



Mathematical Anxiety in Optimizing Students' Mathematical Problem-solving on the Plane Geometry Topic

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Abstract: This study aims to describe mathematical anxiety in solving students' mathematical problems. This type of research is qualitative research with a case study method. The subjects in this study consisted of 1 student who had a high level of anxiety. The technique of taking the subject is by using a purposive sampling technique. Data collection techniques using questionnaires, tests, and interviews. The instruments used were mathematical anxiety questionnaires, tests of mathematical problem-solving abilities, and interviews. Result show that the subject has difficulty solving mathematical problems. It shows that the subject with high anxiety is not optimal in solving mathematical problem-solving problems. Thus, students with high anxiety need specific treatments or require the application of fun learning to optimize their mathematical problem-solving abilities.

Keywords : mathematical anxiety; problem-solving; plane geometry

Introduction

Every human being has his anxiety as a form of psychological disorder that he experiences regardless of time and place. It is a natural thing to happen. Anxiety is a feeling of unease that arises when someone learns because of the pressure and inability to deal with problems (Handayani, 2016). The anxiety or fear experienced by students when mathematics is taking place is a form of mathematical anxiety (Wantika & Nasution, 2019).

Mangi & Hussain (2018) state that mathematical anxiety is "an emotion that blocks a person's reasoning ability when confronted with a mathematical situation." It means that mathematical anxiety is an emotion that hinders one's ability when faced with mathematical situations or problems. This mathematical anxiety tends to occur in students with low math abilities. This high level of anxiety will lead to a dislike of mathematics.

Mathematical anxiety is defined as feelings of tension, anxiety, or fear that interferes with math performance (Ashcraft, 2017). This anxiety is a sudden thought reaction that can cause a

threat or danger to someone. From this description, it can be concluded that mathematical anxiety is a feeling of fear, anxiety, and anxiety experienced by students that arise because of the pressure and inability to deal with mathematical problems.

This anxiety can arise from specific factors. The factors that cause mathematical anxiety according to Erdoğan, Kesici, & Şahin (2011), include: 1) environmental factors, related to experiences in the classroom and the personality traits of teachers; 2) mental factors, related to a high level of abstraction and logic in mathematics content; 3) individual factors, related to self-esteem, good physical condition, attitudes, self-confidence, learning styles and previous experiences related to mathematics. The level of students' mathematical anxiety consists of several levels/groups. It divided into low anxiety levels, medium anxiety levels, and high anxiety levels (Zakaria & Nordin, 2008).

According to Imro'ah, Winarso, & Baskoro (2019) states that there are four indicators of anxiety symptoms, including 1) somatic, namely, anxiety symptoms related to conscious movements, such as goosebumps, sweating, muscle tension, increased heart rate, irregular breathing, breathing in, dilated pupils, increased stomach acid, decreased saliva and so on; 2) affective, namely symptoms of anxiety-related to emotions, such as fear, doubt, feeling of terror, anxiety, and irritability; 3) cognitive, namely symptoms of anxiety-related to cognitive factors, such as anticipation of danger, impaired concentration, worry, reflective thoughts, loss of control, fear of death, and unrealistic thinking; 4) psychometrics, such as running away, avoiding, and so on. This mathematical anxiety can affect students' ability to solve problems. It is supported by the results of research conducted by (Aunurrofiq & Junaedi, 2017). There is a linear relationship between mathematical anxiety and mathematical problem-solving ability, and there is a negative relationship with high mathematical anxiety, which results in low problem-solving abilities.

Problem-solving is a thought that is directed directly to find a solution or a way out of a problem (Ratnasari, 2014). It is in line with the notion of problem-solving, which is seen as a person's process of solving mathematical problems based on information or mathematical knowledge that they already know (Sundayana, 2016). Carson (2007) defines problem-solving as how an individual uses previously acquired knowledge, skills, and understanding to satisfy an unfamiliar situation's demands. If it means problem-solving is a means by which individuals once acquired knowledge, skills, and learning to meet the needs of unknown situations. From these opinions, it can be concluded that mathematical problem-solving ability is a person's ability to find solutions to existing problems based on prior knowledge.

The ability to solve mathematical problems is one of the important skills that every student has. In the learning process, students are expected to solve the problems given by using the knowledge and skills that they already have, which can be shown in their mathematical problem-solving abilities. As for the indicators used to measure students' mathematical problem-solving abilities, according to George Polya in his book "*How To Solve It*" identifies four basic principles or indicators in problem-solving, among others (Polya, 1945): 1) understand the problem (understand the problem); 2) planning a settlement (foreign exchange plan); 3) carry out the settlement plan (carry out the plan); 4) review back (look back).

Method

This research is qualitative research with a case study method for students. This study aims to understand the phenomena or symptoms of students' anxiety in facing mathematics learning and to see their mathematical problem-solving abilities. The case study method (Creswell, 2003) is "*researchers explore in-depth a program, event, activity, process, one or more individuals.*" The case study referred to in this research is that the researcher tries to achieve problem-solving abilities.

Subjects in this study amounted to 1 student, namely students of class V SD Negeri Pasirgunung Selatan 3, who have a high mathematical anxiety level. The sampling technique in this study used a purposive sampling technique, namely a sampling determination technique with specific considerations (Sugiyono, 2016). In this case, the sampling technique used is based on the reflection of anxiety that focuses on problem-solving abilities. The data analysis technique used triangulation of data sources consisting of questionnaires, tests, and interviews.

The instruments used in data collection were mathematical anxiety questionnaires, tests of mathematical problem-solving abilities, and interviews. The mathematical anxiety questionnaire is used to measure the level of students' mathematical anxiety towards mathematics with dimensions that include somatic, affective, cognitive, and psychomotor aspects. This mathematical anxiety questionnaire was adapted from a research questionnaire that had been conducted (Susilowati, 2017) using a Rating Scale of 4 alternative answer choices. While the test instrument used in this study is a problem-solving ability to test questions with building materials. The presentation of the data in this study is a description of the optimization of mathematical problem-solving abilities for students who have high levels of mathematical anxiety.

Result and Discussion

The subjects in this study were taken using a student mathematical anxiety questionnaire. The mathematical anxiety questionnaire was given consisted of 16 favorite items and 16 unfavorable items. Furthermore, students are given a test instrument in the form of questions made by mathematical problem-solving abilities indicators. The questions were not shown on the same day as the mathematics anxiety questionnaire but were given three days after that.

The questions are made in the form of open questions that can spur students to solve problems with various alternative solutions and answers. This question is given to measure students' level of ability with high anxiety in solving mathematical problems in building material. After completing the questions provided, an interview is then conducted to gather information about the anxiety questionnaire's matters, and the questions are given. The interviews were given in the form of simple questions and answers.

The results of the analysis of the mathematical anxiety questionnaire on the somatic dimension show that AA feels tense during mathematics lessons and feels nervous when asked by the teacher to solve/answer math problems. It is in line with research Sugiatno et al. (2015) that students with high anxiety often experience fear, nervousness, tension, anxiety, or worry. In the affective dimension, AA is afraid of mathematics. In the cognitive dimension, AA considers mathematics to be a difficult subject for him, which causes AA not to concentrate on learning

mathematics. The last dimension is the psychomotor dimension. AA tends to be silent during mathematics lessons. Based on the results of the analysis, it can be seen that the level of anxiety of the subjects in this study is still relatively high.

Students' mathematical problem-solving abilities can be seen from the four indicators/steps of the problem-solving process. In the first step, students must understand the problem at hand. Furthermore, in the second step, students can make a solution plan by linking existing problems with students' material previously obtained. In the third step, students can complete the completion plan. The final stage or the fourth step is that students must check the answers they have received.

Based on the results of the answers to the two questions given, for the first question, AA was able to understand the problem given by writing down what was known and what was asked in the question. Then AA was able to plan a settlement. However, in the third step, namely implementing the settlement plan, AA could not complete it by ignoring existing information and prior knowledge. It is not in line with research conducted by Mawaddah & Anisah (2015) that the subject is quite good at completing plans to solve the problems given.

AA was able to understand problems and write down what was known and what was asked. Then AA was able to write down the completion steps correctly. However, there were steps to complete that were not quite right, and also, AA did not review the answers that had been done. This is in contrast to research conducted by (Irfan, 2018) which stated that the subject could check again. The answers have been obtained. So that the answer given by AA is not quite right. Thus, it can be seen that the subject's ability to solve mathematical problems is low.

Based on the results of interviews with research subjects, it can be seen that AA is indeed weak in counting. When mathematics was in progress, AA had feared. He was afraid that the teacher would appoint him to work on the problem in front of the class and was tense, which would disturb his concentration. AA considers mathematics to be a complicated subject, which causes AA to dislike mathematics. In answering the questions given, there are several causes as an obstacle or difficulty experienced by AA, namely being anxious, blank so forgetting the formulas, being in a hurry to do them, and not understanding the meaning of the questions well. It results in low AA mathematical problem-solving abilities, in line with research conducted by (Aunurrofiq & Junaedi, 2017) that high mathematical anxiety results in low student mathematical problem-solving abilities..

Many factors cause a high level of anxiety and the low ability to complete this research subject's mathematical completion, both internal factors from within the subject or external factors from the research subject's environment. According to Chinn (2009), this is in line with the opinion that environmental, intellectual, and personality factors can cause mathematical anxiety.

Conclusion

Based on the results and discussion, the conclusion is that the subject has difficulty solving mathematical problems. It shows that the subject with high anxiety is not optimal in solving mathematical problem-solving problems. Thus, students with high anxiety need specific treatments or require the application of fun learning to optimize their mathematical problem-solving abilities.

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