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Students' difficulties analysis in solving systems of linear equations in two variables

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Abstract. Learning how to solve mathematical problems has been a long withstanding difficulty faced by students and has been given constant focus in mathematical development. The aim of the study is to describe the difficulties of students in solving the system of linear equations in two variables. The data source is 15 students of the grade VIII of high junior school. Data colleted through tests, and interviews. Data is processed qualitalively. The results showed that the difficulties in solving systems of linear equations in two variables in the form of difficulty has not mastered the material, less mastered the concept of linear equations in two variabels, and difficulty performing arithmetic operations. While the difficulties are in students, namely the lack of interest of students in learning to improve their abilities and overcome their own difficulties.

1. Introduction

Education plays an important role in improving the quality of human life. Through education, human beings can improve their level and degree in the eyes of the world and especially in the eyes of God. One of the lessons to be taught in the world of formal education is mathematics. Mathematics is a subject taught at all levels of education, from elementary school to college level. Mathematics is a science that is needed in various fields, both in mathematics itself and in other fields. Mathematics not only for the needs of the present, but also the future [1]. Problem with mathematical difficulties have long been faced by students, therefore learning must be focused on developing mathematics [2].

The results of observations and interviews with mathematics teachers in grade VIII junior high schools showed that students had difficulty in solving systems of linear equations in two variables (SPLDV), elimination methods and substitution methods. In addition of students also discuss problems related to stories, which are difficult to change in the everyday language of mathematical models.

The difficulties experienced by students in solving systems of linear equations with two variables elimination method is at the time they complete the set of two-variable system of linear

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equations in two variables. For example, the value of x is sought by eliminating the variable y, while the value of y is sought by eliminating the variable x. While the difficulties faced by the students in understanding the system of linear equations in two variables is the substitution method when searching for the completion of each set of systems of linear equations in two variables. For example, look for a set of completion of each system of linear equations in two variables substitution method.

Student's difficulties in linear equation problems can occur due the lack of understanding of the mathematical objects in the form of facts, concepts, operations, and principles [3]. Students may not have the same conceptions of understanding in mathematics learning when they are studying primary, secondary, or tertiary mathematics [4].
When students experience cognitive conflict, he will try to achieve a new balance that is a solution to the problem at hand, so that being able to solve it is actually the cognitive stage has increased [5]. Lack of many mathematics skills caused difficulties in solving problem. Students are required to apply and integrate many mathematical concepts and skills during the process of making decision and problem solving [6]. Problem solving contains four steps to solve it, namely to understand the problem, plan problems, solve problems according to plan and re-check all steps taken [7].

2. Experimental Method

This research used a qualitative approach. The study was conducted in one of the junior high schools in Aceh, while the subject consisted of 15 students' grade VIII junior high school. Data collection in the form of a written test on the topic of systems of linear equations in two variables and interview the students' many difficulties. This test is given in the form of an essay that the respondent is grade VIII junior high school with two items and the number allotted time of 90 minutes. The preparation of the author's test questions is guided by the grade VIII math books and other related mathematics books.

Table 1. Problem of linear equations in two variables

No	Question
1	Complete the following questions by eliminating them! The price of 10 books and 2 pencils is IDR 16,200 while the price of 5 books and 4 pencils with the same model is IDR 9,900. Determine the price of each book and every pencil!
2	Complete the following questions by substituting! Price of 5 CD cassettes and 3 disks Rp. 25,500 while the price of 4 cassette CDs and 4 similar disks is Rp. 31,600. Determine the price of each CD and each diskette?

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3. Result and Discussion

Table 2 shows the difficulties that the students' in solving systems of linear equations in two variables and causes, difficulties in understanding the concept, difficulties in mathematical operations, difficulties in analyzing the problem, as shown in Table 2.

Table 2. Percentage of Difficulties' Based on Type of Difficulty

No	Difficulties in understanding the concept		Difficulties in mathematical operations,		Difficulties in analyzing the problem	
	f	%	f	%	F	%
1	9	60%	11	73,34%	13	86,67%
2	8	53,33%	10	66,67%	7	53,85%

Based on table 2, the results of the test data analysis on the number one question 60% of students had difficulties in understanding the concept 73,34% of students had difficulty operating mathematics, and 86,67% of students had difficulties in analyzing the problem. For question number two 53.33% of students had difficulty understanding the concept, 66.67% of students had difficulties in mathematical operations, and 86,67% of students had difficulties in analyzing the problem.

3.1. Finding from the written test

Based on the analysis explained that mathematical difficulties are lacking in presenting questions into mathematical statements. It should be before answering the problem students first present the problem into mathematics with for example by making what is known and asked from the questions that exist. Subjects of MS students experience difficulties when specifying b as what, and p as what, by itself the problem cannot be solved. The following illustrations of student work can be seen in the following figure 1.

1. Complete the following questions by eliminating them!
   The price of 10 books and 2 pencils is IDR 16,200 while the price of 5 books and 4 pencils with the same model is IDR 9,900. Determine the price of each book and every pencil!

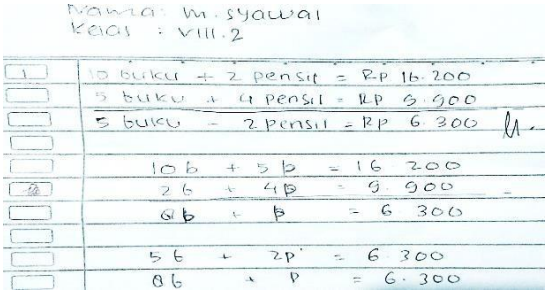

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Figure 1. Students' difficulties cannot understand the problem

2. Complete the following questions by substituting! Price of 5 CD cassettes and 3 disks Rp. 25,500 while the price of 4 cassette CDs and 4 similar disks is Rp. 31,600. Determine the price of each CD and each diskette?

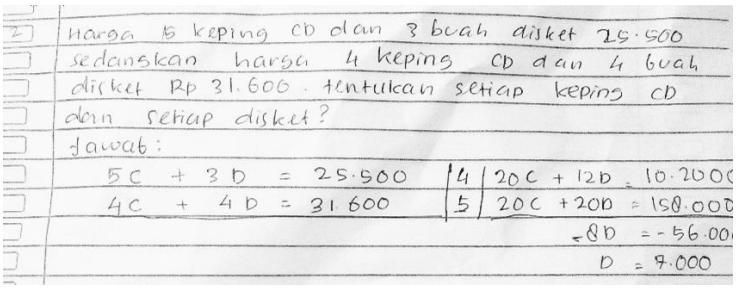

Figure 2. Difficulties in analyzing the problem

In figure 2, it can be concluded that the workmanship of the answer is correct, but does not make it known and asked. The work step is also not suitable as the question instructions. At the stage of work the problem students do with elimination. Answer MS also not completed. So that teachers draw the conclusion, where students do not understand the concept of linear equations in two variables between distinguish a matter which must be eliminated and substituted.

3.2. Finding from the interviews

Problem number 1
MS subject

P : What are your difficulties with this number?
S : There is Buk, I have difficulties and ways to differentiate between elimination and substitution, so I finish with the same reduction of variables.
P : There are stages of resolution, as you explained. Did you not pay attention?
S : Yes Bu. I noticed, but for me it was very difficult.
P : If there are difficulties in learning what you do, ask the teacher?
S : No, just ask a friend

Problem number 2
MS subject

P : What are your difficulties in question number 2?
S : Difficult Buk

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P : Where do you not understand?
S : In the second method of substituting togetherness.
P : When the teacher explains what you have noticed?
S : Yes, but I forgot
P : The answer is, you do it yourself or copy to a friend?
S : Banning the book, but I developed it myself.

The result show that students who test results are low, have difficulties and obstacles in solving of linear equation in two variable. This is in accordance with Djadir [12], which he said that the student had students with medium mathematics achievement have factual difficulties, and students with low mathematics achievement have factual, conceptual, operational, and principle difficulties. This is because they do not understand the problem, make a solution plan, perform calculations, and re-examine the results that have been obtained. The results of the interview, it was found that the students in solving of linear equation in two variable questions. They do not understand the intent or content of the question and they lack the mastery of the two-variable linear equation material with substitution and elimination. It can be concluded that the difficulty of solving the problem of linear equation systems is two variables because they do not understand the language of questions, the steps in solving problems and they also do not master the concepts, principles and facts contained in the two-variable linear equation material, especially by elimination and substitution. In addition to mastering the material that must be absolutely mastered, a teacher is also required to have skills in delivering material in teaching and learning activities. If the teacher is able to create an atmosphere in learning in the classroom so that there is a teaching and learning interaction that can motivate students to learn well and truly.

4. Coclusion

The aim of the study is to describe the difficulties of students in solving the system of linear equations in two variables. Based on the results of tests and interviews with students can be analyzed the causes of difficulties experienced by students in general because students have not mastered the material, less mastering the concept of linear equations in two variables, the cause found in students themselves is lack of interest in learning to improve their skills and overcome difficulties themselves.

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