Mathematical Anxiety in Mathematical Problem Solving: Literature Review

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Abstract. Feeling anxious when learning mathematics or things involving mathematics known as math anxiety and problem solving is a process of activities that prioritize the importance of procedures, strategic steps that students take in solving problems, so as to eventually find answers to questions. The purpose of this study was to find out mathematical anxiety in mathematical problem solving. The research method used in this research is a narrative literature review. The result of this narrative literature review is that a person who has mathematical anxiety does not always lead to the failure in solving mathematical problems.

Key words: mathematical anxiety; mathematical problem solving; literature review.

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INTRODUCTION

Mathematics is one of disciplines that have important role in education and everyday life. It needs to be understood by all levels of society, especially formal school students. Therefore, mathematics is one of the sciences taught from elementary (elementary school) to higher education (university). The Content Standard (SI) curriculum 2006 stated that the purpose of mathematics subjects in schools is that students to be able to understand mathematical concepts, use reasoning, solve problems, communicate ideas, and have an attitude of appreciating the usefulness of mathematics in life. From this explanation, one of the goals of learning mathematics for students is to enable them to have the ability or skills in solving problems or math problems, as a means for him to hone careful, logical, critical, and creative reasoning.

Mathematics problem solving is complex and can be challenging, both cognitively and emotionally (Di Leo et al., 2019). In addition, Ozcan also argues that problem-solving is transferring knowledge that is already owned into new situation (Özcan, 2016). Furthermore, Bahar and Maker stated that the concept of problem solving is referred to by scientists as a high-level thinking process consisting of intellectual ability and major cognitive processes (Bahar & June Maker, 2015).

Mathematical problem solving can be caused by external factors and internal factors. External factors, such as learning methods and strategies. Internal factors, such as student emotions, anxiety about mathematics, and self-efficacy (Riski et al., 2019).

Problems in mathematics occur when students are faced with problems, so students do not have certain methods to solve them, students are required to be able to solve them and students feel challenged to solve the problem or question. A question or test is a problem for students, if the student does not have a certain way that can be used to find the answer to the question, so the ability to solve the problem is needed. Problem-solving is also a process of an activity that prioritizes the importance of procedures, the strategic steps taken by students in solving problems, so that ultimately finding answers to questions. Problem solving is a complex process that requires a variety of skills to be used together (Lisesi, 2019).

In solving mathematical problems, correct concrete steps are needed so that the answers obtained can be correct. Surya states that problem-solving ability is the ability of students to be able to understand problems through identifying elements that are known, asked, and the adequacy of elements needed to solve the problems, creating or developing strategies to solve problems and represent (with symbols, pictures, graphs, table diagrams, models etc.), Choosing or implementing strategies to find solutions to problems and checking the correctness of the solutions to problems and interpreting it (Surya et al., 2017).

Four dimensions of the basic framework in problem solving revealed by Wu, namely: 1) reading/obtaining all information from questions; 2) use a real-life approach and common sense to

solve problems; 3) mathematical concepts, mathematization and reasoning; and 4) standard and precise counting skills

Polya's steps are some of the mathematical problem-solving steps created by the mathematician, George Polya. In his book, Polya describes four step in solving problem-solving, namely: understanding the problem, planning problem-solving, performing calculations to solve problems using a plan that has been compiled and reviewing or re-checking what has been done.

Mathematical anxiety is a form of a person's feelings either in the form of feelings of fear, tension, or anxiety in the face of mathematical problems or in carrying out mathematical learning with various forms of symptoms caused. Math anxiety is a person's feelings of distress, worry, anxiety, dislike, or fear of everything related to mathematics (Anditya, 2016). This is feared to affect the psychological and emotional condition of students while doing math learning. People who have math anxiety tend to think of math as unpleasant. These feelings arise because some factors either come from personal experiences related to teachers or of friends' taunts for not being able to solve math problems (Saputra, 2014).

Anxiety is a common thing that is described as uncomfortable feeling about a cause of anxiety. Anxiety in students can occur if students are already experiencing feelings of frustration that continue in learning. Susanto (2016) said, "anxiety in learning is very influential on the learning process of students, both in school, in the family environment, and in association". These feelings of anxiety will encourage students to avoid the source of anxiety, in this case, the source of one of them is mathematics. The feeling of anxiety experienced when doing math learning or things involving mathematics is what is referred to as math anxiety.Anditya (2016) defines math anxiety as "one's feelings of distress, worry, anxiety, dislike, or fear of everything related to mathematics". This is feared to affect the psychological and emotional condition of students while doing math learning.

Elliot (Saputra, 2014) states that there are three types of people who feel anxious about mathematics, namely:

1. People who memorize mathematics but they do not apply the acquired concepts (the mathematics memorizer)
2. People who avoid mathematics (the mathematic avoider)
3. People who feel incompetent in the field of mathematics studies (the self-professed mathematics incompetent)

Hadfield and McNeil clarified the causative factors of math anxiety, including environmental, mental, and individual factors. Lazarus, Averill, and Fitzgerald explained the factors that cause math anxiety, namely as follows:

1. Environmental factors, including experience in math classes and personality of math teachers
2. Mental factors, associated with high-level abstraction and logic ability in mathematical content
3. Individual factors include self-esteem, good physical condition, attitude to mathematics, confidence, learning style, and previous experiences related to mathematics.

Trujillo and Hadfield (tahun) state that the causes of math anxiety can be classified into three categories, namely as follows:

a. Personality factors (psychological or emotional)

For example, students' feelings of fear of self-efficacy, low self-confidence that leads to low student expectations, low student self-motivation and, emotional history such as unpleasant experiences in the past related to mathematics cause trauma.

b. Environmental or social factors

The example of this condition is when the learning process occurs in a tense classroom caused by the math teachers' way of teaching, models and, methods of teaching. The fear and anxiety about mathematics and the lack of understanding that math teachers feel can be passed on to their students. Another factor is family, especially the parents of students who sometimes force their children to be good at math because mathematics is seen as a science that has prestigious value.

c. Intellectual factors

Intellectual factors consist of cognitive influences, which leads more to the talent and level of the students' intelligence.

METHOD

The methodology used in this research is narrative literature review, using primary sources as the main book reference, and secondary sources of empirical research results from research results in reputable international journals and reputable national journals.

RESULTS AND DISCUSSION

Problem-solving is a process that is taken to overcome the difficulties faced in order to achieve the goal or desired. Mathematics problem solving is complex and can be challenging, both cognitively and emotionally (Di Leo & Muis, 2020). In mathematics learning, problem-solving is one of the results to be achieved and an ability that is expected to be mastered by students. In addition, problem solving is one of the thinking skills that teachers use to teach students how to think (Carson, 2007).

Schoenfeld's research found that knowledge and behavior are needed for solving mathematical problems and presented four categories as follows: 1) Resources (mathematical knowledge that is owned to solve problems), 2) Heuristics (planning the process of implementing problem solving on problems that are unusual or not standards; rules for solving problems), 3) Control (overall decisions regarding the selection and implementation of resources and strategies), and 4) Belief Systems (a person's "mathematical world view", a set of determinants of individual behavior) (Thiangthung, 2016).

Mathematical problem solving can be caused by external factors and internal factors. External factors, such as learning methods and strategies. Internal factors, such as student emotions, anxiety over mathematics, and self-efficacy (Riski et al., 2019).

Mathematical anxiety is an emotional state related to feelings; Unhappy, fearful, anxious, depressed, worried, bored, and refusal when discussing numbers, solving math problems in everyday life, or studying math in class (Sigmund, 1936; Marzita, 2002; Arem, 1993; Buxton, 1991) Some factors that cause math anxiety are the class condition, mathematical abstraction, experience, family pressures, experiences of being criticized by teachers in front of the classroom, and the teacher's teaching techniques (Marzita, 2002). A person who has math anxiety feels less competent, which is due to low learning performance (Ashcraft et al, 2002). Mathematical anxiety is experienced by both men and women, but the relationship between math anxiety and gender cannot be accurately determined (Anglin, 2008; Hall et al, 1999; Meelissen & Luyten, 2008; Penner & Paret, 2008). Some research shows that female have higher math anxiety than male; female tend to avoid math-related jobs such as computers and technology, math careers, and solving math problems (Baloğlu & Koçak, 2006; Bandalos et al., 1995; Betz, 1978). In contrast, several other studies have revealed that math anxiety has a greater influence on male performance than female (Hembree, 1990; Miller & Bichsel, 2004).

Anxiety in mathematics is an important factor that inhibits the success of solving one's mathematical problems (Hidayat et al, 2018), some research suggests that there is a negative influence between mathematical anxiety on the ability to solve mathematical problems (Aunurrafiq, 2017; Rusyda, 2020). However, there are some research results show that there is no significant influence between mathematical problems on mathematical problem-solving ability (nofikasari, 2020), and based on research from Faradiba who conducted an analysis of how mathematical problem-solving skills to five people who had the highest score from the results of mathematical anxiety questionnaires showed that those five people even have good problem-solving skills. Thus, it is concluded that mathematical anxiety does not always lead to failure in solving mathematical problems (Faradiba, 2019)

CONCLUSION

Feeling anxious when studying mathematics or things involving mathematics is known as math anxiety and problem-solving is a process of activities that prioritize the importance of procedures, strategic steps that students take in solving problems, to eventually find answers to questions. The result of this narrative literature review is that a person who has mathematical anxiety does not always lead to failure in solving mathematical problems.

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