**EDUMATSAINS**
JURNAL PENDIDIKAN MATEMATIKA DAN SAINS
E-ISSN:2527-7235
Volume 9 Issue. 2 January, 2025, pp 292-300
http://ejournal.uki.ac.id/index.php/edumatsains

# STUDENTS' MISCONCEPTIONS IN SOLVING STORY PROBLEMS OF TWO-VARIABLE LINEAR EQUATION SYSTEMS ASSESSED FROM NUMERACY LITERACY

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**Article Info**

Article history:
Received : September 28, 2024
Revised : January 31, 2025
Accepted : January 31, 2025
Available online : January 31, 2025

https://doi.org/10.33541/edumatsains.v9i2.6182

**Abstract**

Misconceptions in solving story problems involving the System of Linear Equations of Two Variables (SPLDV) are often a challenge for students. This research aims to identify the types of misconceptions experienced by students of grade VIII of Kasih Yobel Junior High School in Singkawang in solving SPLDV story problems, which are studied from the perspective of numeracy literacy. This research used descriptive qualitative method involving six students as research subjects. Data were collected through diagnostic tests and interviews to identify misconceptions based on numeracy literacy components: understanding, use, interpretation, and communication. The results showed that students experienced several types of misconceptions, especially in the translation of story problems into mathematical form, the use of strategies/methods, and calculations. The misconceptions were caused by students' lack of understanding of the basic concepts of SPLDV and inability to apply mathematical symbols and operations correctly. The discussion of the research results emphasizes the importance of learning approaches that strengthen students' numeracy literacy, especially in terms of understanding concepts and applying effective strategies. The conclusion of this study shows that improving numeracy literacy needs to be a priority in mathematics teaching to reduce misconceptions and improve students' ability to solve SPLDV story problems.

Keywords: Misconceptions, System of Linear Equations Two Variable, Story Problem, Numeracy Literacy

## 1. Introduction

Misconceptions that often occur in students cannot be separated from the consequences of the incompatibility of existing concepts. Misconceptions in students often arise due to the lack of

complete prior knowledge (preconceptions), thus causing errors in understanding the information that has been received previously (Suparno,2013). Effective way to overcome and correct students who are often affected by misconceptions is to provide diagnostic tests that can measure students' misunderstandings (Arikunto,2013). Therefore, giving diagnostic tests is the right way to overcome misconceptions and provide improvements in student understanding.

Based on the results of my teaching experience at Kasih Yobel Junior High School in Singkawang, there are still many students who experience misconceptions when solving story problems related to problem solving on the material of the system of linear equations of two variables, so that student learning outcomes are low. This is shown in the results of the math test on the material of the system of linear equations of two variables in solving story problems in class VIII of Yobel Singkawang Junior High School as follows: The test results with 30 students, there were 23 students who obtained test scores that were still below the Minimum Completeness Criteria (KKM) applied at school which is 75.

Based on teaching experience in class VIII on the results of many student tests found there were 7 students who answered correctly and 23 students who answered not in accordance with the question answer key. With various classifications of errors. There are 5 students who experience translation misconceptions, namely students cannot convert a problem into a mathematical model, there are also 7 students who experience sign misconceptions, namely the inability of students to write or give the right mathematical signs, operations or symbols. there are also 10 students who experience systematic misconceptions, namely in writing the steps in working on the problem or the discrepancy between the answer and the solution, and there are also 8 students who experience arithmetic misconceptions, namely the inability of students in mathematical calculation operations.

Based on the problems described above, misconceptions in solving math problems require special attention. According to Edogawatte (2011) and (Natalia, et al. 2016), there are three types of errors that commonly occur in solving mathematical problems, namely: misunderstanding ideas (wrong ideas), algorithms or processes (false algorithms) and human error. (errors due to lack of precision or thoroughness).

Equations are often used in mathematics and other subjects, which means that a medium that can teach students how to solve equations, especially linear equations of two variables, or System of Linear Equations of Two Variables (SPLDV) as it is called in Indonesian, is needed (Rohaeti, E,E., et al, 2023). Misconceptions in the system of linear equations of two variables can have a negative impact on students' ability to solve problems involving mathematical relationships in the real world seen that misconceptions mostly belong to the subjects of numbers and operations (Yazici, N., Simsek, M. 2022). Therefore, research on numeracy literacy misconceptions in solving story problems of the system of linear equations of two variables is very important. One of the factors that can influence the emergence of misconceptions is the lack of understanding of numeracy literacy, which is the ability of individuals to use and interpret mathematical information in various situations. Students who have low numeracy literacy may tend to experience

misconceptions when facing story problems involving the system of linear equations of two variables.

Numeracy literacy requires students to be able to read, understand, and analyze mathematical problems, while story problems require students to be able to read and understand problems. Thus, numeracy literacy and story problems are related. (Basri et al., 2021). Use of story problems can train students' basic literacy and numeracy literacy skills (Mahmud & Pratiwi ,2019). Story problems are a form of mathematical problems presented in the form of narratives or real-life situations, which require students to understand, analyze, and apply mathematical concepts in problem solving. Story problems in mathematics learning help students develop conceptual understanding, improve critical thinking skills, and train them in applying problem-solving strategies in real life. In addition, story problems encourage students to connect various mathematical concepts with situations that are relevant and meaningful to them (Wijaya, A,2017).

Numeracy literacy is considered as a potential alternative to overcome the above obstacles. Numeracy literacy is an individual's ability to formulate, use and interpret mathematics in various contexts. It includes quantitative thinking and reasoning skills, understanding numerical concepts and using mathematical tools in everyday life (OECD, 2019). Numeracy literacy includes students' ability to describe mathematical problems in a clear narrative form and communicate mathematically well about the solutions they find. Therefore, this study aims to go in-depth into the misconceptions that often arise when students solve story problems of the system of linear equations of two variables using the numeracy literacy approach in class VIII junior high school.

Based on student learning outcomes at Kasih Yobel Junior High School in Singkawang, students in mathematics learning experience various misconceptions of learning mathematics. For example, students have difficulty in reading and interpreting statistical data and basic mathematical symbols such as the ability to model and write other mathematical symbols. Students are also less than optimal in applying the mathematical concepts that have been given in everyday life. this cannot be denied because mathematics is abstract learning so that an innovation is needed that can lead children to be able to improve numeracy literacy.

With a better understanding of these misconceptions and the impact of numeracy literacy approaches, mathematics educators and researchers can develop more effective teaching strategies to assist students in understanding the concept of the system of linear equations of two variables. This research is expected to make an important contribution to efforts to improve mathematics learning and students' problem solving skills at the junior high school level.

Based on the description above, the author is interested in knowing how students' misconceptions are assessed from numeracy literacy in solving story problems of the System of Linear Equations of Two Variables in class VIII of Kasih Yobel Singkawang Junior High School.

## 2. Methods

The research method that will be used in this research is descriptive qualitative method. This method will be used to find out how the misconceptions of class VIII students of Kasih Yobel Singkawang Junior High School in solving story problems of two-variable linear equation system are assessed from numeracy literacy. The subjects in this study were class VIII students totaling 6 students at Kasih Yobel Singkawang Junior High School.

In this study, the data collection techniques used were test techniques and direct communication techniques. The data collection tools used in this study were diagnostic tests and interview guidelines. As for preparing the test, the test preparation procedure is used, including the preparation of the question grid, writing items, testing the validity of the items, and reliability.

The procedure in this study includes three stages, namely: first, the preparation stage such as conducting pre-research at Kasih Yobel Junior High School in Singkawang, compiling a research proposal, compiling research instruments, namely as follows: Grids of questions, test questions, answer keys and scoring guidelines for test questions, rubrics for scoring test questions, scoring guidelines. After the research instrument was compiled, the researcher validated the instrument and revised it based on input from experts. Furthermore, researchers took care of licensing for research implementation at the school and determined the research schedule with the mathematics subject teacher at Kasih Yobel Junior High School in Singkawang. In the second stage, namely the implementation of giving diagnostic tests to junior high school students, conducting interviews with students, conducting data management and analysis, describing the results of data management and analysis, the last stage is preparing a report based on the research results that have been obtained.

Qualitative data analysis techniques used in this study go through three stages, namely the first data reduction, including correcting the answers that have been filled in by students, the work of the subjects to be interviewed is presented in the form of images that are first analyzed for errors then transformed in the form of notes that will be used as interview material and managing the results of interviews in the form of notes with a good and neat narrative. The second is the presentation of data which includes giving the value of the results of the answers of students based on the criteria of the scoring rubric for the test material of the system of linear equations of two variables in the form of stories, presenting the results of interviews that have been recorded in the form of documentation and notes in the form of narratives, presenting the results of data analysis in the form of students' misconceptions in solving story problems seen from numeracy literacy skills. and the third is drawing conclusions in this study is to analyze the test results and the results of student interviews so as to obtain students' misconceptions studied from numeracy literacy in

solving the story problem of the System of Linear Equations of Two Variables in class VIII SMP Kasih Yobel Singkawang.

## 3. Result and Discussion

This research reveals various misconceptions experienced by students of grade VIII SMP Kasih Yobel Singkawang in solving story problems of system of linear equations of two variables (SPLDV) studied from numeracy literacy. Based on the results main findings of data analysis, misconceptions found in students include misconceptions of translation, concepts, symbols, strategies/methods, systematic/steps, and calculations.

The results showed that translation misconceptions occurred in 33.33% of the students studied, especially in question number 1. This misconception arose because students had difficulty in understanding the context of the question sentence and were unable to write the meaning correctly. This indicates that they are lacking in the understanding component of numeracy literacy, especially in identifying information and understanding the meaning of mathematical symbols used in the problem.

In addition, concept misconceptions were also found in 33.33% of students in question number 1. Students had difficulty in understanding and connecting the basic concepts of SPLDV correctly. They often make mistakes in writing what is known and what is asked in the problem, which indicates an inability to identify relevant information and understand related mathematical symbols and meanings.

Symbol misconceptions were also found, where students did not understand the correct use of mathematical symbols, especially in determining the correct calculation operation. These errors indicate that students lack understanding of the meaning of mathematical symbols, which is part of the understanding component in numeracy literacy.

Strategy/method misconceptions occurred for 50% of students in problem number 1 and 66.67% of students in problem number 2. Students had difficulty in selecting and applying effective solution strategies, which showed an inability to use mathematical concepts and operations correctly.

Systematic misconceptions/steps and calculations were found in 83.33% of students in both problems. Students were unable to develop systematic solution steps and perform accurate calculations, indicating weaknesses in analyzing the information provided, assessing the accuracy of results, and communicating solutions clearly and structurally.

This research revealed that misconceptions in solving story problems of system of linear equations of two variables (SPLDV) in grade VIII students of Kasih Yobel Junior High School in Singkawang are closely related to numeracy literacy, especially in the components of

understanding, using, and interpreting mathematical information. Based on the results of the analysis, it was found that students experienced various types of misconceptions, which included translation, concepts, symbols, strategies/methods, systematic/steps, and calculations.

**Translation Misconception**

Translation misconceptions occur because students are unable to convert the information in the story problem into an appropriate mathematical model. Some students understand the context of the problem in general, but fail to express the real meaning in the form of mathematical symbols or equations. This shows that they have difficulty in identifying important information and understanding the mathematical symbols used in the problem. This error may be due to a lack of skills in reading carefully and understanding the meaning of words, which is an important aspect of the "understanding" component of numeracy literacy.

**Concept Misconception**

Concept misconceptions occur when students are unable to correctly connect the basic concepts needed to solve SPLDV problems. For example, students may know the relevant formula or equation, but cannot apply it in the context of a story problem. These misconceptions indicate that students' understanding of basic mathematical concepts is not strong enough, so they have difficulty in integrating the knowledge they already have with the new situation encountered in the problem. This indicates the need for greater emphasis on teaching that develops deep conceptual understanding.

**Symbol Misconceptions**

Symbol misconceptions reflect students' inability to understand and use mathematical symbols correctly. Students often make mistakes in determining the correct arithmetic operation, such as addition, subtraction, multiplication or division. These errors indicate that they do not have an adequate understanding of mathematical symbols, which should be part of the "understanding" component of numeracy literacy. Lack of practice in using these symbols in various contexts may be the main cause of these misconceptions.

**Strategy/Method Misconceptions**

Strategy or method misconceptions occur when students are unable to select and apply effective solution strategies. In this case, students may try to use incorrect or inappropriate strategies to solve SPLDV problems. These errors indicate that students have not fully mastered the skills in applying appropriate mathematical concepts and operations, which is part of the "using" component in numeracy literacy. It is important for teachers to provide more and varied practice in solving problems that require the application of various solution strategies.

**Systematic/step misconceptions**

Systematic or stepwise misconceptions arise when students are unable to construct logical and systematic solution steps. Errors in the sequence of solution steps often result in incorrect answers, even though the student may have understood the basic concepts. These misconceptions indicate that students have difficulty in planning and executing solutions systematically. This relates to the "interpreting" component of numeracy literacy, where students should be able to analyze the given information and devise effective strategies.

**Calculation Misconceptions**

Calculation misconceptions occur when students are incorrect in performing mathematical operations or in interpreting the results of calculations. These errors can be caused by an inability to apply the correct mathematical operations or to double-check the calculation results to ensure accuracy. This misconception suggests that students need more practice in performing accurate calculations and in evaluating the reasonableness of their results. This is also related to the "interpreting" component of numeracy literacy.

Overall, this study shows that students' misconceptions in solving SPLDV story problems are closely related to weaknesses in numeracy literacy. The misconceptions that occur reflect the need for improvement in concept understanding, the use of mathematical symbols and operations, as well as appropriate strategies and calculations. To overcome this problem, a more comprehensive teaching approach is needed, which focuses not only on mastering concepts but also on developing analytical thinking and problem-solving skills. Thus, students will be better able to understand, use, interpret and communicate mathematical information effectively, which will ultimately improve their learning outcomes.

Story problem can contextualized mathematics learning is more effective because it helps students understand the relevance of numeracy concepts in real life. By using story problems based on daily life problems, teachers can make learning more interesting and meaningful for students (Boaler, 2016). The use of mathematical models such as diagrams, tables and graphs in solving story problems helps students understand the relationship between numbers and concepts. Teachers can teach various modeling strategies to improve students' numeracy comprehension (Lesh & Doerr ,2003).

Suggest areas for future research could explore the long-term impact on the development of students' numeracy skills, especially in the application of mathematical concepts in daily life and the world of work.

## 4. Conclusion

This study found that students in grade VIII of Kasih Yobel Junior High School in Singkawang experienced several misconceptions in solving story problems on the system of linear equations of

two variables assessed from numeracy literacy. Students have difficulty translating information from story problems into mathematical form, do not fully understand the basic concepts of SPLDV, and often make mistakes in the use of symbols and calculation steps. These errors show the importance of numeracy literacy, which involves the ability to understand, use, interpret and communicate. It can be concluded that a more effective learning strategy is needed to overcome these misconceptions and improve students' ability to solve SPLDV story problems.

Recommendations for students should this research can be a reference to know or identify their abilities and misconceptions in solving a problem. For teachers to better understand the mathematical problem solving abilities of their students in various fields so that it makes it easier for students to understand the next material and follow up on the misconceptions that many students make by training students to be skilled in the calculation process so that students can get the correct answer, so that students do not repeat these misconceptions.For future researchers, use research subjects that represent each misconception that occurs to make it easier and plan solutions to the causes of students' misconceptions so that similar misconceptions do not occur.

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