

## Analysis Of Students' Difficulties In Solving Systems Of Linear Equations Of Two Variables Based On Problem Solving

Fadhlor Rahman<sup>1\*</sup>

### ABSTRACT

ABSTRACT This study aims to analyze students' difficulties in solving story problems of two-variable linear equation systems (SPLDV) based on problem-solving. The background of this study is based on students' low ability to identify and model information from story problems into the correct mathematical form. The study was conducted using a qualitative approach on 15 class X SMA Surya Buana Malang students. Data collection techniques include observation, written tests, interviews, and documentation. The study results showed that students experienced difficulties in several aspects, including: understanding keywords in story problems (variables and constants), writing down known and asked information correctly, choosing an appropriate solution method, and compiling mathematical models and conclusions regularly. These errors indicate that students' problem-solving skills must be improved through a more contextual and student-centered learning approach. This study recommends the use of problem-based learning strategies to help students develop critical thinking skills and an in-depth understanding of mathematical concepts.

**Keywords:** Student difficulties, story problems, SPLDV, problem solving, qualitative approach

## 82 Introduction

Numeracy skills and critical thinking skills are essential in the 21st-century education era, where students are expected to not only master theory but also be able to apply knowledge in everyday life. (Dhesita, 2023). Research shows that there are varying levels of student ability in solving mathematical problems. Students with high ability can solve mathematical problems well, while students with lower ability have difficulties, such as difficulty in identifying concepts and applying mathematical principles. (Malikah, 2023; Nuranggraeni et al., 2020). The use of appropriate learning models, such as constructivism or guided discovery approaches, can help overcome these difficulties and improve students' competence in learning mathematics. Student-focused learning can create an environment that supports exploration and collaboration between students. (Agus, 2019).

Mathematics as an educational science has experienced rapid development, but many students face difficulties in understanding and solving story problems. This is due to the complexity involving symbols, graphs, and numbers that often make students feel frustrated, especially when they have to switch from verbal to mathematical understanding. (Nashrullah et al., 2023). Students are expected to be able to proceed from one problematic stage to the next, and in this context, the ability to calculate alone is not enough; reasoning power and critical thinking

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<sup>1</sup>Universitas Muhammadiyah Malang

\*Alamat korespondensi: fadhlor.rhm@gmail.com

skills are also very necessary. (Firdaus et al., 2015). Therefore, the right approach in mathematics education greatly supports the achievement of critical skills.

Students' problem-solving skills can be developed through four main steps: (1) understanding the problem in depth, (2) developing a strategy or solution plan, (3) implementing the plan, and (4) evaluating the results achieved. These skills are very important, especially when students face math problems in the form of stories that require contextual analysis (Polya, 1973). The ability of high school students in solving story problems of linear equation systems of two variables, many of whom have not been able to solve them properly and correctly. This can be seen from the results of students' daily assessments, which prove that students have not been able to create mathematical models of story problems.

Based on the results of interviews and observations conducted with subject teachers, there are several obstacles experienced, including during learning, students often do not focus on following the learning process. During mathematics learning, students lack concentration in learning, there are still many students who have difficulty concentrating. Marked by errors when solving story problems of two-variable linear equation systems. The mathematics scores obtained by students during daily assessments are often below average. This is by the results of observations made when looking at student activity sheets given by teachers. In the assessment, it was found that 3 students in grade X completed and 12 students got scores below average.

The research is interested in conducting research with the title Analysis of students' difficulties in solving two-variable linear equation systems based on problem solving. Thus, this study aims to determine whether the difficulties experienced by students in solving mathematical story problems are based on problem-solving.

### **83 Research Methods**

This study uses a qualitative approach, a method based on the philosophy of postpositivism and applied to study phenomena in a natural context (Sugiyono, 2015). Unlike the quantitative approach, qualitative research relies on descriptive methods to dig up in-depth and accurate data to obtain more complete and real information.

The subjects of this study were 15 students of class XI SMA Surya Buana Malang. There were 9 male students and 6 female students. The instruments used in this study include observation, story test, interviews, and documentation. Observation is used to observe how teachers implement problem-solving learning. The story test is used to identify difficulties experienced by students. Interviews are conducted as an effort to clarify students' answers on the test. Meanwhile, documentation is used to examine students' work results to determine the types of errors made.

In research, data analysis is done by using data reduction techniques, presenting data, and verification to ensure that the data obtained is valid. The triangulation process is used as a method to test the validity of data, which utilizes other sources in the verification process. (Natow, 2020). Triangulation techniques applied in this study allow data collection from one source through various methods, so that it can confirm or complement findings from various perspectives. (Donkoh, 2023).

### **84 Result and Discussion**

The research was conducted in two face-to-face learning sessions. Learning began with an explanation of the material on the two-variable linear equation system, then working on story problems, and continued with interviews on the first day. Then the second meeting was continued by conducting interviews with students who had not been interviewed. Based on the

results of the research that had been carried out, it was found that students had difficulty in solving story problems based on problem-solving learning for class X. This can be seen from the results of the analysis of student answers, where students did not understand the keywords in the story problems. In the research that had been carried out, there were still some students who were wrong in determining the keywords in the two-variable linear equation system.

According to the interview that has been conducted with students who have answered "easy, sir," they have been interviewed. It turns out that students do not realize that what has been written is not quite right. After finding the keywords, students must write and asked to be able to solve the problem. All students have written and answered correctly. But students do not pay close attention that writing known and asked should be accompanied by a mathematical model that obtains data from the problem.

According to the interview that has been conducted with students who answered "this is written, sir," but students are not aware that students are lacking in writing known and were asked. However, some students are still confused about determining the solution method for solving story problems of two-variable linear equation systems. In determining the method used, students should write it regularly, such as known, asked, and answered, and write the conclusion correctly.

According to the answer of the student who answered "that sir, writing asked, known, answered. But sir, I didn't write one question, because I was confused". There were only a few students who were still confused in determining the method used in solving story problems. The next step that students must take is to solve story problems. Many students make mistakes when solving. Students can model story problems in mathematical models.

Based on the interview results, when experiencing difficulties in solving story problems, students stated that they would ask their friends. After getting the answer, the last step taken by the students was to write the answer by concluding the results that had been obtained. However, because the students did not write the conclusion, there was no representation in the form of a picture produced. When confirmed through an interview, the student answered, "No, ma'am. My answer is correct."

From the explanation, it can be seen that students experience several obstacles, including difficulties in writing mathematical models, not writing down known and asked information accurately, using inappropriate solution methods, errors in determining the final result, and not writing down conclusions from the answers obtained.

## 85 Conclusion

Based on the results of the study conducted during two learning meetings on the system of linear equations in two variables (SPLDV), it was found that students still experience various obstacles in solving problem-solving-based story problems. The most prominent difficulty lies in the early stages, namely in understanding and identifying keywords from story problems, such as variables and constants that should be assumed first. Although students have written the known and asked parts, most have not linked them to the right mathematical model. In addition, many students have not been able to organize the solution steps systematically, and are still wrong in determining the solution method and the final result.

Furthermore, some students did not write down the conclusions of their solutions, even though the previous steps had been taken. This shows that students are not used to reflecting on their answers in their entirety. When faced with difficulties, students tend to immediately ask their friends without trying to understand the problem independently, which indicates a lack of independence in thinking. Therefore, a learning approach is needed that emphasizes more on understanding the basic concepts of the two-variable linear equation system, the ability to analyze story problems, and the arrangement of structured solution steps up to the con-

clusion stage.

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