
- 14 Nugrahanto, S., & Zuchdi, D. (2019). Indonesia PISA Result and Impact on The Reading  
15 Learning Program in Indonesia. In *International Conference on Interdisciplinary*  
16 *Language, Literature and Education (ICILLE)*. Atlantis Press.
- 17 Paradesa, R., & Ningsih, Y. L. (2017). Pembelajaran matematika berbantuan *Maple* pada  
18 mata kuliah Kalkulus Integral terhadap kemampuan komunikasi matematis  
19 mahasiswa. *Jurnal Pendidikan Matematika RAFA*, 3(1), 70-81.
- 20 Paramita, L. W. (2017). *Kemampuan komunikasi matematis ditinjau dari Adversity Quotient*  
21 *melalui penerapan model pembelajaran SSCS pada siswa kelas VIII (Doctoral*  
22 *Dissertation)*. Semarang: Universitas Negeri Semarang.
- 23 Salam, R. (2017). Efektivitas penggunaan model pembelajaran kooperatif tipe Think Pair  
24 Share (TPS) untuk meningkatkan kepercayaan diri dan komunikasi matematis.  
25 *Jurnal Penelitian Pendidikan Insani*, 20(2), 108-116.
- 26 Scott, C. L. (2015). *The Futures of learning 3: What kind of pedagogies for the 21st*  
27 *century?*. ERF Working Papers Series, No. 15. UNESCO Education Research and  
28 Foresight: Paris.
- 29 Soh, T. M., Arsad, N. M., & Osman, K. (2010). The relationship of 21st century skills on  
30 students' attitude and perception towards physics. *Procedia-Social and Behavioral*  
31 *Sciences*, 546-554.
- 32 Son, A. L. (2015). Pentingnya kemampuan komunikasi matematika bagi mahasiswa calon  
33 guru matematika. *Gema Wiralodra*, 7(1), 1-8.
- 34 Stoltz, G. P. (2000). *Adversity quotient: Mengubah hambatan menjadi peluang*. Jakarta: PT  
35 Grasindo.
- 36 Sugiyono. (2016). *Metode Penelitian pendidikan pendekatan kuantitatif, kualitatif, dan*  
37 *R&D*. Bandung: Alfabeta.
- 38 Syarifah, T. J., Sujatmiko, P., & Setiawan, R. (2017). Analisis kemampuan komunikasi  
39 matematis tertulis ditinjau dari gaya belajar pada siswa kelas XI MIPA 1 SMA Batik  
40 1 Surakarta tahun pelajaran 2015/2016. *Jurnal Pendidikan Matematika dan*  
41 *Matematika (JPMM)*, 1(2), 1-19.
- 42 Ulfa, K., Buchori, A., & Murtianto, Y. H. (2017). Efektivitas model Guided Discovery  
43 Learning untuk video pembelajaran dalam mengetahui perbedaan kemampuan

- 1 pemecahan masalah matematika siswa. *MUST: Journal of Mathematics Education,*  
2 *Science and Technology*, 2(2), 267-275.
- 3 Wijaya, E. Y., Sudjimat, D. A., Nyoto, A., & Malang, U. N. (2016). Transformasi pendidikan  
4 abad 21 sebagai tuntutan pengembangan sumber daya manusia di era global. *In*  
5 *Prosiding Seminar Nasional Pendidikan Matematika*, 1(26), 263-278.
- 6 Yuniarti, D. A. F. (2015). *Analisis hasil penilaian dignostik kemampuan komunikasi*  
7 *matematis dalam pembelajaran Osborn berdasarkan Adversity Quotient (Tesis).*  
8 Semarang: Pascasarjana Universitas Negeri Semarang.  
9



# Infinity

## ORIGINALITY REPORT

4%

SIMILARITY INDEX

%

INTERNET SOURCES

%

PUBLICATIONS

4%

STUDENT PAPERS

## PRIMARY SOURCES

1

Submitted to Universitas Negeri Surabaya The State University of Surabaya

Student Paper

1%

2

Submitted to Open University Malaysia

Student Paper

1%

3

Submitted to Universitas Pendidikan Indonesia

Student Paper

1%

4

Submitted to Sheffield Hallam University

Student Paper

<1%

5

Submitted to Universitas Negeri Padang

Student Paper

<1%

6

Submitted to University of Birmingham

Student Paper

<1%

7

Submitted to Academic Library Consortium

Student Paper

<1%

8

Submitted to Sekolah Bogor Raya

Student Paper

<1%

9

Submitted to General Sir John Kotelawala

Defence University

Student Paper

<1%

---

10

Submitted to Universitas PGRI Semarang

Student Paper

<1%

---

Exclude quotes Off

Exclude matches Off

Exclude bibliography On