Analysis of the Mathematical Communication Quitters Student in Mathematics' Problem Solving

Wharyanti Ika Purwaningsih[1], Teguh Wibowo[2], Budiyono[3], Tri Widiantoro [4]
wharyanti@umpwr.ac.id, twibowo@umpwr.ac.id, budiyono555@gmail.com,
triwidiantoro87@gmail.com

Department Mathematics Education, Muhammadiyah University of Purworejo[1,2,3,4]

Abstract. Mathematical communication support student's problem solving in math. Mathematical communication is the ability of students to understand, express mathematical ideas and ideas, evaluate information, and present clear arguments with the language of mathematics. In solving math problems, everyone has different ways and styles of thinking because not everyone has the same thinking skills. That mean adversity quotient (AQ). This study aims to describe the mathematical communication of students with adversity quotient on quitters of SMP students in resolving the mathematical problems of two-variable linear equations system. This research was a qualitative descriptive study. The subject method is purposive technique. Data collection used mathematical communication tests, interviews, documentation and field records. The results showed the mathematical aspects of communication that appeared on the students of quitters when performing problem solving of two-variable linear equations system material were: (1) using mathematical language, symbols or notation in mathematics to express Mathematical ideas correctly. (2) Organizing and consolidating their mathematical thinking through communication. (3) Analyzing mathematical thinking.

Keyword: adversity quotient, mathematical communication, problem solving., quitters.

1 Introduction

Mathematics is a subject that is given in various levels of education, starting from elementary to high school in Indonesia. It appears in Law Number 20 Year 2003 concerning the National Education System Article 37 Paragraph 1 [1]. One of the goals of mathematics learning in the KTSP curriculum at Permendiknas No. 22 (2006)[2] the purpose of learning mathematics is communicate ideas with symbols, tables, diagrams or other media to clarify the situation and problems.

One of the skills students must have is the ability of mathematical communication [3]. According to the National Council of Teachers of Mathematics (NCTM) [4], through communication students can organize and consolidate their mathematical thinking. The Ministry of Education Singapore (MES), the mathematical communication is a component of the mathematical problem solving process [5]. Qohar [6] said mathematical communication skills can support mathematical abilities, such as problem solving skills. With good communication skills then the problem will more quickly be represented correctly and this will support in solving problems. In addition, according to Paridjo [7], mathematical

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communication in solving mathematical problems is necessary. And the communication skill is fundamental in mathematics learning [8]. Based on these statements mathematical communication support student's problem solving in math.

Communication is the ability to use mathematical language to express mathematical ideas and arguments appropriately, briefly and logically. Mathematical communication skills are the ability for students to express their ideas, explain, and discuss coherent, and clear concepts. It is a student to explain and justify actions in procedures and processes both orally and in writing [9]. Through the learning of mathematics in class students are required to be able to communicate both orally and in writing, because mastering mathematical communication can help students in understanding their concept [10]. Thus mathematical communication is the ability of students to understand, express mathematical ideas and ideas, evaluate information, and present clear arguments with the language of mathematics.

According to NCTM [4] there are 4 aspects of mathematical communication namely:

1. Organizing and consolidating their mathematical thinking through communication.
2. Communicate their mathematical thinking in a coherent manner (logically arranged) and clear to his friends, teachers and others.
3. Analyse and evaluate mathematical thinking and strategies that others use.
4. Use the language of mathematics to correctly express mathematical ideas.

In solving math problems, everyone has different ways and styles of thinking because not everyone has the same thinking skills. Sometimes in solving math problems found that there are students who demonstrate excellent skills, there are students who demonstrate the usual skills, and there are students who are experiencing difficulties. This is because one can solve a problem well when it is supported by the ability to face good obstacles [11]. From here is where Adversity Quotient (AQ) is considered to have an important role in solving problems [12], [13].

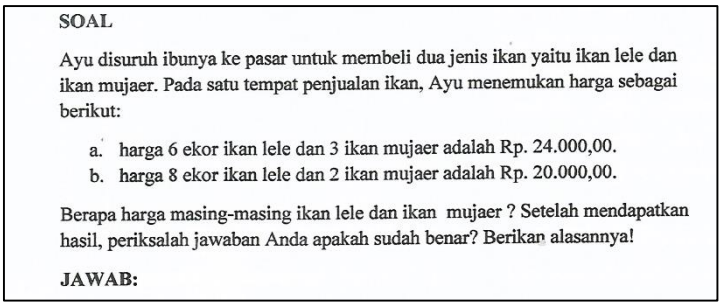
AQ is a measure to know your response to difficulties [14]. This suggests that everyone has different responses in the face of difficulties, as they have a distinct AQ level . AQ is the intelligence of one's face and overcoming difficulties on a regular basis and can be an indicator to see how well the person can continue to endure a problem he is facing [14]. AQ consists of three types, namely (1) climbers, (2) campers, and (3) quitters [14].

Kupiesiewicz [15] argues "a problem is understood as a difficulty of theoretical or practical nature that causes an inquiring attitude of a subject and leads him/her to the enrichment of his/her knowledge", which means the problem is understood As a theoretical or practical difficulty that causes a subject to ask and enrich its knowledge. This means that every problem encourages students to do a process to solve it. Steps in solving mathematic by Polya [16], [17] is: (1) *Understanding the problem,*), (2) *devising a plan*, (3) *carrying out the plan*, and (4) *Looking back*.

In this study, researchers wanted to know the skills of mathematical communication of students in resolving mathematical problems on Two-variable linear equation system of junior high school. Researchers are interested in researching the ability of mathematical communication especially in the students of quitters at a junior high school in Purworejo district.

2 Method

This type of research is qualitative. To determine the subject in a study, it used a research subject retrieval technique. In this study the subject retrieval technique is purposive. Researchers use the Adversity Response Profile questionnaire to determine the types of quitters, campers or climbers. The subject is a meticulous researcher is the student with the quitters type. The supporting instrument in this study is a mathematical communication test in the form of a two-variable Linear equation system for measuring mathematical communication.



SOAL

Ayu disuruh ibunya ke pasar untuk membeli dua jenis ikan yaitu ikan lele dan ikan mujaer. Pada satu tempat penjualan ikan, Ayu menemukan harga sebagai berikut:

a. harga 6 ekor ikan lele dan 3 ikan mujaer adalah Rp. 24.000,00.
b. harga 8 ekor ikan lele dan 2 ikan mujaer adalah Rp. 20.000,00.

Berapa harga masing-masing ikan lele dan ikan mujaer ? Setelah mendapatkan hasil, periksalah jawaban Anda apakah sudah benar? Berikan alasannya!

JAWAB:

Fig. 1. Mathematical communication instruments test

The data collection techniques used by researchers are observations, tests, interviews, documentation and field records to support research results. Qualitative data analysis is an effort made by way of working with data, organizing data, choice into manageable units, synthesizing it, finding and discovering patterns, finding what Important and what is learned, and decides what can be told to others. In this research, researchers refer to the data analysis model that is right at Miles & Huberman, i.e. (a) data Reduction, (b) Presentation of data (display data), and (c) Verification (Conclusion Drawing/Verification).

3 Results

Research on the mathematical communication of students quitters in the completion of mathematical problems has the purpose of describing the mathematical communications students quitters SMP level in solving the problem mathematical of matter two variable linear equations system. Based on the results of the filling Adversity Quotient questionnaire using ARP (Adversity Response Profile) There are 7 students in the category of Quitters, of the seven students then researchers make a candidate for the research subject by giving tests Mathematical problems regarding SPLDV.

S1 performs the first stage in solving the problem, which is understanding the problem. At this stage, S1 re-reads the story and writes the information that is known and asked questions about the question.

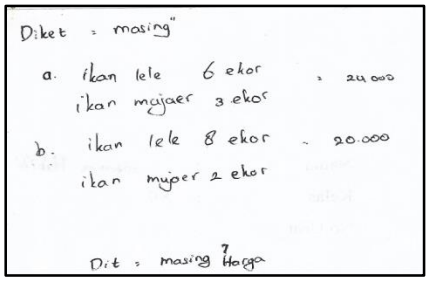


Fig. 2. S1 stage in understanding problems

At Figure 2 shows that S1 is able to do aspects of mathematical communication organizing the mathematical thinking that is to understand the problem of problems by changing the form of statements into the known and asked form.

P: "What is the infornomation in question?".
S1: "The price of 6 catfish equals 3 Mujaer's 24 thousand that a".
P: "Yes, keep?".
S1: "The b price of 8 catfish and 2 Mujaer fishes 20 RB".
P: "What is the question?"
S1: "The price of each catfish and mujaer fish".

The next completion stage is making a completion plan. At this stage S1 does a step consolidating mathematical thinking, which strengthens the mathematical thinking of the text as a model or mathematical equation. S1 does not make any examples fish type with two variables x and variable y, but S1 in the process of writing mathematical equations or models directly using x and y notation.

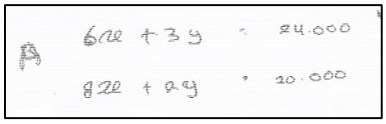


Fig. 3. Transforming the known form of text into mathematical equations

Based on Figure 3, S1 directly write the mathematical model of the information he has get, although previously S1 does not write the type of fish, but at the answer S1 wrote it with a variable x for catfish and y types to Types of Mujaer fishes. Amplified with the following interview results.

The third stage is implementing a problem solving plan. The initial step done by S1 is to equate one variable that is y variable to get variable x, by multiplying by any number so that one of these variables have the same value for deductible.

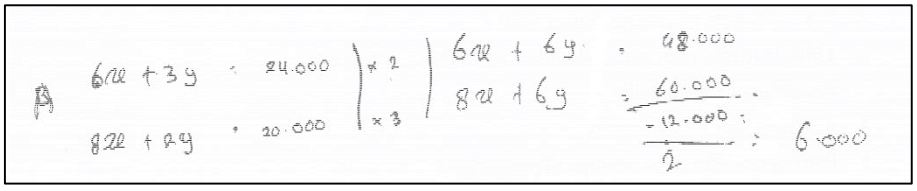


Fig. 4. Finding value from variable x

Seen from the answer written, S1 does elimination equations 1 and 2 by way of equation 1 multiplied by 2 then equation 2 multiplied by 3 resulting in a new equation. But the next step in the process of deprocessing or elimination of S1 has not been precise in writing the problem solving because S1 in the calculation of multiplying equation 1 and Equation 2 The result is still wrong. In addition to when dividing the completion, he also divides it by the number 2 which he thinks comes from the number to multiply equation 1.

S1 : "The first looking x value, Y was eliminated, which is 24 thousand rupiah at times 2, which is 20 thousand in 3 times, continue to be reduced. 6x + 3y = 24,000 times 2 and the 8x + 2y = 20,000 at 3 times the result is 6x + 6y = 48,000 equal to 8x + 6y = 60,000 after which the result is reduced to the theme 12,000 ".

P : "Yes, 12,000 then?".

S1 : "Then the result is shared, but here I doubt divided 2 or what".

P : "Do you think divided by?".

S1 : "I think divided 2 of the top multiplication but I'm less sure anyway".

Based on the interview passage S1 multiplies the first equation with 2 and the second equation with 3 to remove the y value and generate the value of x, but S1 only multiply the variable y and the price of fish alone does not multiply with variable x. by The result is S1 then divide it by the number 2 that it considers derived from multiplication to equate one of the variables, but S1 is doubtful of the answers that have been found.

To find the value of y, S1 creates a new equation as well as finding the x value but in this equation multiplied by 4 and 3.

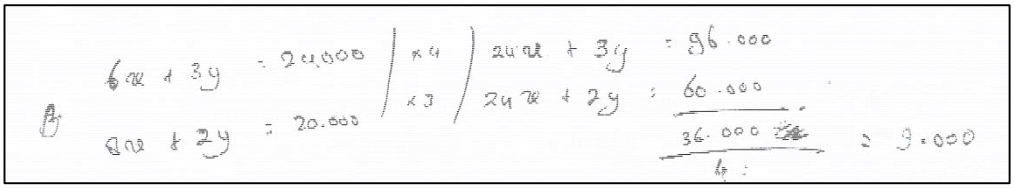


Fig. 5. Specifying the y value

Not much different from the completion to find the value of x, S1 writes back the equation that he get from the problem, the different is in finding the value of S1 multiply equation 1 with 4 and equation 2 with 3, but the same with the search value X, S1 is wrong in the process of multiprocessing. In the process of eliminating or decreasing it is still not true. So it affects the outcome of the wrong answer.

S1 does not re-examine the results, it immediately writes the final answer to the question.

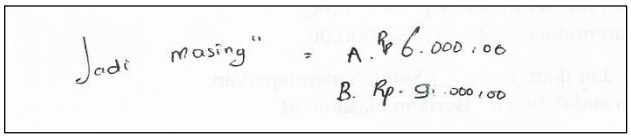


Fig. 6 conclusion of students ' answers

4 Discussion

In this researchers will discuss the research results on Mathematical communication section students quitters in the problem-solving mathematical matter Linear equations of two variable systems. The completion stage of the research subject refers to the completion stage of the Polya. At each stage of solving the two variables Linear equation system problem, the subject performs mathematical communication on the outcome of completion and the result fulfills some aspects of mathematical communication.

Mathematical communication at the stage of understanding the problem meets the mathematical aspects of communication "organizing the Mathematical Thinking", where at this stage students are able to organize the mathematical thinking that is to understand the problem. At this stage students are asked to know what information is in question, and know the problems that will be solved in the matter. One form of mathematical communication is that the students are able to explain the known and asked questions on this point that the students are able to see the content and understand what is written on the question. According to Polya understand the problem (understand the problem) should be believed to be true, by way of repeated reading, and can be asked yourself some things, such as what is known, what is unknown, how the relationship between the known and what The unknown, and others, to convince themselves, that the problem is well understood [17].

At the stage of making the student completion plan requested to plan the completion process according to their understanding. At this stage, students do change the information that is known by students to be used as mathematical equations, namely ax + by = C, and then formed a mathematical model of the equation. It is done in order to get the x and y values. Equation 1 is 6x + 3y = 24,000 and Equation 2 is 8x + 2y = 20,000. To get the X and y values, students multiply equations 1 by 2 and 3. The mathematical communication that appears at this stage is a communication aspect consolidating mathematical thinking. According to Lim [18], mathematical communication in mathematics will form the ability of students to interpret certain problems into mathematical models and vice versa. Anwar & Amin [19] students are said to devise a plan for resolving the problem if it can determine a way to resolve the issue.

Furthermore, at the stage of implementing the problem solving, students perform an equation to be able to find the value of x and y variables by equating one variable multiplied by a specific constant to be reduced so that the obtained value From the variables to be searched. At this stage you can find out how knowledgeable the students are in terms of multiplying equations with number constants, and knowing the process of finding the value of a variable from the mathematical model that has been compiled. From these activities, students have conducted mathematical communication on the aspect of analyzing mathematical thinking. The NCTM argues that analyzing mathematical thinking is looking for solutions from mathematical equations or mathematical models that appear and look for variable values of models or equations that have been compiled [4], [20]. But at this stage students make mistakes when multiplying equations with number constants. Then the mathematical communication that formed is not yet appropriate.

While examining the process and the aspect of communication that is contained in this stage is to evaluate the mathematical thinking that is to do a re-check or re-examine the work and draw conclusions from the work that has been Resolved. At the re-examining stage, students do not re-check the outcome but the student immediately writes the final conclusion of the answer that has been obtained.

5 Conclusion

From the above exposure can be known that the mathematical communication of students quitters in the problem solving the mathematical matter of the two variable Linear equation system is:

1. Use mathematical language, symbols or notation in mathematics to express mathematical ideas correctly. The mathematical symbols and notation on the completion of the SPLDV are + (summation), = (equals), ± (positive, negative) × (multiplication), A/b (division), variable x, variable y, and number.
2. Organizing and consolidating their mathematical thinking through communication. Organizing the mathematical thinking, in this case students are able to write down and explain the things known and asked questions. Consolidating the student is able to write the mathematical equation of ax + by = C and then plan the problem solving.
3. Analyzing the mathematical thinking, i.e. students do calculations on the equations that have been created, but at the stage multiply the equation with the number constants and divide the results to find the value of the student variables make mistakes IE Inaccuracy in multiplying and errors in the concept of division.

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