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Analysis of mathematical connection ability of elementary school students

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Abstract. Mathematical connection ability is one of the important abilities that students have. This study aims to analyze the mathematical connection ability of elementary school students. The research method was carried out qualitatively with a purposive sampling technique. The sample was taken as many as two elementary school students. Data collection using written tests and interviews. The data analysis was done qualitatively by analyzing the results of the students' answers in the written test and then the verification stage was carried out during the interview. The results showed that the students' ability to connect mathematics topics and mathematics applications was still lacking. This is motivated by the students' lack of conceptual understanding. In addition, it is necessary to consider students' self-efficacy in developing mathematical connection skills.

1. Introduction

Based on the results of data analysis, it is concluded that there is a correlation of self-efficacy on the mathematical communication skills of prospective elementary school teachers. Self efficacy provides motivation for someone to believe in their abilities. Someone who has self-efficacy will be able to communicate mathematical ideas both orally and in writing [1].

Mathematical connections consist of internal and external connections [2]. Internal connection deals with connections between mathematical topics. Meanwhile, external connection is related to the connection between mathematical material and other materials and the connection between mathematical material and daily life. Both of these connections need to be owned by students to organize their thinking in order to understand the relevance and benefits of mathematics. The ability of mathematical connections that are formed in students will help the internalization process during the learning process.

Students need to have mathematical connection skills to learn some mathematical concepts that are related to one another. Mathematical interconnection is not only related to mathematical concepts but is related to the concepts of other subjects and can be applied in everyday life. In other concepts students' mathematical connection ability is still low [3,4]. Therefore, it is necessary to do an analysis of the mathematical connection ability of students so that in the next research efforts can be made to improve the mathematical connection ability.



2. Methods

The research method was carried out in a qualitative descriptive manner. The sampling technique used purposive sampling by taking two elementary school students. Data were collected by giving a written test with an indicator of mathematical connection ability and interviews. Data analysis was carried out by analyzing the results of students' answers from the written test and then verified by interview.

3. Results and discussion

3.1. The ability to connect between math topics

Based on the results of the mathematical connection ability test on the indicators connecting between math topics, S-1 has not done the questions correctly while S-2 can work on the questions correctly. The written test results of the S-1 mathematical connection ability, namely:

Dik:
 d_1 kebun = 40 m
 d_2 kebun = 30 m
 d_1 kolam = 30 m
 d_2 kolam = 10 m

 $2 \text{ m}^2 = 3 \text{ kg Jagung}$
 $5000/\text{kg}$, modal awal = 2600.000
 Dit: keuntungan bersih
 Jaw: Luas kebun: Luas seluruh kebun - luas kolam
 $= \frac{1}{2} d_1 d_2 - \frac{1}{2} d_1 d_2$
 $= \frac{1}{2} 40 \cdot 30 - \frac{1}{2} \cdot 30 \cdot 10$
 $= \frac{1}{2} \cdot 1200 - \frac{1}{2} \cdot 300$
 $= 600 - 150$
 $= 450 \text{ m}^2$

Figure 1. S-1 answer for problem 1.

Based on these answers, it can be seen that S-1 does not understand the test questions given. S-1 only answers the area of the plantation, whereas in that question what he asks is the net profit. S-1 did not know that the question was related to other materials, namely social arithmetic and only understood the concept of kites and rhombuses. The following is an excerpt from the interview with S-1.

- T : What did he ask
 S-1 : Net profit
 T : What was the first step you did?
 S-1 : Find the area of the garden
 T : Then what about next?
 S-1 : I don't know
 T : Could there be any other material in that question?
 S-1 : Yes

- T : What is it?
 S-1 : I don't know, but the material is about buying and selling
 T : Where is the buying and selling material used?
 S-1 : After looking for an area of the garden
 T : Next what needs to be done?
 S-1 : I don't know
 T : Why don't you know, even though you already know that the matter is related to buying and selling?
 S-1 : I'm not sure about my idea.

Based on the results of the interview, it was concluded that the students could understand the matter, but there was doubt in him to write down his ideas. This is because S-1 self-efficacy is still low. Having a high level of self-efficacy about a person's ability will encourage him to explore more, while a low level of self-efficacy will lead to poor performance [5].

3.2. Ability to connect math topics with other topics

Based on the results of a written test regarding the mathematical connection ability of the indicators connecting math topics with other topics, S-1 and S-2 are able to answer questions correctly.

3.3. Ability to connect math topics with everyday life

Based on the results of written tests regarding the mathematical connection ability of the indicators connecting math topics with everyday life, S-1 and S-2 were unable to answer the questions correctly. The S-1 answer, namely:

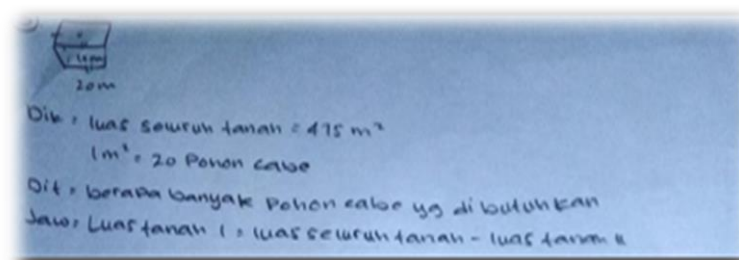


Figure 2. S-1 Answers to Problem 3.

Based on these results it can be seen that S-1 does not understand the questions given and is only able to write down what is known and asked without writing the answer. Following are the results of the interview with S-1.

- T : What is the first step in working on this problem?
 S-1 : Find the area of the land
 T : How big is the land?
 S-1 : I don't know
 T : Why don't you know, when you can name things that he knows.
 S-1 : I forgot to mention the trapezoidal formula and the range of levels ma'am, because I like to swap with other flat shapes and I am afraid to fill it wrong

In addition, the S-2 answers are also presented, namely:

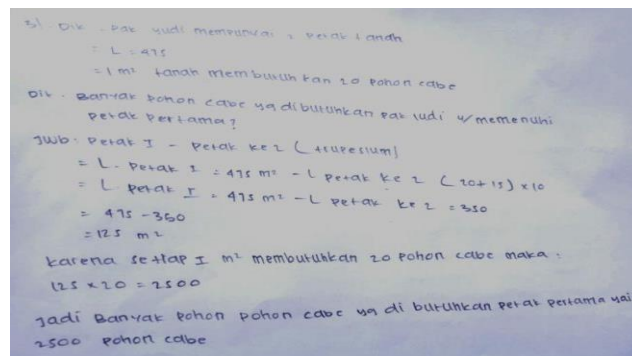


Figure 3. S-2 Answers to problem 3.

Based on this answer, S-2 can understand the problem correctly but the final answer is wrong. The following shows the results of the interview with S-2.

- T : Does that have something to do with daily life in this village?
 S-2 : Yes
 T : What is the first step in working on this problem?
 S-2 : Find the land area
 T : If there are lots of chilies, how do you count them?
 S-2 : $125 \times 20 = 2500$
 T : Let's see if the formula you wrote is correct?
 S-2 : I don't know, I actually forgot the formula.

The results of the interview, S-1 showed that he did not understand mathematical concepts and lacked self-confidence. While S-2 can work on the problem, he made a mistake in writing the area formula for the trapezoid. The two students have not been able to connect mathematical concepts to everyday life. Some people have difficulty exploring other dimensions of their knowledge for example about content applications [6].

The mistakes made by the two students were because they lacked mathematical understanding skills. This ability is the main thing students must have in order to have higher order thinking skills. One of the less mathematical comprehension skills is conceptual understanding. Most students are still lacking in conceptual understanding [7]. Conceptual understanding is related to students' knowledge to understand the concept of a subject matter. Lack of understanding ability will have an impact on the lack of mathematical connection skills so that students cannot express the ideas they have. Most students lack mathematical connection skills which results in students having difficulty expressing ideas and developing logical arguments [8].

In addition to the lack of mathematical understanding skills, it is indicated that students lack self-efficacy. The affective aspect of a person affects the ability of mathematical connections [9]. Self-efficacy as part of the affective aspect has an influence on students' ability to convey their ideas. It is hoped that mathematics teachers can develop a learning process that can improve mathematical connection skills so that students can succeed in solving math problems [10].

4. Conclusion

Based on the results of data analysis, it was concluded that students still lacked the ability to connect mathematically, especially in the indicators of connecting mathematical concepts and connecting mathematical concepts with everyday life. This is because students lack conceptual understanding and self-efficacy skills.

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