THE EFFECT OF MATHEMATICAL RESILIENCE ON THE MATHEMATICAL PROBLEM-SOLVING ABILITY OF STUDENTS

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Abstrak

Pelaksanaan pembelajaran matematika memiliki tujuan utama yaitu memperkuat kemampuan peserta didik dalam memecahkan masalah. Namun, Kemampuan peserta didik dalam memecahkan masalah masih terbilang minim. Untuk mengetahui seberapa baik siswa dapat memecahkan masalah adalah tujuan dari penelitian ini dan mencari tahu efek serta korelasi antara tingkat resiliensi matematis yang dimiliki peserta didik dengan kemampuan mereka dalam pemecahan masalah matematis. Penelitian ini menggunakan metode penelitian kuantitatif dengan pendekatan berbasis survei. Penelitian ini dilakukan dengan menggunakan sampel dari peserta didik kelas XI IPS SMA Negeri 106 Jakarta sebanyak 67 peserta didik kelas XI IPS SMA Negeri 106 Jakarta yang dipilih menggunakan teknik purposive sampling. Penelitian dimulai dengan menyebarkan angket kepada peserta didik untuk mengukur resiliensi matematis mereka serta menyebarkan soal tes matematika untuk mengetahui ukuran kapasitas seseorang untuk memecahkan permasalahan matematis. Berlandaskan hasil pengujian analisis regresi linier sederhana menggunakan aplikasi IBM SPSS yakni menunjukkan besar nilai koefisien korelasinya R yaitu 0,577 dengan R2 = 33,30%. Dari hasil pengujian tersebut mengindikasikan besar efek resiliensi matematis mencapai 33,30% pada kemampuan pemecahan masalah matematis peserta didik.

Kata kunci: Pemecahan masalah matematis; resiliensi.

Abstract

The primary objective of implementing mathematics instruction is to improve students' problem-solving skills. Nonetheless, the problem-solving skills of students remain limited. The purpose of this research is to determine how effectively students can solve issues, as well as the influence and association between their degree of mathematical resilience and their capacity to solve mathematical difficulties. This research utilizes a survey-based quantitative research methodology. This research was conducted using a sample of students from class XI IPS SMA Negeri 106 Jakarta. 67 students from class XI IPS SMA Negeri 106 Jakarta were recruited using a technique of purposive sampling. The project was initiated by providing questionnaires to students to gauge their mathematical resilience and math exam questions to determine a person's capacity to solve mathematical difficulties. Based on the findings of a basic linear regression analysis using the IBM SPSS program, the correlation coefficient R is calculated to be 0.577, with R2=33.30 %. The test findings suggested that mathematical resilience has a 33.30 % impact on pupils' arithmetic problem-solving skills.

Keywords: Mathematical problem solving; mathematical resilience.

INTRODUCTION

As a scientific field, mathematics has a substantial impact on several facets of life, including education and everyday life (Maulina, Harun, & Sutrisno, 2022). The ability to solve mathematical problems is a crucial component of mathematics education

(Albay, 2019). In accordance with Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 36 of 2018, the 2013 revision of the 2018 Curriculum indicates that problem-solving skills are the objective of every educational experience (Rahmmatiya & Miatun, 2020). To make it easier for students to solve mathematical issues, namely by leveraging their mathematical problem-solving skills (Nurjanah & Jusra, 2021). Consequently, the ability to solve mathematical problems is one of the most crucial talents that any learner must possess (Tampubolon, 2021).

Resilience is one of the factors that improves student accomplishment. Students with greater tenacity are able to overcome obstacles with relative ease, whereas students with poor persistence are more likely to give up when faced with obstacles (Attami, Budiyono, & Indriati, 2020). Resilience is needed in learning mathematics (Lee & Johnston-Wilder, 2017). Lee and Johnston Wilder describe mathematical resilience as perseverance and tenacity in the face of adversity, as well as comprehension and mastery of mathematical theory (Lee & Johnston-Wilder, 2017). Then according to Johnston-Wilder S and Lee C (Yohannes & Juandi, 2021), Mathematical resiliency is a positive attitude maintained by individuals in the face of fear, particularly when studying mathematics and encountering hurdles.

Based on research outcomes (Maharani & Bernard, 2018) demonstrates that 0.649 of the influence on students' ability to solve mathematical problems is attributable to mathematical resilience, whereas 0.351 is attributable to other factors. Meanwhile in research (Suparni, Nurfitriyanti, & Eva, 2021) The

collected results suggest that there is a significant relationship between mathematical resilience and mathematical communication skill equivalent to 11.99%, whereas 88.01% indicate other factors. Research proves otherwise (Setiawan, Sukestiyarno, & Junaedi, 2022) According to the findings, there is a 30.4% influence of mathematical resilience on students' mathematical literacy. This is in relation to the mathematical resilience that affects students' mathematical literacy.

According to scholars, the influence of mathematical resilience on students' ability to grasp mathematical problem solving has not been adequately examined in prior research. How mathematical resilience relates to a person's ability to solve mathematical issues or how it influences mathematical communication and other abilities has been the focus of the majority of prior research.

Based on study performed by Budi Eko Setiyono and Iwan Junaedi, it appears that students' problem-solving abilities are still somewhat limited (Eko, Riau, Junaedi, & Artikel, 2016). Teodora Tania (2021) stated the same thing; students' skills to solve mathematical issues were quite limited. According to the findings of Lubis' research, students' problem-solving skills are in a state that is far below expectations, with an average percentage of barely reaching 50%. These outcomes fall into the category of poor performance (Tampubolon, 2021). Multiple factors, such as a student's IQ, emotional intelligence, mathematical temperament, mathematical resiliency, and so on, might influence the ability to solve mathematical problems (Attami et al., 2020).

Based on research (Kurnia, Royani, Hendiana, & Nurfauziah, 2018) demonstrates children with strong mathematical resiliency solve tasks with confidence, students with poor mathematical resilience are less thorough when completing problems and are more likely to give up when confronted with challenging difficulties. This demonstrates that pupils with a high level of resilience have no difficulty learning math. However, students with low levels of resilience will find it challenging to master mathematics.

Therefore, it is necessary to explore the repercussions and relationships between mathematical resilience and students' capacity to solve mathematical issues. It is hoped that the outcomes of the present research will encourage children to acquire mathematical resiliency and problem-solving skills.

RESEARCH METHOD

Jakarta's SMA Negeri 106 was chosen as the research site for the 2022-2023 academic year. Researchers identified SMA Negeri 106 Jakarta as a location for their research since the school's accreditation was exceptional. Using the approach of Simple Random Sampling, 67 students in class 11 IPS 1 and 11 IPS 2 were sampled for research. This research utilizes quantitative research approaches. This research includes two variables: mathematical resilience (X) and mathematical problem solving ability (Y).

For data collection, the researcher employed a survey with a non-mathematical resilience test instrument in the form of a questionnaire containing forty statements and a test instrument for mathematical problem-solving abilities in the form of four essay questions pertaining to the content

of the system of two-variable linear equations (SPLDV).

Prior to completing the research, the validity and dependability of both instruments were assessed using the Rasch Model approach and the Winstep program. Check the Dimensionality table's Observed Raw Variance Explained By Measure value column's claimed validity as the basis for the validity of the instrument. Then, the reliability test based on the Item Summary table was deemed reliable based on the Item Reliability & Person Reliability criteria and the Cronbach Alpa criterion.

Using IBM SPSS Statistics, the researcher next performed a basic linear regression analysis on the collected data. The research was undertaken to determine how much mathematical resilience influences a person's capacity to solve mathematical issues based on Coefficient Variable, as well as how much the correlation coefficient's value depends on R.

RESULTS AND DISCUSSION

Before inputting the study results, validity and reliability tests were conducted with a sample of 34 students from class 11 IPS 3 SMA Negeri 106 in Jakarta. After valid and reliable test findings have been determined through validity and reliability testing, data gathering can commence. The research was done on 67 students from 11th grade IPS 1 and IPS 2 classes. First, students are given a test instrument in the form of a four-question essay assessing their ability to solve mathematical problems using "System of Linear Equations with Two Variables" content. After answering the questions on their ability to solve mathematical problems, students are handed a non-test instrument sheet in

the form of a questionnaire including forty statement items. After examining the students' responses, the researcher moved on to the testing step. The steps of testing may be seen below.

The researcher initially ran a basic linear regression analysis preparatory test, which consisted of a test for the normality and dependability of the data acquired from respondents. The Kolmogorov normality test is utilized to test for normality in order to determine whether residual data are regularly distributed. The findings are shown in Table 1.

Table 1. Kolmogorov normality test results

	Significance Level
Unstandardized Residual	0,200

H_0 is accepted and demonstrates that the residues are normally

distributed since the significance value of the Kolmogorov normality test, which is displayed in Table 1, is 0.200 > 0.05. The results of the subsequent researcher's linearity test are then displayed in Table 2.

Table 2. Linearity test results

	Significance Level	Description
Deviation from Linearity	0,859	Normal Distributed Residues

In Table 2, the significance value of the linearity test is 0.85 > 0.05. This explains why mathematical resilience and the capacity to solve mathematical difficulties are linear factors. After completing all conditions for simple linear regression analysis, the next step is to test the hypothesis using simple linear regression analysis. The test results are provided in Table 3.

Table 3. Variable coefficient results.

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-3.741	8.511		-0.440	0.662
Mathematical Resilience	0.352	0.062	0.577	5.701	0.000

According to table 3, the mathematical resilience variable (X) has a coefficient value of 0.352 and a constant value of -3.741. Consequently, the equation for linear regression is

derived Y = -3,741 + 0,352 X, This indicates that for every 1 rise in the value of mathematical resilience, the value of mathematical problem solving skill improves by 0.352.

Table 4. ANOVA Summary

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2417.186	1	2417.186	32.496	0.000
Residual	4834.933	65	74.384		

Based on table 4, it can be seen that the value of Fhit = 32.496 > Ftable = 3.99, which indicates that for a Sig value of 0.000 <0.05, it establishes that

the test decision is H0 is rejected, is more than the value of Ftable = 3.99. It may be inferred that mathematical resiliency has an impact on students'

mathematical problem-solving skills. This indicates that a person's problem-solving skills will improve as the value of their mathematical resilience improves. Moreover, if their mathematical resiliency is diminishing, so are their problem-solving skills. This is due to the absence of positive emotional qualities among pupils when tackling mathematical tasks. Students are required to cultivate positive affective traits so that the greater the value they receive, the more positive results they will produce in the learning process, and their mathematical problem-solving skills will improve, allowing them to find appropriate solutions to mathematical problems. However, when students' mathematical problem-solving skills are inadequate, they will receive poor marks and poor learning results.

The extent of the association and correlation between mathematical resilience and mathematical problem solving ability is displayed in Table 5.

Table 5. showed the correlation between mathematical resilience and mathematical problem-solving ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.577[a]	0.333	0.323	8.62459

The value of the correlation coefficient R is reported in table 5 as 0.577, with R2 = 33.30 %; this indicates that mathematical resilience has a 33.30 % influence on problem-solving skills. The value of the correlation coefficient, which is 0.577, reveals that mathematical resilience is positively correlated with the ability to solve mathematical issues. This illustrates the significance of the positive association. It may be inferred that as students' mathematical resilience improves, it has a positive effect on their mathematical problem-solving skills. When individuals have sufficient mathematical resilience, their mathematical problem-solving skills will be superior to those with low levels of mathematical resilience.

According to the research authors, there exists a high correlation and influence between students' mathematical resilience and their ability to solve mathematical issues. Mathematical resilience influences the capacity to solve mathematical problems by 33.30 %, while the remainder is impacted by other variables. This conclusion may be drawn from table 5's correlation coefficient R value of 0.577 and R2 = 33.30 %, This explains why mathematical resilience has a 33.30 % effect on problem-solving skills. Based on these findings, it can be concluded that there is a positive association between mathematical resilience and the capacity to solve mathematical issues, as shown by the correlation coefficient's value of 0.577. This illustrates the significance of the positive association. In addition to mathematical resiliency, problem-solving skills are also affected by other variables, such as achievement drive, as demonstrated by the research (Aspriyani, 2017), or in research (Karsim & Isnarto, 2017) indicating that IQ also influences mathematical problem-solving skills.

Students with a high mathematical resiliency may be better at solving the provided issues, as seen by the correct solution technique even if there is a lack of correctness in the final answers. While children with moderate

mathematical resiliency are incorrect in establishing problem-solving techniques, they are also incorrect in discovering answers. There are some students who do not write down answers because they still do not comprehend the concept of the two-variable linear equation system because they have low mathematical resilience and feel despair after trying to answer questions that are deemed tough. This affects the research findings in some way.

This research has a number of shortcomings, including its restricted focus on pupils' mathematical problem-solving abilities and mathematical resiliency. However, there are additionnal benefits to this research, including the fact that there has not been a great deal of research on the influence of mathematical resilience on mathematiccal problem-solving skills in earlier studies. Although mathematical resiliency and mathematical problem-solving skills play a significant part in the mathematics learning process for pupils, they are not sufficient for success.

A comparable earlier research, mostly (Suparni et al., 2021), Examines the connection between mathematical resiliency and problem-solving ability. Iman and Firmansyah (2019) conducted a related study looking at the relationship between mathematical resilience and learning outcomes in mathematics. This research is titled Mathematics Learning Outcomes and the Impact of Mathematical Resilience Capabilities. The findings of this research can be utilized as a reference or as a starting point for additional research since they represent the most recent research on mathematical resiliency and mathematical problem-solving skills based on multiple comparable studies.

CONCLUSIONS AND SUGGESTION

It can be concluded that mathematical resilience affects mathematical problem-solving abilities. The simple linear regression analysis results using the IBM SPSS application indicate that the correlation coefficient R is 0.577 with $R^2 = 33.30\%$. It reveals that mathematical resilience affects mathematical problem-solving abilities by 33.30%, and the rest is influenced by other variables. It shows that the high value of mathematical resilience affects the high pupils' mathematical problem-solving abilities.

Researcher suggests that pupils should improve their mathematical problem-solving abilities and the teacher observes and support pupils with exercises so that pupils' mathematical problem-solving abilities increase. Further research can also examine other variables that affect mathematical problem-solving abilities.

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