



The Effect of Mathematics Anxiety on the Problem-Solving Ability

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Abstract: Math anxiety is a disturbing condition in mathematics learning. The influence of math anxiety is one of the causes of low student problem-solving ability. This study aims to obtain the influence of mathematics anxiety on the problem-solving ability of grade XI science students of SMA Negeri 1 Gerung for the 2023/2024 school year. The type of research used in this study is quantitative research with ex-post facto research methods. The data analysis used is inferential statistical analysis. The results of the t-test that obtained a value of $t_{hitung} = 6.955 > t_{tabel} = 1.967$ with a sig value = 0.05 or 5% then there is a significant influence between mathematical anxiety on problem solving ability. The results of the regression equation $\hat{Y} = 4.072 - 0.831X$, showed that there was a negative relationship between mathematical anxiety and problem-solving ability. The result of a correlation coefficient of 0.459 shows that between mathematical anxiety and problem-solving ability has a moderate relationship. The coefficient of determination points to 0.617 or 61.7%.

Keywords: Math anxiety, problem solving ability, problem solving.

Introduction

One of the objectives of learning mathematician is so that students have problem-solving skills. Whether or not these goals are achieved, it can be seen based on the assessment of student learning outcomes where the more cognitive abilities students have, the more able students are to solve problems, and vice versa students with low cognitive abilities will mines make mistakes in problem solving (Nafi'an, 2015). The main standards in mathematics learning contained in the National Council Of Teachers Of Mathematics (NCTM) namely problem solving skills, communication skills, connection skills, reasoning and proof skills, and representation skills. Likewise, it is mentioned that problem solving should be the main goal of teaching and learning mathematics and providing opportunities for every student to be involved in problem-solving activities Nafisah, Turmuzi, Triutami, & Azmi, 2022).

According to Ripai & Utama (2019) stated that the 2013 curriculum requires the development of abilities that are in accordance with the times, so these abilities must be improved towards high order thinking with one of the high order thinking abilities, namely being able to solve problems. Students must be able to utilize knowledge and train their skills to be able to find and formulate solutions to mathematical problems, especially complex problems that require great

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effort so that students can develop an understanding of mathematical problem solving abilities. Based on the results of an interview with one of the teachers of mathematics subjects class XI IPA SMA Negeri 1 Gerung On September 26, 2022, information was obtained that many students have not been able to do questions in the form of story questions because they are familiar with routine questions or routine problems after learning certain concepts. In contrast to non-routine questions require further thought in using the procedures used to solve the problem.

The Linear Program is one of the mathematics subjects in class XI Senior High School / MA that is closely related to everyday life. The linear program material in this class is focused on maximizing or minimizing the value of a goal function, this material also prioritizes the level of accuracy of students in solving story problems. However, the reality in the field proves that students still have difficulty solving linear program story problems. Based on the results of research conducted by Dede Nuryana in his journal entitled "Analysis of Errors of Vocational Students in Solving Mathematical Problem Solving Problems on Linear Program Material", it is known that the mathematical problem solving ability of the students studied is relatively low. It can be concluded that most students experience a lot of difficulties in doing story problems which results in low student problem-solving ability scores.

Various factors were identified as the cause of low mathematical problem solving ability in students. According to Utami & Puspitasari (2022: 57-68), the factors that cause low mathematical problem solving ability can be grouped into two factors, namely external factors and internal factors. Exeternal factors are factors that come from outside the student such as learning methods or strategies. While internal factors are factors that come from within students, such as emotions and attitudes towards mathematics. Problem-solving ability can be caused by internal factors, this factor has a considerable role in the ability to solve mathematical problems. One of the internal factors that affect the ability to solve mathematical problems is anxiety. The results of interviews with teachers found that students tend to often experience nervousness, fear and worry. In line with the observations, it also explains that students often experience math anxiety such as, nervous during question and answer, tense when doing problems, and feel worried during mathematics learning.

Sudrajat (Mukholil, 2018; Kusmaryono & Ulia, 2020) revealed that anxiety or anxiety is a form of individual emotion related to a sense of threat by something, usually with an object of threat that is not so clear. The threat stems from students' views of the subject itself, in this case in mathematics. Furthermore, according to Anita (2014: 125-132) mathematics anxiety as a feeling of tension, anxiety or fear that interferes with math performance. The students' math anxiety can be classified into three categories, namely as follows: (1) Personality factors (psychological or emotional), (2) Environmental or social factors and (3) Intellectual factors.

Method

The research method used in this study is quantitative research with ex-post facto research methods. Sappaile (2010: 1-16) suggests that research is a useful method that can provide a lot of valuable information for decision making in the field of education. Ex-post facto research is a systematic empirical examination of the condition that researchers do not have direct control over the independent variable because the event has occurred and cannot be manipulated (Sari, Siswati, Suparto, Ambarsari, Azizah, Safitri, & Hasanah, 2022). The analysis that will be used in this study is a simple regression analysis for Can see the effect of independent variables on dependent variables.

This research was carried out in class XI IPA SMA Negeri 1 Gerung which is located at Jl. Gatot Subroto, North Gerung, Gerung District, West Lombok District, West Nusa Tenggara in the 2023/2024 academic year. In this study, the population is all students of grade XI IPA SMA Negeri 1 Gerung for the 2023/2024 school year totaling 218 students spread across 7 classes. Then, the

sampling technique used in this study is purposive sampling. The sample to be used as research will be taken between 10% – 15% or 20% – 25% if the study population is more than 100 people (Arikunto, 2010: 112). The instruments used in this study were math anxiety questionnaires, problem-solving ability tests and interview guidelines. The instrument for the math anxiety questionnaire is in the form of 25 statements Statement, for the test of students' mathematical problem solving ability in this study is linear program material in the form of description questions totaling 2 questions and for interview instruments as many as 11 questions.

Furthermore, in this study, the validity test that will be used is the validity of the content that will be validated by two experts, namely, one lecturer of Education at the University of Mataram and one Mathematics Teacher of SMA Negeri 1 Gerung. Then the formula for calculating validity, which is based on the validity of Aiken in Paramitha (2020: 161). Data analysis techniques in this study use inferential statistics of the formulation of the problem posed. Prerequisite assumption tests are carried out first for the purposes of hypothesis testing, then simple linear regression tests and determination tests are carried out to determine the magnitude of the influence of mathematical anxiety on problem solving abilities.

Result and Discussion

In this study, the data processed were quantitative data from the results of mathematical anxiety questionnaire tests and problem-solving ability test questions. The research instrument was validated by expert validators, namely one mathematics lecturer at FKIP Mataram University and one mathematics teacher at SMA Negeri 1 Gerung. The results of validation by experts are calculated using an index formula by Aiken and validation results are obtained that the three instruments are declared valid so that they can be used for research. Furthermore, the data from the research results were analyzed using SPSS and Microsoft Office Excel 2010.

Data Analysis

Sample Data Normality Test

The normality test was carried out with one sample kolmogorov-smirnov using SPSS obtained mathematical anxiety data of $0.448 >$ from the sig value = 0.05 and obtained problem solving ability data of $0.182 >$ from the sig value = 0.05. So that from these two data, it can show that the data is distributed normally.

Sample Data Homogeneity Test

The results of the homogeneity test then obtained the value $x^2_{count} = 6,090 \leq x^2_{table} = 7,814$ which means that the result of mathematical anxiety about the problem-solving ability of grade XI science students of SMA Negeri 1 Gerung for the 2023/2024 school year has the same variance.

Hypothesis Test (t-test) Sample Data

The following is a hypothesis for testing regression coefficients with a significant level $\alpha = 0,05$.
 $H_0 : \beta_0 = 0$ (There was no significant effect of math anxiety on students' problem-solving abilities)
 $H_0 : \beta_0 \neq 0$ (There is a significant effect of math anxiety on students' problem-solving abilities.)

The result of the regression coefficient is obtained value $t_{count} = 6,955$ and $t_{table} = 1,697$, because $t_{count} > t_{table}$ so it can be concluded that there is a significant influence of mathematics anxiety on the problem-solving ability of grade XI science students of SMA Negeri 1 Gerung for the 2023/2024 school year.

Simple Linear Regression Analysis

The results of a simple linear regression analysis show a α constant value of 4.072 and b value of -0.831 so that the regression equation is obtained, namely:

$$\hat{Y} = 4,072 - 0,831X \quad (1)$$

Based on these data, it shows that there is a relationship between mathematical anxiety and problem-solving ability, which means that the regression coefficient value of the student's math anxiety variable is negative -0.831, indicating the influence between the variable of mathematical anxiety on students' problem-solving ability. Thus, the relationship between the two is a value-turning relationship.

Coefficient of Determination Test (R^2)

The coefficient of determination test aims to show the magnitude of the influence of mathematical anxiety on problem-solving ability. The value of the coefficient of determination refers to a number 0,617 or $R_{square} = 0,617$ which means the effect of math anxiety on problem-solving ability is as large as 61,7% and 38,3% influenced by other variables. The table of coefficient of determination test results can be seen as follows:

Table 1. Test Results of Correlation Coefficient and Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.786 ^a	.617	.604	5.95681

The results of the data analysis showed that students' mathematics anxiety had a significant influence on students' problem-solving abilities in mathematics subjects grade XI IPA SMA 1 Gerung for the 2023/2024 school year. The magnitude of this influence is written in the form of a regression equation $\hat{Y} = 4,072 - 0,831X$ Which means that the regression coefficient value of the student's math anxiety variable is negative, showing the influence between the math anxiety variable on students' problem-solving ability. This is in line with research conducted by Aunurrofiq and Iwan (2017) which concluded that mathematical anxiety is negatively related to problem-solving ability with a contribution of 66.69%.

Then the regression equation model expresses the change in variable Y for every change in variable X by one unit. The value of the regression coefficient marked negative indicates that the change that occurs is incremental with each mathematical anxiety (X) increasing by one unit, then the problem-solving ability (Y) decreases by 0.831. In line with research conducted by Asyhaer, Amrullah, Nourma, & Ketut, (2023) that problem-solving ability (Y) increases by one unit with an increase of 0.812 in variable (X). Thus, there is a negative and significant influence between mathematical anxiety (X) and problem-solving ability (Y). In line with research conducted by Septiarini (2020) which says that problem-solving abilities in students are influenced by anxiety Mathematics means that in solving problems or problems students experience anxiety, nervousness, and haste so that the final score results are not satisfactory. Another opinion is that mathematics anxiety affects not only when students do problems, but also at the beginning of learning students already feel anxious, nervous, and afraid of mathematics lessons.

The contribution of mathematical anxiety in influencing problem-solving ability is 61.7% obtained from the coefficient of determination of 0.617. Thus, there are still 38.3% of other variables beyond math anxiety that can affect students' problem-solving abilities. The results of this study are in line with research conducted by Lestari, Rozi & Halen (2020) which states that there are differences mathematical problem-solving abilities of learners at low, medium and high category

anxiety levels; And there was a negative influence of mathematical anxiety on the ability to solve mathematical problems with an influence value of 86.3%. Based on research conducted by Purnamasari (2016) shows that students who have problem-solving abilities at high qualifications are only 11.77%, while as high as 35.29%, low and very low as much as 52.94%. Furthermore, based on the results of research conducted by Husnul Qausarina (2016) showed that mathematical anxiety in affecting problem solving ability was 55.76%. Similarly, the results of research conducted by Devi Pratiwi (2021) show that the amount of mathematical anxiety in affecting problem-solving ability is 35.9%.

According to Septiarini, Kesumawati & Jumroh (2020), this math anxiety is negative because it can damage students' concentration. The negative correlation between math anxiety and mathematical problem solving ability means high level anxiety and low level problem solving ability, while low level math anxiety and high level problem solving ability (Aunurrofiq & Junaedi, 2017). Then there are three factors that cause mathematics anxiety in students, namely personality factors, social environment factors, and intellectual factors (Utami & Puspitasari, 2022: 57-68). Personality factors include fear of self-ability, lack of confidence, and trauma from bad past experiences. The percentage of personality aspects in this study was 68%, social environmental aspects were 62% and the intellectual aspects obtained were 70%, thus showing that students have not been able to optimize the learning process appropriately.

The problem-solving stage proposed by Polya is one of the stages that is considered the simplest of the other stages (Mawardi, Arjudin, Turmuzi & Azmi, 2022: 1031-1048). Based on the data obtained, it can be said that from each indicator of problem-solving ability or problem-solving stages, students are the most difficult in re-examining. This can be seen from the results of the answers to the description questions or problem-solving ability test questions given to students. Furthermore, there are also many students who Err and do not write down the fourth indicator which is to check again. In line with research conducted by Inastuti, Subarinah, Kurniawan, & Amrullah (2021), the stage of re-examining the solutions obtained by students does not re-examine, to interpret the solutions obtained with the initial questions/problems.

The percentage of scores obtained for the stage of understanding the problem in questions number 1 and 2 respectively is 89% and 70%, at the stage of preparing the implementation plan for questions number 1 and 2 respectively is 77% and 57%, then the third stage with the percentage of questions 1 and 2 is 66% and 52% and the last stage is re-checking questions number 1 and 2 is 25% and 20%. Of the percentage of the four stages, the stages with the least percentage is the last stage or re-examination. Students do not recheck answers and do not know how to recheck (Saputra, Baidowi, Wulandari, & Nurul, 2023). Based on observations, students are still in the realm (C1) or cognitive knowledge, that is, students can only recognize or know about concepts without understanding and using the concepts. In line with the results stated by Saputri (2019) that most students only memorize the material and just know without understanding the material.

According to Ariani (2018) that the assessment used to assess students' problem-solving abilities from student test results using scoring guidelines according to Polya theory is different from assessments using standard scoring guidelines. Scoring guidelines according to Polya get lower scores compared to standard scoring assessments in general. In line with research conducted by Permatasari, Sridana, Amrullah, & Sarjana (2022) that students have not been able to carry out all Polya's problem-solving stages well, students' habits of only memorizing and relying on formulas when learning and facing math problems, and the culture of discussion when the written test takes place which makes students unable to focus optimally on solving problems. In line with research conducted by Septiarini, Sripatmi, Kurniawan, & Baidowi (2022) that the ability to solve problems using Polya theory with less category of 57.70%, sufficient category of 11.54 &, good category of 7.69 & and very good category of 23.07%.

Conclusion

Based on the results of the study, it was found that there was a significant influence of mathematical anxiety on the problem-solving ability of grade XI science students of SMA Negeri 1 Gerung for the 2023/2024 school year. With the regression equation $Y \approx 4.072 - 0.831X$ with a confidence level of 95%. A correlation coefficient of 0.459 indicates that there is The relationship between math anxiety and problem-solving ability at moderate levels. The coefficient of determination obtained is 0.617, meaning that mathematical anxiety affects problem-solving ability by 61.7%.

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