



The Profile of Students' Mathematical Communication Ability on Statistics Based on Adversity Quotient

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ABSTRACT

Mathematical communication skills have an important role in human life because humans are social creatures who cannot live individually but always relate and need other people. This type of research is descriptive qualitative research. This study aims to determine the profile of students' mathematical communication skills on statistical material in terms of Adversity Quotient (AQ) which are climbers (high), campers (medium), and quitters (low). This research was conducted on students of class XII MIPA 1 SMA Laboratorium UPGRIS. The research subjects were 6 students consisting of 2 subjects with climbers type (high), 2 subjects with campers type (medium), and 2 subjects with quitters type (low). The instrument used in this research is the ARP Adversity Quotient questionnaire and uses a communication skill test. The data analysis technique was carried out in 3 stages, namely data reduction, data display, and conclusion drawing/verification. The validity of the data using source triangulation. The results of this study indicate that (1) Subjects with the quitters type have not met all indicators of communication skills including written text, drawing, and mathematical expression; (2) Subjects with the campers type meet the indicators of mathematical communication skills, namely written text and drawing, but do not meet the indicators of mathematical expression; (3) Subjects with the climbers type fulfills all indicators of mathematical communication skills including written text, drawing, and mathematical expression.

Introduction

Mathematics is a symbol where everyone who learns mathematics will be required to have the ability to communicate using the language of mathematical symbols. There are five basic abilities that are standard processes in mathematics, namely problem solving skills, reasoning and proof abilities, communication skills, connection skills, and representation abilities (Vebri, 2018). According to NCTM (2005: 29) argues that there are five mathematical abilities that must be mastered by students in learning mathematics, including: (1) problem solving abilities, (2) reasoning abilities and proof (reasoning and proof), (3) mathematical communication skills (communication), (4) mathematical connection abilities (connections), and (5) mathematical representation abilities (representation). This is in accordance with the objectives of learning mathematics as stated in (Permendiknas Number 22 of 2006 concerning Content Standards) which states that one

of them is so that students are able to communicate ideas with symbols, tables, diagrams, or other media to clarify situations or problems (Hamzah, 2014).

Mathematical communication is the most important thing in learning mathematics in schools, because apart from being an ability possessed by students. The low mathematical communication skills are due to the lack of students' ability to work on description problems, such as stating situations, pictures, diagrams, or objects into language, symbols or mathematical models, reading diagrams or tables and explaining mathematical ideas, situations, and relations in spoken or written form (Solekha, 2013). According to Jannah (2016) the cause of low mathematical communication skills is that the teacher gives practice questions for students to do routinely, namely the completion procedure is similar to the example just studied and imitates the problem solving style of the teacher, causing students to be unable to express ideas and ideas in writing, oral and written form.

Less optimal learning is caused by several factors, including student habits in the teaching and learning process. Students only receive material and practice questions without practicing new questions, this causes many students to choose to give up on learning difficulties. The ability to survive and overcome adversity is called Adversity. Meanwhile, the result of engraving the ability to survive and overcome difficulties is called Adversity Quotient (AQ). According to Stoltz (2000) a person's AQ can be grouped into three types of AQ, namely climbers, campers, and quitters. Climber type students are those who have high AQ, campers type students are those who have medium AQ, and quitters type students are those who have low AQ.

Based on the explanation above, it can be concluded that the importance of mathematical communication skills that must be possessed by students, with the Adversity Quotient of students who have different types of AQ. One of them is the Adversity Quotient, which is the basis for the study of this research, so that researchers are interested in carrying out research with the title "Profile of Students Mathematical Communication Ability in Statistical Based on Adversity Quotient (AQ)". The focus of this research is to determine the profile of students' mathematical communication skills on Statistics based on Adversity Quotient (AQ).

Research Methods

This study used a descriptive qualitative approach. This qualitative research is used to obtain in-depth data with the aim of knowing the profile of students' mathematical communication skills on Statistics based on Adversity Quotient (AQ). The research was conducted at SMA Laboratory UPGRIS Semarang. The research subjects were six students who were categorized as climbers, campers, and quitters. This research was conducted for four days by distributing ARP (Adversity Response Profile) questionnaires and conducting a written test. There are two data collection techniques used, namely the questionnaire method and the written test method. The validity of the instrument used in this study was tested with the help of a validator. Data validity is done by triangulation of sources. The analytical technique used to analyze the data that has been collected according to Sugiyono (2014), includes 3 components, namely data reduction, data presentation, and drawing conclusions (data verification).

The categories AQ climbers is a group of people who are persistent in reaching the peak of success, ready to face obstacles, challenges, obstacles regardless of one's background, advantages, disadvantages, and good or bad luck, AQ campers is a group of people who have the will to try to deal with problems but they will stop if they feel unable to solve problems, and AQ quitters is a group of people who stop in the middle of the climb. People who give up easily and are not enthusiastic in facing challenges. A group of people who are easily discouraged, tend to be passive to reach the pinnacle of success. In categorizing subjects in the Adversity Quotient category using the calculation of the Adversity Quotient (AQ) score, where if the score (0 ± 119) is low AQ or is in the Quitters group, the score (160 ± 199) is moderate AQ or is included in the Campers group, the score (240 ± 300) is a high AQ or included in the Climbers group (Yenuarrozi, 2014: 32 – 37). The instrument used in this research is an adversity quotient questionnaire, a test of mathematical communication skills.

Before collecting research data, the stage of selecting research subjects that meet the criteria is carried out based on students' communication skills: (a) The first step to take is to give a questionnaire online via a google form consisting of 30 events where each event consists of two statements given to 1 class. Then after filling out the questionnaire, students who have the categories AQ climbers, AQ campers, and AQ quitters will be selected ; (b) The second stage is to provide a mathematical communication ability test instrument consisting of one item to students who have the categories of AQ climbers, AQ campers, and AQ quitters; (c) The third stage is checking the results of the mathematical communication test of students who have the adversity quotient.

Results and Discussion

Results

Data analysis of mathematical communication skills with Adversity Quotient

1. The results of the mathematical communication ability data of AQ Type Quitters students

a. AS Subject

1) Written text

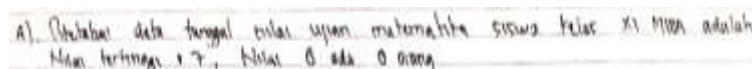


Figure 1. Subject Answer AS Written Text

Based on Figure 1, the AS subject only wrote what was known from the problem, namely "It is known that the single data for the mathematics test scores of students in class XI MIPA is the highest score of 7, the score of 8 is 8 people." but not quite right, and the subject did not write down what was asked of the problem. This can be seen in point a. that the AS subject has not fulfilled mathematical communication.

2) Drawing

Interval	Kelas	Frekuensi
5		6
6		8
7		10
8		12
9		9

Figure 2. Subject Answers AS Drawing

Based on Figure 2, the AS subjects have described it in tabular form correctly, but the data obtained is not precise and does not present it in the form of a line chart. This can be seen from point b. that the US subject has not met the drawing indicators.

3) Mathematical Expression

$$\begin{aligned}
 & \frac{1}{4} \cdot (5 \times 6) + (6 \times 8) + (7 \times 10) + (8 \times 12) + (9 \times 9) \\
 & \quad \quad \quad 6 + 8 + 10 + 12 + 9 \\
 & = 30 + 48 + 70 + 96 + 81 \\
 & \quad \quad \quad 40 \\
 & = \frac{325}{40} \\
 & = 8,125
 \end{aligned}$$

Figure 3. Subject Answers AS Mathematical Expression

Based on Figure 3, the subject stated the mathematical solution in writing, and did not correctly perform the calculation but was still wrong, and in solving the problem the problem had not written down the formula and the results were not correct. This can be seen from point c. that does not meet the mathematical expression indicators.

b. AUM Subject

1) Written text

Figure 4. Answers of AUM Subjects Written Text

Based on Figure 4, the subject of AUM has not written down known and asked information on the problem clearly and precisely, the subject only writes the title of the problem, namely "Mathematical Exam Scores for XII MIPA Students". This can be seen in point a. that the subject of AUM has not met the written text indicator.

2) Drawing



Figure 5. Answers to AUM Drawing Subjects

Based on Figure 5, AUM subjects can describe mathematical ideas in the form of tables and diagrams correctly, and the calculations obtained are still inaccurate and incorrect. This can be seen in point b. that the subject of AUM has not met the drawing indicators.

3) Mathematical Expression

X_i	F_i	$X_i F_i$	$(X_i - \bar{X})^2$
5	6	30	4
6	8	48	1
7	10	70	0
8	12	96	1
9	4	36	4
	40		10
$\frac{1}{n} \sum_{i=1}^k \frac{f_i}{f_i}$			
$\frac{1}{n} \sum_{i=1}^k F_i (X_i - \bar{X})^2$		50	1,2
$\frac{1}{n} \sum_{i=1}^k F_i$		40	

Figure 6. Subject Answers AUM Mathematical Expression

Based on Figure 6, AUM subjects stated mathematical solutions in writing, and used mathematical notation and their structures, but in calculating frequency (f_i), $x_i.f_i$ multiplication, and variance (variance) were still wrong. This can be seen from point c. that the subject of AUM has not met the mathematical expression indicator.

2. The results of the mathematical communication ability of AQ Students Camper Type

a. AAM Subject

1) Written text

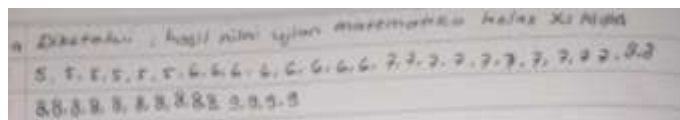


Figure 7. Subject Answers AAM Written Text

Based on the figure 7, AAM subjects wrote down the information that was known and asked about the problem, namely "the value of 5 was 6 people, the value of 6 was 8 people, the value of 7 was 10 people, the value of 8 was 12, and the value

of 9 was 4 people." This can be seen in point a. that the subject of AAM meets the written text indicator.

2) Drawing

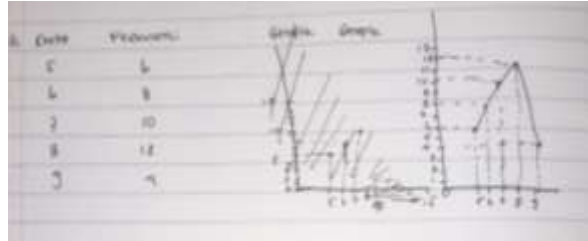


Figure 8. Answers to AAM Drawing Subjects

Based on the figure 8, AAM subjects describe mathematical ideas in the form of tables and diagrams correctly and precisely. This can be seen in point b. that the AAM subject meets the drawing indicators.

3) Mathematical Expression

$$\begin{aligned} \bar{x} &= \frac{\sum_{i=1}^n x_i \cdot f_i}{\sum_{i=1}^n f_i} \\ &= \frac{5 \cdot 3 + 6 \cdot 2 + 7 \cdot 10 + 8 \cdot 4 + 9 \cdot 2}{3 + 2 + 10 + 4 + 2} \\ &= \frac{15 + 12 + 70 + 32 + 18}{21} \\ &= \frac{137}{21} = 6.52 \end{aligned}$$

Figure 9. Subject Answers AAM Mathematical Expression

Based on Figure 9, the AAM subject has not stated the mathematical solution in writing clearly, and in carrying out calculations that are less precise, namely "AAM subjects determine the arithmetic mean (mean) with the symbol \bar{x} and can assume the value (x_i), frequency (f_i), to find the arithmetic mean (mean), as well as in doing the calculations are still wrong. This can be seen in point c. that the subject of AAM has not met the mathematical expression indicators.

b. FNW Subject

1) Written text

7a) Diketahui : 5 sebanyak 6 kali
6 sebanyak 8 kali
7 sebanyak 10 kali
8 sebanyak 12 kali
9 sebanyak 4 kali
Ditanya : tabel, persentase, mean, median

Figure 10. Subject Answers FNW Written Text

Based on the picture, 10 FNW subjects wrote down what information they knew and asked about the problem completely and accurately. This can be seen in point a. that the FNW subject meets the written text indicator.

2) Drawing



Figure 11. Subject Answers FNW Drawing

Based on Figure 11, FNW subjects can describe mathematical ideas in the form of tables and diagrams accurately and correctly. This can be seen in point b. that the FNW subject meets the drawing indicators.

3) Mathematical Expression

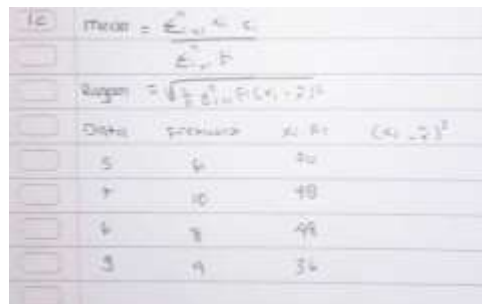


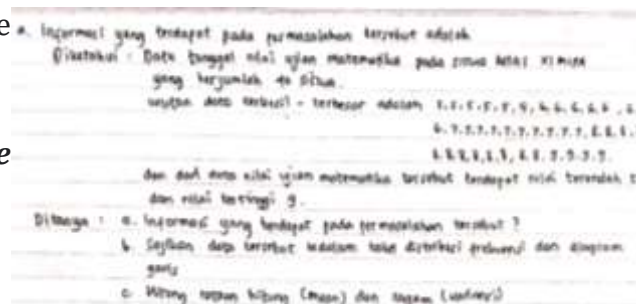
Figure 12 Subject Answers FNW Mathematical Expression

Based on the picture 12, FNW subjects have not stated mathematical solutions clearly in writing, can use symbols, mathematical notation, and do not perform complete calculations. This can be seen in point c. that the FNW subject has not met the mathematical indicator.

3. The results of the communication Type Climbers

a. IM subject

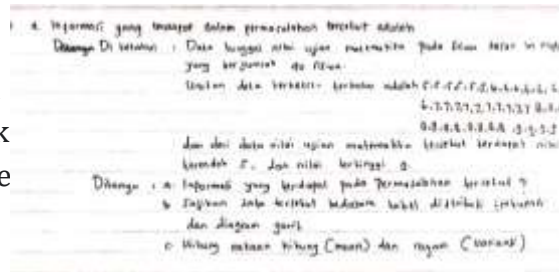
1) Written text



mathematical ability of AQ Students

Based on known and ask point a. that the

2) Drawing



the information that was ectly. This can be seen in or.

Figure 14. IM Drawing Subject Answers

Based on the picture 14 IM subjects can describe mathematical ideas in the form of tables and graphic diagrams correctly and precisely. This can be seen in point b. that the IM subject meets the drawing indicators.

3) Mathematical Expression

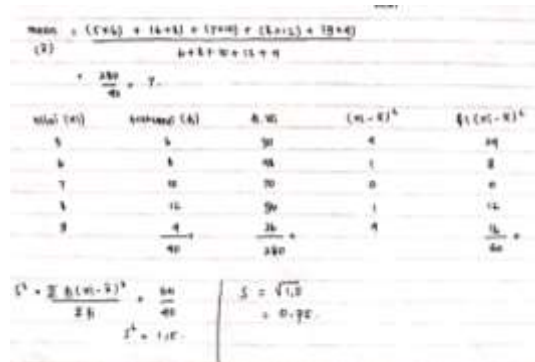


Figure 15. IM Subject Answers Mathematical Expression

Based on the picture 15 IM subjects can state mathematical solutions in writing clearly and precisely, use mathematical symbols, and perform calculations correctly and precisely. This can be seen in point c. that IM subjects meet the mathematical expression indicators.

b. NAN Subject

1) Written text

Figure 16. Subject Answers NAN Written Text

Based on the NAN wrote down information from mathematical and correctly. This the NAN subject indicator.



picture, 16 subjects of known and asked the problem, and used language appropriately can be seen in point a. that meets the written text

2) Drawing

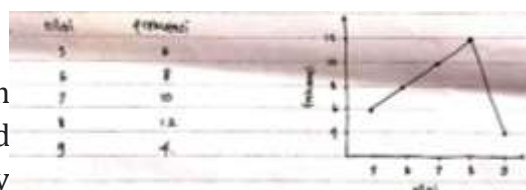


Based on form of tables the NAN subject meets the drawing indicators.

atical ideas in the een in point b. that

3) Mathematical Expression

Figure 18. Subject Answers



NAN Mathematical Expression

Based on subjects stated writing clearly mathematical symbols, and performed calculations or obtained complete and

he figure 18, the NAN mathematical solutions in and precisely, used or obtained complete and

correct solutions. This can be seen in point b. that the NAN subject meets the mathematical expression indicators.

Discussion

The discussion in this study is to determine the description of the results obtained in this study. From the validity of the data by using source triangulation by comparing the results of the source data. Based on the results of research on students at the UPGRIS Laboratory High School regarding communication skills in statistical material, it is found that:

1. *Mathematical Communication Skills of Quitters AQ Students.*

Subjects with quitters type AQ in this study did not meet all indicators of mathematical communication skills including written text, drawing, and mathematical expression. This is in accordance with the characteristics of quitters proposed by Yansen Marpaung (2005: 6), namely quitters have less strong attitudes and motivations.

Based on the results of the research that has been described, it can be seen that the subject of AQ with the quitters category, on the written text indicator, the subject has not written down the information that is known and asked about the problem correctly, the subject only writes information that is not clear and inaccurate, the subject drawing indicators have not solve mathematical ideas in the form of pictures correctly, this is because the subject determines the wrong data, and in mathematical expression the subject completes with an inaccurate formula so that the subject does not meet the indicators of communication skills. This is in line with Paramita's research (2017) which states that quitters type AQ subjects tend to not meet all indicators of mathematical communication skills.

This study is in line with research conducted by Paramita (2017), Yuniarti (2015). Paramita's research (2017) states that quitters tend to not fulfill all indicators of mathematical communication skills, including the ability to express a situation into mathematical language, the ability to describe mathematical ideas through writing and verbally and visually describe, the ability to express mathematical concepts into mathematical notation. In Yuniarti's research (2015) stated that the quitters category did not meet the mathematical communication indicators and almost all types of errors occurred in the quitters category. This is appropriate in this study where the AQ subject with the quitters category did not meet all the indicators of mathematical communication including written text, drawing, and mathematical expression.

2. *Mathematical Communication Ability of Camper Type AQ Students.*

AQ subjects with camper type in this study met the written text and drawing indicators, but did not meet the mathematical expression indicators. This is in accordance with the characteristics of campers proposed by Yansen Marpaung (2005), namely that the type of campers is likely to try, but they will stop when they feel the problem becomes more complicated.

Based on the results of the research that has been described, it can be seen that the camper type AQ subject meets the indicators of written text and drawing communication

skills, this is because on the written text indicator the subject writes information that is known and asked about the problem correctly, and on the drawing indicator the subject describes the idea - mathematical ideas in the form of diagrams and tables correctly. But the mathematical expression indicators have not met, because the subject has not expressed mathematical concepts in mathematical notation, using formulas and calculations that are less precise. So it can be concluded that the subject has not met the mathematical expression indicators, but has met the written and drawing indicators. Stoltz (2000) states that campers are a group of people who still have a desire to respond to existing challenges, but do not reach the peak of success and are easily satisfied with what has been achieved. Stoltz (2000) states that campers do not exploit their full potential, campers have limited ability to change, especially big changes, campers live with the belief that after a few years or after a certain amount of effort, life should be relatively free from difficulties.

This study is in line with the research proposed by Paramita (2017) and Yuniarti (2015). In Paramita's research (2017) stated that campers subjects tend to meet two indicators, namely the ability to express a situation into mathematical language and the ability to visually describe mathematical ideas in the form of tables and diagrams, and in Yuniarti's research (2015) stated that campers subjects meet several indicators of mathematical communication, and the campers category made errors in calculations and drawing conclusions.

3. *Mathematical Communication Ability of Climbers Type AQ Students.*

Subjects with climbers type AQ in this study met all indicators of mathematical communication skills including written text, drawing, and mathematical expression. This is in accordance with the characteristics of climbers proposed by Yansen Marpaung (2005), namely that climbers have a high attitude and motivation.

Based on the research results that have been described, it can be seen that the AQ subject with the climbers type fulfills all the indicators of communication ability including written text, drawing, and mathematical expression. This is because the AQ subjects with the climbers type write down information and are asked completely and accurately, the drawing indicators depict them in tables and diagrams accurately, and the mathematical expression indicators state the situation in the form of mathematical models, and perform mathematical calculations correctly. This is in line with Hodiyanto (2016) stating that writing is explaining ideas or solutions to a problem or image using their own language, drawing is expressing ideas or solutions to a mathematical problem in the form of pictures, diagrams, or tables, and mathematical expressions are expressing ideas or solutions to a mathematical problem, everyday problems or events in the language of mathematical models.

It can be concluded that the AQ subject with the climbers type fulfills all indicators of communication skills including written text, drawing, and mathematical expression. Stoltz (2000) climbers are a group of people who always strive to reach the peak of success, are ready to face the obstacles that exist, and always raise themselves to success. This is in accordance with (Widyastuti, 2015) stating that the subject of climbers in

solving complex mathematical problems, the climbers type will try very hard in dealing with problems.

This research is in line with Paramita (2017) and Yuniarti (2015). In Paramita's research (2017) it states that the AQ subject with the climbers type fulfills all indicators of mathematical communication, including the ability to express a situation into mathematical language, the ability to visually describe mathematical ideas, the ability to explain mathematical ideas in writing, and the ability to evaluate mathematical ideas in writing. In Yuniarti's research (2015) it is stated that the subject with the category of climbers fulfills all indicators of mathematical communication.

Conclusion

Based on the results of research and discussions that have been carried out by researchers on AQ subjects with the types of Climber (high AQ), Camper (medium AQ), and Quitter (low AQ), it can be concluded that: (1) Mathematical communication skills on the subject of AQ with Climbers type meet all indicators of mathematical communication skills including written text, drawing, and mathematical expression; (2) Mathematical communication skills on the subject of AQ with Campers type do not meet the indicators of mathematical expression, but meet the indicators of written text and drawing; (3) Mathematical communication skills on the subject of AQ with Quitters type have not met all indicators of communication skills including written text, drawing, and mathematical expression.

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