Mathematics writing ability on high self-efficacy students

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Abstract. The purpose of this research is to describe how students with high self-efficacy can write mathematically. Write mathematically is rarely done by students when solving a problem. Write mathematically means how students write the problem-solving coherently, completely, and systematically. The students only calculate without looking at to other variables in the problem and write the problem-solving. It because the mathematics is considered a very difficult lesson. So, many students just answer the question even not believe in their ability. Student's confidence in their ability to solve problems is related to self-efficacy. This research method is a qualitative descriptive with purposive sampling. The subjects are three students in the 9th grade of SMP Negeri 1 Plaosan Magetan East Java Indonesia with a high category of self-efficacy. Data obtained from the results of written problem solving and interviews. One of the results of this research shows that students do not describe the problem's illustration well. So it can be known that students with the high category of self-efficacy cannot get all mathematics writing indicators in writing the problem-solving.

1. Introduction

Learning mathematics is an activity to study the abstract concepts, formulas, or strategies to solve a problem. It underlies why mathematics is cannot do with simply memorizing and imagining. Mathematics cannot deliver if only through verbal messages. Therefore, the mathematical proving must be communicated precisely, coherently and clearly through logical reasoning so that it can be accepted [1]. It also needs a way of delivering messages through writing. Writing is one of a good method to improve the ability of students' math concepts [2]. Steps of writing in math learning can help teachers to see students' errors in the concept and level of the material's absorption that has been taught [3]. Teachers use the method of writing in math learning will affect the students. There is raising ability to solve problems, interest in reading, and the abilities to write ideas in their respective languages [3,4]. While students write, they can see different angles they can use to learn mathematics in a slightly new way [5]. Through writing activities, student learning process can see more real. Student ideas in writing can be documented and used as an evaluation tool [6]. The group of writing mathematics ability based on the writing aspect includes written texts, drawings, and mathematical expression [7,8]. Drawing aspects are to raise concept models such as images, diagrams, tables, and graphics; mathematical expressions that mathematical model; and written texts, i.e. verbal arguments based on drawings and formal concepts [8,9]. Writing ability consists of four indicators: the discussion arising from reading a story, drawing a graph, the writing for designing data analysis and data presentation [10]. Three aspects will be the basis to analyze students' mathematical writing ability. Its known from the writing indicators has been derived from these aspects. The indicators in this study
are: illustrate the problem, write the information with symbols, write the idea or the mathematical concept used, write the way to get the solution and write the conclusion.

Writing is one aspect of communication that needs to be developed in mathematics learning [6]. Students who have more mathematical communication ability will be the greater their understanding of mathematics [11]. Understanding of math will affect student achievement. Besides the student achievement can also be influenced by students' belief in their ability to inform their ideas simultaneously in math. The belief in the ability of individuals to be able to organize and carry out a series of actions deemed necessary to achieve the desired namely self-efficacy. Bandura explains that self-efficacy is the individual’s evaluation of his capability to manage actions required to reach successful levels of performance. There are three dimensions of measurable self-efficacy, i.e. magnitude, strength and generality [12]. Learners having a strong belief in their capabilities set higher goals for themselves are more flexible in problem-solving activities and achieve a higher academic performance [13].

Bandura believed that the learners with high self-efficacy feel confident about finding the solution to a problem because the learners have created an idea to problem-solving that has accomplished in the past [14]. Students with high self-efficacy are excellent to identify problems in questions and interpret them into mathematics model and figures completely and can use appropriate mathematics symbols and instruments [15]. Students with high self-efficacy can write things that are known and asked the full, clear, and use mathematical symbols properly, can interpret the issues by making illustration image in accordance with the problem. Students are sure in choosing the right resolution steps and mathematical concepts. Students are also able to make a correct conclusion and use the sentences appropriate with the issue [16]. This research wants to see how writing ability of students who have high self-efficacy. Writing ability of students views based on three aspects, that is drawing, mathematical expression, and written texts. This research is important for students to know their mathematical writing ability and their level of self-efficacy in solving math problems.

2. Experimental method
The purpose of this research is to describe students' mathematical writing ability with high self-efficacy category. The research method used is descriptive qualitative with sampling technique that is purposive sampling. Students who become subject of this study are students who have the highest self-efficacy score based on predetermined standards. The following are the score guidelines for measuring self-efficacy.

Table 1. The rule of reference score conversion to determine the student self-efficacy category.

| No | Score Conversion | Category |
|----|------------------|----------|
| 1  | 30 ≤ score < 90  | Low      |
| 2  | 90 ≤ score < 120 | Medium   |
| 3  | 120 ≤ score < 150| High     |

Table 1 is a standard for determining students on the high, medium or low category based on the scores obtained. Self-efficacy scores are obtained from students who have been doing the self-efficacy questionnaires. The questionnaire contains referring to the self-efficacy dimensions [12]. Students with high self-efficacy score become the research subjects. Problem test is given to write the solve, then the answer will be clarified by interview. The results of written test answers and in-depth interviews will be analyzed in accordance with indicators of writing ability. The test question used is a test to identify students' writing abilities based on writing ability indicators. In-depth interviews are conducted to clarify student answers that have been previously written.

This research was carried out in 9th grade of SMP N 1 Plaosan, Magetan, East Java in February 2018. Questionnaire self-efficacy was given to 30 students. The score obtained by students after answering a questionnaire are presented in this table.
Table 2. Table of the number of students who have the level of self-efficacy, where the level in accordance with the reference to the conversion score.

| No | Score Conversion | Category | The Number of Student |
|----|------------------|----------|----------------------|
| 1  | 30 ≤ score < 90  | Low      | 14                   |
| 2  | 90 ≤ score < 120 | Medium   | 9                    |
| 3  | 120 ≤ score < 150| High     | 7                    |

The table classifies students' self-efficacy based on the scores obtained. The seven students include in the high category, but only three students were taken into subjects with highest scores among students with high self-efficacy category. S1 is a student get self-efficacy score 137, S2 get 131, and S3 get 128. These three students will be the research subjects. All subjects were assigned to solve the problems about a plane's area.

The test is given twice in different time periods. This is done to confirm the validity of the data obtained. The method to see the validity of a data in a different time like this is called time triangulation [17]. Interviews were conducted after the subjects have finished the both of tests.

The test question is a problem in everyday life and it is related to the trapezoidal plane's. Problems are given about "Mr. Aji has a square garden, two sides of the garden are parallel, while the other two sides of the garden are not parallel. The two parallel gardens are given a fence. The length of the garden fence is 190 meters and the distance between the two fences it is 61 meters ". The problem is how much the area of Mr. Aji's garden. The questions related to the problem split into four question. In every question, refers to writing indicators. It is intended that the researchers can be easier to analyze student answers.

3. Result and discussion

On the test results of students, there are ideas that poured in writing by students will be evaluated and serve as documentation of research [6]. After the subjects were doing the test, the students' answers were obtained in writing results. Written results which will be used as the data to be analyzed further.

![Figure 1](image-url)

Figure 1. The test results in writing of the first subject.

Figure 1 shows that S1 did a test well. This indicated by the illustration (shown with red circle), the information on the problem, and the solution of the problem. Drawing a trapezoid is served by the S1, shows that S1 can describe the problem in a simple illustration. The analysis of the outcome of this problem is supported by a pre-existing theory. In the picture circled in red, it can be seen that the illustration of the problem is just a picture without any description explaining about the information
known from the picture. S1 write the known and asked information with symbols in math so that S1 can write the information in the problem and express it in their own language (shown with yellow circle). Mathematical concepts in the area of trapezoid used by S1 to solve that problem. It showed that S1 can solve the problem by using known information, image and math concepts of the trapezoid areas. S1 also writes the simple conclusions of a brief problem solving through a self-made language (shown with blue circle). During an interview, these students explained that he is familiar with the steps to resolve the problem. It illustrates the problems with a simple image because he understood the purpose of the issue. Although S2 didn't write the captions on the pictures, but these students are confident that the matter that has been worked on producing the right answers. It is said also that the description on the image has been rendered on the information known.

Figure 2. The test results in writing of the second subject.

Figure 2 shows that same thing happens in S2 where this student describes the problem in trapezoid, writes what is known and asked, and solves problems using mathematical concepts that have been previously obtained. The image illustrated by this student is just an image of a trapezoid and nothing description indicating the information of the image that shown by red circle. The information in the problem is presented in the "known information" section by using simple symbols. The mathematical concept used is the trapezoid area. But, this student only write that he just find the solution based on the known and asked information that shown by yellow circle. After finding the right answer, the student writes the conclusions with short language (shown by blue circle). When interview, S2 have been familiar with problem-solving steps like it. S2 said that he can solve the problem coherent and complete. Further S2 said that the problem-solving steps that he did are drawing, writing is known and using the concept of trapezoidal area to find solutions problem. Why he only draws a trapezoid with no captions in the picture, S2 replied that the description of the images already written on known information. The same case with S1, these students are convinced that what has been done is the correct answer. S2 is not aware if he didn't write the captions on the pictures. That is because S2 thinks that the image caption already rendered on the information known by the use of symbols.
Figure 3. The test results in writing of the third subject.

Figure 3 shows that S3 has the written results that are an illustration of the problem, the known and asked information, how to find the solution, and the conclusion. The illustration image shows that these students can present the problem, but there is no description given on the image (red circle). The finding information is written in the known section. A symbol used to distinguish any information in the problem. This student explains that he used the illustration image, known information and the formula trapezoid area to find the solution (yellow circle). The blue circle shows that a simple conclusion written by this student. Although the conclusion is simple, the statement in the conclusion is the right answer. In an interview, known that student forgets to give a description of the image. Students only focus to find solutions to problems. The most important in solving the problem is understand all of the information and know the formula will be used to find a solution. Although this student forgot to write a description of the picture, this student can explain orally and in writing about how his business to get the right solution.

In the first test, the three students who have high self-efficacy write the complete problem-solving. There is illustration image of the problem, known and asked information, mathematical concepts used, steps to solve it, and the conclusion. But all of the students have not able to achieve the mathematical writing indicator. The achievement of indicators in each student is different. Among others, differences in illustrating the problem through an image, the different manner of expressing ideas and how to do to find solutions to a problem. To further strengthen the results of research, then the second test is given for student so that data obtained from the first test can be valid.

In general, the results of this second test are not much different with the results of the first test. Although given a different problem, however, the steps written by three students is almost the same as the previous test. These three students illustrate the problem with a simple parallelogram image without written description, write the known and asked information, using mathematical concepts about the parallelogram area, and write the conclusion of problem resolution. When interviewed, the three students were not able to explain their image because there is no description contained in the image.

The second test results are not much different from the first test results, so both the data obtained can say to be valid. According to the study that students with high self-efficacy can write the known and asked information by using appropriate symbols, illustrate the problem although not accompanied by the description in the image, express the idea in writing, solve the problem and write conclusion [16]. But the study was not in accordance with the results of this study because in this study students cannot...
describe the problem and not all students can write the way to get a solution. However, the three students sure that the solution to the problem they write correct and complete result [15].

4. Conclusion
From these results can be concluded that the students with high self-efficacy category were able to finish the problem. But, the students cannot write a description of the problem illustration. Two students wrote the idea with their own languages, while one student could not write the idea. In other words, students with high self-efficacy have not been able to reach the drawing aspect and the way to get the solution of mathematical writing. Writing problem-solving will make the students more active in express their idea in the mathematics learning. It takes attention from the teachers so that students trained to write the problem-solving completely. This aim when other people read the written problem-solving, they can understand the problem even only through the students writing. For other researchers, it is expected to do more research about the ability of the students in every aspect of the mathematics writing ability.

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