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ANALYSIS OF STUDENTS' MATHEMATICAL REPRESENTATION ABILITY IN SOLVING DIVERGEN MATHEMATICS PROBLEMS IN VIEW OF GENDER DIFFERENCES

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Abstract

The ability of mathematics representation os one of the basic skill (ability) that must be had by students. This ability is the ability to tell the mathematics idea as a tool to find solution of mathematics problems. This ability needed by students to understand mathematics concept and to communicate mathematics idea. The purpose of the research was to describe the ability of mathematics representation of male and female students in finishing divergent mathematics problems. Library research was used to complete this research. The result was male students were able to complete divergent mathematics problems in symbolic representation indicator correctly and precisely, but they tend to be difficult in completing verbal representation. Whereas, female students were able to complete divergent mathematics problem on verbal representation indicator correctly and precisely, but they thend to be difficult in completing symolis representation.

Keywords: representation, divergent msthemstics problem, gender

Abstrak

Kemampuan representasi matematika merupakan salah satu keterampilan (kemampuan) dasar yang harus dimiliki oleh siswa. Kemampuan ini merupakan kemampuan mengungkapkan ide matematika sebagai alat untuk mencari solusi dari masalah matematika. Kemampuan ini diperlukan oleh siswa untuk memahami konsep matematika dan mengkomunikasikan gagasan matematika. Tujuan penelitian ini adalah untuk mendeskripsikan kemampuan representasi matematika siswa putra dan putri dalam menyelesaikan soal matematika divergen. Penelitian kepustakaan digunakan untuk melengkapi penelitian ini. Hasilnya adalah siswa laki-laki mampu menyelesaikan soal-soal matematika divergen indikator representasi simbolik dengan benar dan tepat, namun mereka cenderung kesulitan dalam menyelesaikan representasi verbal. Sedangkan siswa perempuan mampu menyelesaikan soal matematika divergen pada indikator representasi verbal dengan benar dan tepat, namun kesulitan dalam menyelesaikan representasi simbolis.

Kata kunci: representasi, masalah msthemtics divergen, gender

INTRODUCTION

Mathematics is a field of study that plays an important role in life, the role of mathematics in the world of education is a source of knowledge from other sciences (Watratan et al., 2021). Because it is considered important and obligatory for its role, mathematics is taught at all levels of education. Klinei stated that mathematics is not an independent knowledge that can be perfected because of itself, but that the existence of mathematics is to assist humans in understanding and mastering social, economic, and natural problems. Sinaga (2016) stated that mathematics is a field of science that can increase a

person's ability to think logically, rationally, critically, accurately, effectively and efficiently, but to achieve this requires good mathematical understanding and competence (Ratuanik & Rudhito, 2020).

Mathematical learning is very closely related to mathematical ability which is the ability to deal with problems both in mathematics and real life (Ratuanik, 2019). The National Council of Teachers of Mathematicals (NCTM, 2000) states in a book entitled 'Principles and Standards for School Mathematics' that there are five mathematical abilities that students should have, namely learning to communicate (mathematical communication), learning to reason (mathematical reassignment). , learn to solve problems (mathematical problem solving), learn to relate ideas (mathematical connection), learn to interpret ideas (mathematical repetition). This mathematical ability describes the relationship between mathematical understanding and mathematical competence that students should know and do.

Of the five aforementioned abilities, mathematical repetition is one of the basic foundations of all abilities that must be possessed by students because in the process of teaching mathematics, the ability of repetition is very important to support the success of the learning process (Ratuanik et al., 2021). However, basically teaching mathematics in the classroom still emphasizes understanding of students without giving opportunity to students to try various kinds of repetition in understanding a concept. Students are not given the opportunity to find answers or different ways from what the teacher has taught. The teacher does not give opportunity to students to construct their own opinion or understanding of mathematical concepts (Ratuanik et al., 2021).

Representations that arise from students are expressions of mathematical ideas or ideas conveyed by students in their efforts to find a solution to the problem they are facing (NCTM, 2000: 67). Different thoughts or ideas from each student will give rise to various kinds of representations, especially if students are given freedom in expressing their ideas. Of course, there are various reasons for students to determine which repetition will be used. Based on these ideas expressed in mathematical repetition, it can be seen that students' ability to understand mathematics (Ratuanik, 2019). In addition, from the various kinds of mathematical representations used by students, it can also be seen how students use their mathematical knowledge to deal with mathematical problems.

There are various mathematical problems that can be encountered in everyday life, one of which is the divergence math problem (Ratuanik & Rudhito, 2020). A divergent mathematics problem is a mathematical problem whose completion procedure cannot be directly used to find answers to the said questions and allows you to have different ways of solving it as well as having diverse answers. Therefore, the problem of divergence is relative to each individual. In teaching mathematics, for example the same mathematical problem is given to several individuals, it will get different responses in

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solving it. This is due to the ability of students' mathematical representations to be creative in solving problems, one that can give rise to students' mathematical representational representations is creative thinking.

RESEARCH METHODS

In this research we use a type or research approach in the form of Library Studies (Library Research). Literature study is a study that is used to collect information and data with the help of various kinds of material in the library such as documents, books, magazines, historical stories, and so on (Mardalis, 1999: 45). Literature study can also study various research books as well as the results of previous research that are similar in nature which are useful for obtaining a theoretical basis for the problem to be studied (Sarwono, 2006: 75)

Literary study also means data collection techniques by conducting an analysis of books, literature, notes, as well as various reports related to the problem to be solved (Nazir, 1988:98). related to culture, values and norms that are balanced in the social situation studied (Sugiyono, 2012:14) The data collection technique used by the author in this research is a literature study, namely by searching for data related to the discussion in the research title that the researcher takes (Ratuanik & Feninlambir, 2022). In this research, relevant data were collected in various ways, namely through library studies, literature studies, internet searches of related journals and books, after which they were read and studied. After the data that has been collected, comparisons and tests of the data that have been found are carried out (Watratan et al., 2021). This research type of literature study in this research was conducted to analyze the mathematical representational representation abilities of male and female students in solving different mathematics problems. Data Analysis Techniques The research was carried out using qualitative analysis techniques, namely quoting appropriate opinions (Ratuanik, Mesak; Lolonlun,Blasius; Bacori, 2022).

RESULTS AND DISCUSSION

Mathematics teaching aims to improve students' learning outcomes, as well as to improve various students' mathematical abilities. The National Council of Teachers of Mathematics (NCTM) sets five standards of mathematical ability that must be possessed by students, namely problem solving ability, reasoning ability, communication ability, ability to make connections, and repetition ability. One of the important mathematical skills mastered by students is the ability to represent representation,

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because basically mathematics is an efficient, organized symbol and has the ability to analyze quantitatively.

The word reinstatement in the Indonesian Language Big Dictionary (KBBI) means the act of representing; being represented; what it represents; representative. Representation is a form of interpretation of students' thoughts about a problem, which is used as a tool to find a solution to the problem. The form of student interpretation can be in the form of words or verbal, writing, pictures, tables, graphs, ideas or mathematical ideas displayed by students in their efforts to find a solution to the problem they are currently facing.

Each mathematical ability has its own indicator which is used as a reference in research, while the indicators of repetition ability according to NCTM (2003, 2) are as follows: 1) use of repetition to model and intellectual interpretation of physical, social, and mathematical phenomena, 2) creative and use reipretation to organize, record, and communicate mathematical ideas, and 3) select, apply, and translate to slovei problems.

From the explanation above, it can be explained that indicators of mathematical representation ability include 1) using representation (veirbal, symbolic and visual) to model and interpret physical, social, and mathematical phenomena, 2) creating and using verbal, symbolic and visual representations) to remember to communicate mathematical ideas and, 3) choosing to apply and translate mathematical representations (veirbal, symbolic and visual) to solve problems (Ratuanik, Mesak; Lolonlun,Blasius; Bacori, 2022).

Minarni (2016) explained that mathematical representations can be reproduced in visual and non-visual representations. Visual representations including graphs, tables, sketches/drawings, and diagrams; Non-visual representations include numerical representations, and mathematical equations or mathematical models. According to Hwang (2007) mathematical repetition is divided into several types, as follows: (1) Language repetition (spoken languagei); namely translating the observed properties and relationships in mathematical problems kei in written words. (2) Image Representation (Static Picture) i; namely translating mathematical problems into representations of images, tables, diagrams or graphs. (3) Symbol repetition (Writtein symbol); namely translating kei's mathematical problems into formulas, equations or mathematical expressions. Acording to (Ratuanik et al., 2021)Based on the aforementioned description, the indicators used in assessing students' mathematical repetition ability are similar to those in the following table:

Table 1. Mathematical Representation Indicators

Representation	Representational Forms

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Visual, in the form of: a) Diagrams, graphs or tables b) Pictures	a. Representing data or information from a representation to a representation of a diagram, graph or table. b. Use visual representation to solve problems.
	a. Create geometric patterns. b. Create geometric geometric drawings to explain the problem and facilitate its analysis.
Mathematical equations or expressions	a. Make equations or mathematical expressions from other representations given. b. Make a conjecture of a number pattern. c. Solving problems involving mathematical expressions
Written words or text	a. Create a problem situation based on the data or representation given b. Write down the interpretation of a repetition c. Write down the steps for solving math problems using words or text d. . Answer questions by using written words or text

According to Maharani (2020), students' mathematical representation ability by applying the Cooperative Learning Model of Think Pair Sharei type in terms of geindeir differences it can be seen that male students have a better mathematical representation ability category than female student pairs. Meanwhile, from the final theis analysis it is known that male students have high category mathematical representation abilities compared to female students. Meanwhile, the group of female students is dominated by beautiful abilities in representing a problem.

According to Agustin, et al (2021) the ability of mathematical representation is based on gender according to the criteria for increasing the ability of mathematical representation, namely high, medium, and beautiful. It can be seen that 75% of male subjects and 25% of female subjects have high category mathematical representation ability, respectively. reserve 25% male subjects and 50% of female subjects had the ability to reproduce mathematically in the moderate category, for the ability to reproduce mathematically in the beautiful category there were no male subjects included in this category, but there were 25% of the female subjects who were included in the low category. So the ability of mathematical representation in the high category of male subjects is greater than that of female subjects.

According to Umaroh & Pujiastuti (2020), male subjects are able to represent visually by making pictures clearly, while female subjects have not been able to represent it in the form of images. For the ability of symbolic representation, female subjects are able to use equations or mathematical models

correctly, while male subjects still experience errors in using mathematical symbols. For verbal repetition ability, even though the female subjects lack confidence in answering the questions, the male and female subjects have interpreted the words or written text well in a way that answers the questions correctly and recounts the steps of their work clearly.

Feiriyanto (2019) stated that (a) female subjects presented kei information in tabular representations using the graphical method and the simplex method, while male subjects did not present kei information in a tabular representation of the graphical way, and were less complete in the simplex methode solution, (b) Female subjects made graphic representations in a complete and precise manner, while male subjects made mistakes in graphic repetition and determined the area of completion, (c) male and female subjects wrote representational representations of symbols in problem solving in a complete and precise manner using the graphical method and methods i simplex , but in the simplex method the male subject is less complete, (d) the female subject makes verbal representations complete and precise both by means of graphics and the simple method, while male subjects are less complete in the graphical way and do not make verbal representations in the simple method.

According to Saputra (2021), the mathematical representational abilities of male students in solving divergent math problems, namely male students have difficulty in arranging words in constructing story questions, in solving mathematical problems related to the participants' mathematical symbols and models. the male students completed it brilliantly, and in making pictures the male students experienced a few difficulties. Meanwhile, female students in solving divergent mathematical problems, namely story problems that have been made have been presented in the form of stories or series of words in everyday life, in solving mathematical problems related to symbols and mathematical models, female students experience difficulties, and in make pictures of female students having a little difficulty.

Based on the explanation above, so that in this literature review it can be concluded that the mathematical representation ability of male students is higher than that of female students. Whereas in solving mathematical problems male students are able to solve divergent mathematical problems on the symbolic representation indicator correctly and accurately, male students tend to have difficulty solving verbal repetition. And, female students were able to solve divergent mathematics problems on the verbal representation indicator correctly and accurately, but female students were likely to have difficulty solving symbolic representations.

CONCLUSION

Mathematical representational ability is the ability of students to express ideas presented from a mathematical problem as an interpretation of the mind in various ways, such as pictures, words or mathematical symbols as a form of problem solving so that the meaning becomes clear. Mathematical representational ability is one of the most important components to be possessed by students in balancing thinking abilities, because in the process of teaching mathematics students need to remember some of the material being studied and to interpret ideas or ideas that exist in students.

For example, if the same mathematical problem is given to several individuals, it will get different responses in solving it. This is due to the ability of students' mathematical representations to be creative in solving problems, one that can give rise to students' mathematical representational representations is creative thinking. So, based on the literature review based on several studies, it can be concluded that the ability of mathematical representation of male students is higher than that of female students. In solving mathematical problems male students are able to solve divergent mathematics problems on the symbolic representation indicator correctly and accurately, but male students tend to have difficulty solving verbal repetition. Meanwhile, female students are able to solve divergent mathematics problems on the verbal representation indicators correctly and accurately, but female students tend to have difficulty solving symbolic representations.

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