KnE Social Sciences
ICMScE
International Conference On Mathematics And Science Education
Volume 2024

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Research Article

Analysis of Problems in Learning Mathematics Based on Difficulties, Errors, and Misconceptions in the Material of Equations and Inequality Absolute Values of One Variable: Systematic Literature Review

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Abstract.
Problems in learning mathematics, there will be difficulties, errors, and student misconceptions during learning. This study aims to analyze problems in learning mathematics based on difficulties, errors, and misconceptions about the material of linear equations and inequalities of one variable. The method used in this research is a Systematic Literature Review (SLR). The population of this research is all Of the 30 journal articles obtained, then adjusted to the inclusion criteria and the sample consists of 15 relevant research results on problems in learning mathematics based on difficulties, errors, and misconceptions on the material of linear equations and inequalities of one variable. Samples were taken from indexed journals published in the period 2011-2021. The research question is how to describe problems in learning mathematics based on difficulties, errors, and misconceptions on the material of linear equations and inequalities of one variable based on the year of school, level of study, research location, and sample size. The SLR method can find mathematics learning problems with ten years of study. The results showed that students' errors and misconceptions dominated learning outcomes in the problem of learning equations and inequalities absolute value of one of the variables. Most of the research was conducted at the junior high school level outside Java with a sample size of 30 people or more. Based on the results of the review, the conclusion of the study proves that students often experience errors when studying equations and inequalities of the absolute value of one variable.

Keywords: learning mathematics based on difficulties, errors, and misconceptions, systematic literature review, the material of equations and inequality absolute values of one variable.

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Published: 26 April 2024

Publishing services provided by Knowledge E

Selection and Peer-review under the responsibility of the ICMScE Conference Committee.

1. INTRODUCTION

Mathematics is a science that is taught to students from elementary school to senior high school level. Mathematics has a very important role in everyday life [1]. However, some students stated that mathematics was boring and scary. Thus, a sense of anxiety and distrust arises in students [2, 3]. Based on the following problems in learning mathematics, there will be difficulties, errors, and student misconceptions during learning.

In the 2013 curriculum, absolute value material is combined with equations and inequalities. Thus, students must understand the prerequisite material, namely absolute values. Absolute value is an implicit concept. Thus, this concept is a difficult mathematical subject. This will result in learning barriers in the material of equations and inequalities [4].

Students' difficulties in solving problems about the equation and inequality of the absolute value of a linear variable still occur. Based on the research of Ammani, R, et al., they discussed that students' difficulties in the material of equations and inequalities absolute value were seen from 2 factors, namely internal and external factors. Internal factors come from within students such as motivation, interests, talents, and intelligence. Meanwhile, external factors come from outside the students, such as the delivery of material from the teacher [5].

As for other studies that found student difficulties. According to Akrom that students have not understood the basic concepts of algebra and the concept of absolute value maximally. So, when solving problems about equations and inequalities, the absolute value of one variable experiences difficulties and errors [6].

On the other hand, students have difficulty, there are errors that often occur when solving equations and inequalities of absolute linear value of one variable. According to Sullastri, students experience errors due to a lack of understanding of students about the concept of absolute value. So, in solving equations and inequalities, the absolute linear value of one variable, students experience an error [7].

The same thing happened to students, namely experiencing errors in solving equations and inequalities of absolute linear value of one variable. According to Almong, et al. that errors that occur in students are due to misconceptions in understanding absolute values. Where students often omit the absolute value sign and state positive numbers on the absolute value sign and students understand that the absolute value concept only changes negative numbers to positive [8].

Based on the description above, the purpose of this study is to describe the results of the analysis of problems in learning mathematics that often occur including difficulties,

errors, and student misconceptions. Thus, the data collection stage is an important stage of SLR. Through the research data collected, the researcher asked several relevant questions as follows.

1. How is the description of the results of the research regarding the problems in learning the material of equations and inequalities the absolute value of one variable based on the year of study?
2. How is the description of the results of the research regarding the problems in learning the material of equations and inequalities the absolute value of one variable based on the level of study?
3. How is the description of the results of the research regarding the problems in learning the material of equations and inequalities the absolute value of one variable based on the research location?
4. How is the description of the results of the research regarding the problems in learning the material of equations and inequalities the absolute value of one variable based on samples size?

2. RESEARCH METHOD

The research method used is Systematic Literature Review (SLR), which is a survey-based quantitative descriptive approach [9]. The survey was conducted on secondary data based on the results of primary research regarding problems in learning which were reviewed based on difficulties, errors, and misconceptions on the material of equations and inequalities absolute value of one variable..

The stages in this research, namely data collection, data analysis, and drawing conclusions. Data sourced from primary studies that have been used as journal articles. Data is collected using indexed electronic databases such as Google Scholar, Portal garuda, Doaj, and direct urls of national journals. Then, all the articles were extracted to select the relevant articles. Articles that meet the criteria will be entered in the analysis stage.

The criteria for obtaining data for research purposes use inclusion criteria. Inclusion criteria are criteria for research subjects who will represent research samples that qualify as samples [10]. The inclusion criteria were determined as follows: 1) the articles came from mathematics education research, 2) the articles were published in the 2011-2021 period, 3) the research came from the analysis of students' difficulties, errors, and

misconceptions on the equation and inequality material of the absolute value of one variable.

The population of this research is all analytical research on students' difficulties, errors, and misconceptions on the material of equations and inequalities of absolute value of one variable. Based on 30 journal articles obtained, then adjusted to the inclusion criteria. Thus, a sample of 15 relevant journal articles was obtained for systematic review.

3. RESULTS AND DISCUSSION

3.1. Data Based on Criteria

In the following a table will be presented based on the inclusion criteria by categorizing them based on four moderating variables, namely the year of research, the level of research, the place of research, and the sample size. Descriptive data are presented in Table 1.

TABLE 1: Number of studies based on criteria.

No	Criteria	Learning Problems		
		Student difficulties	Student erros	Student misconception
Year of study	2011-2013	1	0	1
	2014-2016	0	0	0
	2017-2019	1	2	1
	2020-2021	1	6	2
Level study	SD	0	0	0
	SMP	0	0	0
	SMA	3	8	4
Research Location	Pulau Jawa	2	4	0
	Luar Pulau Jawa	1	4	4
Sample size	≤	0	4	1
	>	3	4	3
Total		**3**	**8**	**4**

Table 1 shows that in the past 10 years, research has been dominated by student errors and has been published in various indexed journals [1, 8, 19, 11–18]. Furthermore, it will be discussed through the moderating variables that have been determined.

3.2. Year of Study

There are four groupings based on the time of the study, starting from 2011-2012-2013-2014-2015-2016-2017-2018-2019. The data obtained are as follows.

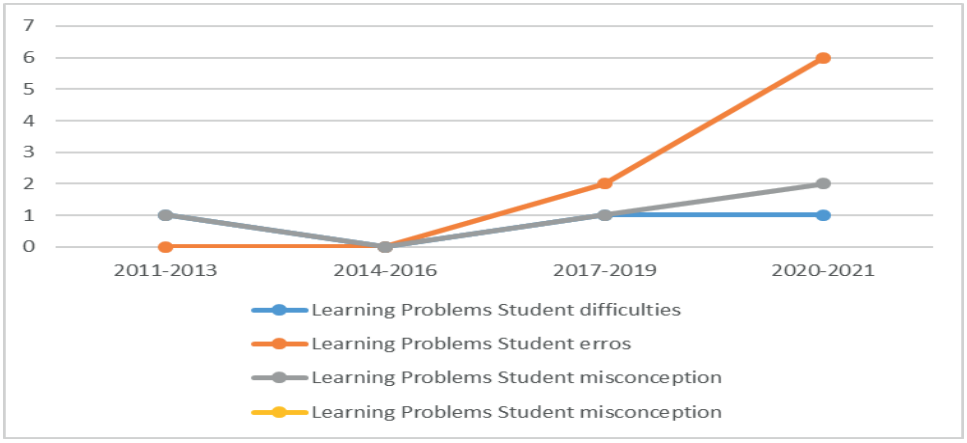

Figure 1: Data based on year of study.

Figure ?? shows research on learning problems in mathematics on equations and inequalities the absolute value of one variable tends to increase after 2016-2017 and student errors are one of the types of learning problems in mathematics on equations and inequalities material absolute value of one of the most commonly encountered variables from two other types of learning problems. This shows that the problems that often occur in learning mathematics are student errors.

3.3. Study Level

There are three groupings based on the level of study, namely Elementary School, Junior High School, and Senior High School. The following data were obtained as follows.

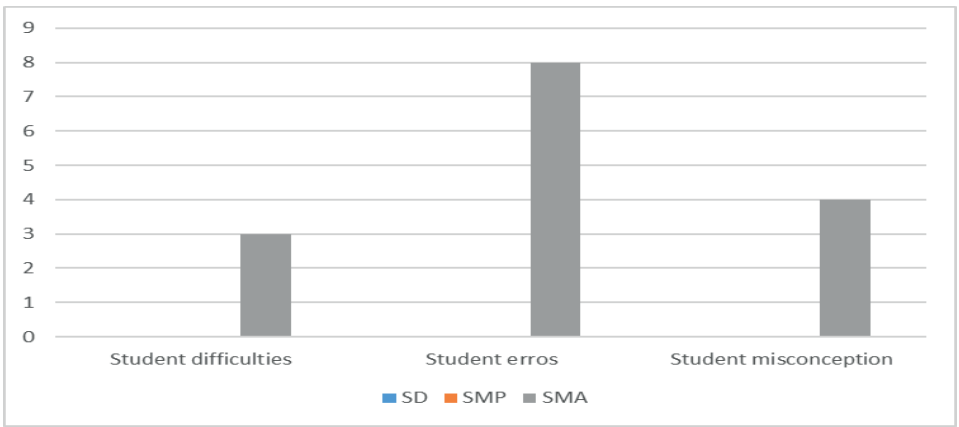

Figure 2: Data based on study level.

Figure 2 can be concluded that student errors are often found at the high school level. In the field of mathematics, especially the subject of equations and inequalities the absolute value of one variable is studied at the high school level. This has attracted the attention of researchers to be able to provide solutions in solving mathematics learning problems on the material of equations and inequalities of absolute value of one variable.

3.4. Location Research

There are two groups based on the research location, namely outside Java and Java. The following data are obtained as follows.

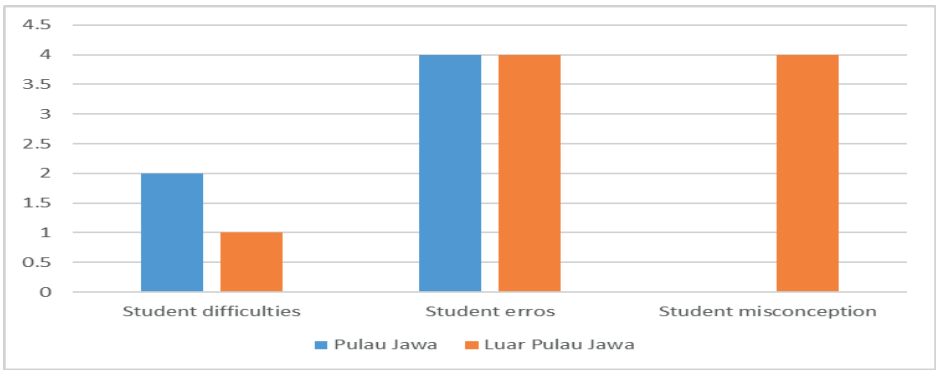

Figure 3: Data based on location research.

Figure 3 can be interpreted that each period of research on problems of learning mathematics on the material of equations and inequalities of absolute value of one variable is mostly carried out outside Java and the types of problems that are most commonly encountered are student errors and student misconceptions. However, the types of mathematics learning problems that are often found in the Java island are only student errors. Therefore, this can be considered by researchers in the Java island region. This has also attracted the attention of researchers in the island of Java to be able to conduct research related to mathematics learning problems in the equation and inequality material of the absolute value of one variable.

3.5. Sample Size

There are two groups based on sample size, namely ≤ 30 people and > 30 people. The following data are obtained as follows.

Figure 4 shows that PBL to improve concept understanding and problem solving skills from the 2012-2019 period was dominated by research with a sample of less than

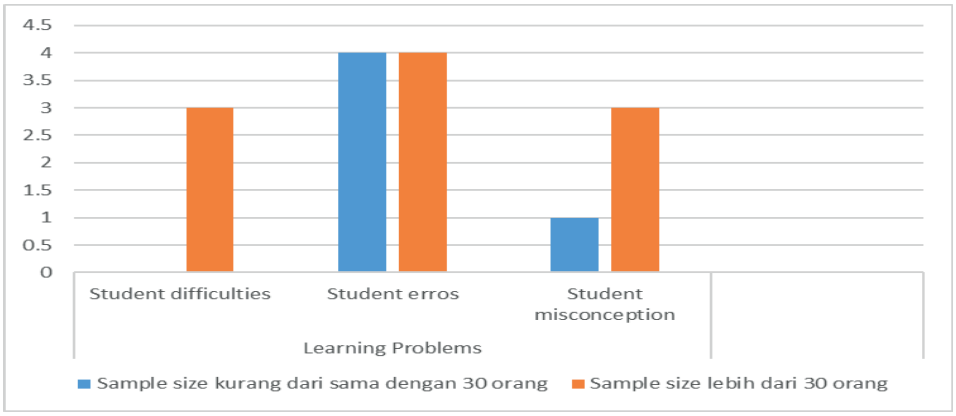

Figure 4: Data based on sample size.

or equal to 30 people, while in communication skills, it was only found for a sample of more than 30 people.

4. CONCLUSION

Research that discusses the problem of learning mathematics in the material of equations and inequalities the absolute value of one variable for 5 periods, especially in 2017-2021 has increased. Among students' difficulties and students' misconceptions, student errors get a lot of attention to be studied as a teacher's reference in overcoming these problems.

Research on mathematics learning problems based on student difficulties, student errors, and student misconceptions is mainly carried out at the high school level outside Java with a sample of 30 people or more. Based on the results of the study, it was proven that there were various kinds of problems in learning mathematics in the matter of equations and inequalities of absolute value of one variable. The results of a review of 15 articles that became the main study in this study found several variations of students' difficulties, errors, and misconceptions during the learning process in each primary study research result. From the results of this diversity, it can be concluded that the results of preliminary studies with wide variations are in the large category of student errors and student misconceptions.

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