The Effect of Adversity Quotient on Student's Mathematical Problem-Solving Ability

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Abstract

Math problem-solving skills are important for students to have. Because the subject of mathematics is very close to everyday life. But in reality many students have difficulty solving math problems and give up before finding a solution. Adversity quotient as one of a person's intelligence is often associated with fighting power in fighting difficulties, so it is indicated as a factor that has an influence on the ability to solve mathematical problems. Therefore, it is necessary to study the effect of adversity quotient on students' mathematical problem solving ability. This study aims to (1) find out the picture of students' adversity quotient, (2) know the picture of students' mathematical problem solving ability, (3) find out the influence of adversity quotient on students' mathematical problem solving ability. This study is not only to determine the influence of adversity quotient on problem solving ability, but also the adversity quotient indicator that has the greatest influence so that efforts can be made to improve students' mathematical problem solving ability. The population in this study was grade V students at MI Ma'arif Kadipaten. Sampling techniques with non-probability sampling types and saturated sampling techniques. The research trial sample was class V A students totaling 25 respondents, while the research sample amounted to 22 respondents from class V B. Adversity quotient data was obtained through questionnaires and mathematical problem solving skills through tests. The results of this study are (1) students' adversity quotient is in the medium category, (2) mathematical problem solving ability is in the medium category, (3) there is a significant positive influence of adversity quotient on mathematical problem solving ability.

Keywords: *Adversity Quotient; Problem-Solving Ability; Mathematics*

Abstrak

Kemampuan pemecahan masalah matematika penting untuk dimiliki siswa. Pasalnya, mata pelajaran matematika sangat dekat dengan kehidupan sehari-hari. Namun kenyataannya banyak siswa yang kesulitan dalam memecahkan masalah matematika dan menyerah sebelum menemukan solusinya. *Adversity quotient* sebagai salah satu kecerdasan seseorang sering dikaitkan dengan daya juang dalam melawan kesulitan, sehingga terindikasi sebagai faktor yang memiliki pengaruh terhadap kemampuan pemecahan masalah matematika. Oleh karena itu perlu dikaji pengaruh adversity quotient terhadap kemampuan pemecahan masalah matematika siswa. Penelitian ini bertujuan untuk (1) mengetahui gambaran *adversity quotient* siswa, (2) mengetahui gambaran kemampuan pemecahan masalah matematika siswa, (3) mengetahui pengaruh *adversity quotient* terhadap kemampuan pemecahan masalah matematika siswa. Penelitian ini tidak hanya untuk mengetahui adanya pengaruh adversity quotient terhadap kemampuan pemecahan masalah, namun juga indikator adversity quotient yang pengaruhnya paling besar sehingga dapat diupayakan peningkatan terhadap kemampuan pemecahan masalah matematika

siswa. Populasi pada penelitian ini adalah siswa kelas V di MI Ma'arif Kadipaten. Teknik pengambilan sampel dengan jenis *non-probability* sampling dan teknik *sampling* jenuh. Sampel uji coba penelitian adalah siswa kelas V A berjumlah 25 responden, sedangkan sampel penelitian berjumlah 22 responden dari kelas V B. Data *adversity quotient* diperoleh melalui angket dan kemampuan pemecahan masalah matematika melalui tes. Hasil penelitian ini adalah (1) *adversity quotient* siswa berada pada kategori sedang, (2) kemampuan pemecahan masalah matematika berada pada kategori sedang, (3) terdapat pengaruh positif secara signifikan *adversity quotient* terhadap kemampuan pemecahan masalah matematika.

Keywords: *Adversity Quotient; Kemampuan Pemecahan Masalah; Matematika*

INTRODUCTION

Problem-solving ability is very important in life. Including mathematics as one of the subjects that are closely related to everyday life. But ironically, many students cannot solve these problems even though mathematics is an important element in life. The National Council of Teachers of Mathematics (NCTM) says the importance of mathematics as the key opportunity with its statement (mathematics is the key opportunity). In addition, a person must also have competence, achievement, and intellectual ability in maximizing this opportunity. Mathematical problem-solving ability is one of the most important skills. The problem starts from a mismatch between what is expected and what happens. In Cooney's opinion, something can become a problem if it cannot be solved by the individual in the previous way. Simple questions can be problematic if students cannot solve them with the usual methods. In this situation, the role of problem-solving ability is important (Andi Nurlaelah et al., 2021).

Problem solving is defined by Polya as an effort to find a solution to a problem until it can achieve a long-term goal (Amaliah et al., 2021). To solve problems, students need ways or strategies in order to find a way out. Thus, the ability to find a way out of a problem that is not resolved in a way is usually an important ability that students must have. Problem-solving ability is considered a cognitive ability related to the ability to evaluate, observe, and design techniques to solve problems (Hali et al., 2022). Slovin argues that problem solving is the use of information and the ability to achieve the right goals. Problem-solving ability is related to many things including motivation, self-control, endurance, cognitive abilities, and so on (Hulaikah et al., 2020).

One indication of problem-solving ability is the adversity quotient. This is because it relates to willingness in the face of problems (Rambe & Afri, 2020). This is in line with Singh's research that adertity quotient has an influence on occupational stress (Singh & Sharma, 2017). According to Shen's research, students' adversity quotient affects their response to adversity and their ability can improve through practice (Chao-ying, 2014). Adversity quotient is a person's ability to face difficulties and analyze these problems with cognitive abilities that become tasks and must be completed (Pangma et al., 2009). Student success in learning depends on the way students deal with difficulties. Adversity quotient is a person's intelligence in dealing with difficult situations (Puspitacandri et al., 2020). Adversity quotient is also often associated with fighting power in fighting

difficulties and is considered to support student success in terms of learning achievement. Students with a high adversity quotient are able to solve the challenges faced well. Conversely, students who have a low adversity quotient will perceive obstacles or difficulties as the end of the struggle. (Hulaikah et al., 2020)

Adversity quotient is included as one of the references in getting success. This is because the adversity quotient has three forms of formulation including the following:

1. Adversity quotient as a new conceptual framework in understanding and improving aspects of success
2. Adversity quotient as a benchmark to determine the response to difficult situations
3. Adversity quotient is a set of scientific tools in improving response to difficulties (Phoolka & Kaur, 2012).

Based on the results of initial observations related to the state of students, it is suspected that the ability to solve mathematical problems is influenced by the adversity quotient. If the adversity quotient is proven to have a positive effect on the ability to solve mathematical problems, then efforts can be made to improve the ability to solve mathematical problems by exploring the adversity quotient indicator. In previous studies mentioned above, it was proven that adversity quotient affects occupational stress and difficulty even though examining the effect on problem-solving ability itself is more important. So it needs to be further investigated related to the influence of adversity quotient on students' mathematical problem solving ability.

METHODS

This type of research is a survey study where researchers will administer surveys to a sample or the entire population of people to describe attitudes, behaviors, opinions, or special characteristics in the population and aims to determine the effect of Adversity Quotient on Student Math Problem Solving Ability (Creswell, 2015).

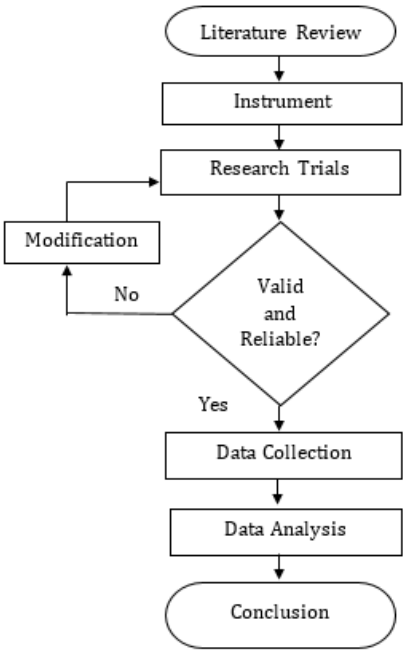

Figure 1. Research Flowchart

This research was carried out in MI Ma'arif Kadipaten of Ponorogo Regency. The subjects of this study were students of class V A as a research trial class to find out the instruments that were declared valid and reliable, so that it could be continued in research in class V B. In this study the sample used amounted to 22 people with non-probability sampling techniques with saturated sampling models.

Data collection techniques in this study were carried out with two techniques, namely test and non-test techniques. Test techniques are carried out with planned and systematic measuring instruments and arranged according to procedures to measure the ability and knowledge of students. In this study, tests were used to measure students' problem-solving abilities. While non-test techniques are a set of instruments to assess students without testing them, but with systematic observation. Non-test techniques are used to determine student adversity quotient through the distribution of questionnaires whose results are known based on student responses.

In the research of Paul G. Stoltz, an equation was formulated to be able to estimate the intelligence difficulty or adversity quotient in individuals in the form of CO2RE. The equation is an indicator in the adversity quotient consisting of control, origin and ownership, reach, and endurance (Sigit et al., 2019). The questionnaire instrument prepared must contain these four indicators.

Table 1. Adversity Quotient Indicator

Indicator	Description
Control	Students can control emotions and dare to face problems
Origin and Ownership	Students are able to find the cause of problems and are willing to take responsibility
Reach	Students can limit problems and not give up easily
Endurance	Students can find solutions as well as be optimistic and confident

The preparation of student problem-solving ability test questions is carried out by paying attention to the stages in problem-solving ability. Polya explains the four stages of problem-solving skills, namely understand the problem, devising a plan, carrying out the plan, and looking back.

Table 2. Stages of Problem-Solving Ability (Adapted from Polya)

Stages	Description
Understand The Problem	Students can write down what is known and asked in the question correctly.
Devising A Plan	Students make a problem-solving plan and write down the complete problem posed along with all the information obtained
Carrying Out the Plan	Students can carry out the plans made, compile the correct completion steps, proper procedures and calculations.
Looking Back	Students reexamine answers and write conclusions

The first research is a form of trial to determine the validity and reliability of adversity quotient questionnaire instruments and tests of mathematical problem solving abilities. If the calculation ≥ r_{table}, then it can be concluded that the questionnaire item is valid. However, if the calculation ≤ r_{table}, it can be concluded that the questionnaire item is invalid (Widyaningrum, 2015). With the number of subjects (N) of 25 students with a significance level of 5%, r_{table} = 0.396 was obtained. The statement item is said to be valid if the calculated value ≥ 0.396. Based on these provisions, 20 adversity quotient questionnaires are valid and 5 math problem solving ability test questions are valid. While the provision of a construct or variable is said to be reliable if the value of Cronbach Alpha > 0.7 (Wulansari, 2018). Based on these provisions, adversity quotient questionnaires and tests of mathematical problem-solving ability are declared reliable. Questionnaires and tests that are declared valid and reliable can be used as research instruments, while invalid items are void.

After the item is declared valid and reliable, the actual research is carried out through questionnaires and tests. The data obtained was then analyzed, in this study two data analysis techniques were used, namely through statistical or inferential tests to explain the data, and linear regression tests to analyze inferential data assisted by the SPSS 25.0 application for windows. To determine the level of adversity quotient so as to

facilitate student data analysis on the ability to solve mathematical problems, it is necessary to group the adversity quotient category (Arikunto, 1996). The grouping criteria are as follows:

Table 3. Adversity Quotient Categorization

Average Score	Category
X ≤(Mx-1,0 SDx)	Low
(Mx-1,0 SDx)<X<(Mx+1,0 SDx)	Medium
X ≥(Mx+1,0 SDx)	High

Information:
X = total score of the object
Mx = average score
SDx = standard deviation

Students' mathematical problem solving abilities also need to be categorized, so that later a picture of mathematical problem solving abilities can be analyzed with students' adversity quotient based on their categories. The following are the criteria for categorizing students' mathematical problem-solving abilities (Arikunto, 1996):

Table 4. Problem-Solving Ability Categorization

Average Score	Category
X ≤(Mx-1,0 SDx)	Low
(Mx-1,0 SDx)<X<(Mx+1,0 SDx)	Medium
X ≥(Mx+1,0 SDx)	High

Information:
X = total score of the object
Mx = average score
SDx = standard deviation

RESULTS AND DISCUSSION

After obtaining the results of research obtained from student responses in questionnaires and student answers in taking tests, then descriptive statistical tests were carried out to determine the picture of adversity quotient and students' mathematical problem solving abilities, as well as linear regression tests to determine the influence between adversity quotients on students' mathematical problem solving abilities.

Overview of Student Adversity Quotient

The picture of students' adversity quotient can be known based on the results of descriptive statistical tests obtained from the answers to a scale 4 questionnaire totaling 20 questions that are distributed and responded to by students. The description of student adversity quotient is presented in the following table:

Table 5. Descriptive Statistics Adversity Quotient

Descriptive Statistics	Value
Minimum	40

Maximum	77
Mean	63,59
Standar Deviation	10,760

Based on the data above, it is known that Mx = 63.59 and SDx= 10.760. Thus, it is known that the questionnaire score is worth more than or equal to 74 getting the high category, between 74 and 53 getting the medium category, and less than or equal to 53 getting the low category.

Table 6. Results of Student Adversity Quotient Categorization

Value	Category	Frequency
X ≤53	Low	4
53 <X<74	Medium	16
X ≥74	High	2

It can be seen from the table above, that the Adversity Quotient questionnaire scores of students in the low category were 4 students, the medium category was 16 students, and the high category was 2 students. So it can be concluded that the adversity quotient of students is in the medium category.

Overview of Students' Math Problem Solving Abilities

The picture of students' mathematical problem-solving ability can be known based on the results of descriptive statistical tests obtained from test answers totaling 5 questions with a maximum score of 10 each question. An overview of students' mathematical problem-solving abilities is presented in the following table:

Table 7. Descriptive Statistics Students' Mathematical Problem Solving Ability

Descriptive Statistics	**Value**
Minimum	25
Maximum	50
Mean	44,0
Standar Deviation	7,323

Based on the data above, it is known that Mx = 44.00 and SDx = 7.323. Thus, it is known that the questionnaire score worth more than or equal to 51.3 gets the high category, between 51.3 and 36.7 gets the medium category, and less than or equal to 36.7 gets the low category. So it can be concluded that students' mathematical problem solving abilities are in the medium category.

Table 8. Results of Categorization of Students' Mathematical Problem Solving Abilities

Value	Category	Frequency
X ≤36,7	Low	3
36,7 <X<51,3	Medium	19
X ≥51,3	High	0

It can be seen from the table above, that the scores of students' mathematical problem-solving ability in the low category were 3 students, the medium category was 19 students, and no students got the high category in mathematical problem-solving ability.

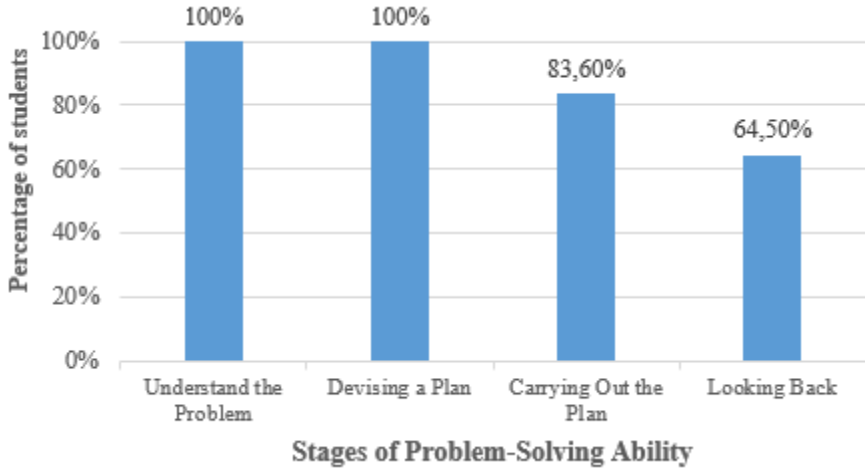

Figure 2. Results of Analysis of Students' Mathematical Problem Solving Abilities

Researchers also analyzed the achievement of each indicator of problem-solving ability on the results of the students' mathematical problem-solving ability test. Based on the results of the analysis, results are obtained as presented in the picture above that students can understand the problem and make a good problem-solving plan. But of the total number of students, only 83.6% of students were able to carry out the math problem solving plan and 64.5% of students re-examined the results of solving math problems. Based on these findings, it can be concluded that students more easily understand problems and make solution plans, but only some of them can implement the solution plan and look back at the results of solving problems that have been done. This can occur due to lack of accuracy and poor self-control so that haste in solving problems.

The Effect of Adversity Quotient on Students' Mathematical Problem Solving Ability

To determine the effect of adversity quotient on students' mathematical problem solving ability, a linear regression test was conducted (Irawan, 2014). However, before entering the linear regression test, it is necessary to carry out classical assumption tests including normality tests, linearity tests, multicollinearity tests, and heteroscedasticity tests (Firza Umar Salim, 2020). The test results can be seen in the following table:

Table 9. Table 9. Classical Assumption Test Results

Classical Assumption Test	Criteria	Value	Result
Normality Tests	>0,05	0,121	Normal
Linearity Tests	*Linearity* <0,05 *Deviation from linearity* >0,05	0,000 0,293	Linear
Multicollinearity Tests	*Tolerance* >0,1 VIF <10	0,728 1,374	Multicollinearity doesn't occurs
Heteroscedasticity Tests	*absolute residual* >0,05	0,488	Heteroscedasticity doesn't occurs

From the table above, it is known that the data is normally distributed, linear, multicollinearity does not occur, heteroscedasticity does not occur so that it is said to have met the classical assumption test as a condition for linear regression tests.

Furthermore, a linear regression test was carried out whose results can be seen as follows:

Table 10. Linear Regression Test Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.013	6.606		1.818	.084
	Adversity Quotient	.503	.102	.739	4.908	.000

a. Dependent Variable: Problem Solving Ability

In the simple linear regression results above, it can be seen that constant (a) is 12.013 and adversity quotient (b) is 0.503. So the regression equation can be written Y = 12.013 + 0.503X. From this equation it can be concluded that the value of the constant is 12.013, meaning that if the adversity quotient is 0, then the student's mathematical problem solving ability is worth 12.013. The regression coefficient of the adversity quotient variable is 0.503, meaning that if the student's adversity quotient increases by one unit, then the student's mathematical problem solving ability will increase by 0.503 units. A positive coefficient means that there is a positive relationship between the adversity quotient and students' mathematical problem-solving abilities. So it can be concluded that the higher the student's adversity quotient, the higher the student's mathematical problem solving ability.

Paul G. Stoltz explains that the adversity quotient is composed of 4 indicators in CO2RE, namely control, origin and ownership, reach, and endurance(Sholihah, 2022). Researchers analyzed the influence of each indicator through a coefficient of determination test, which one had the greatest influence on students' mathematical problem-solving abilities. The results are as follows:

Table 11. Results of Adversity Quotient Indicator Analysis

Indicator	R Square
Control	0,606
Origin and ownership	0,438
Reach	0,412
Endurance	0,314

From the results of the coefficient of determination test, it is known the percentage of influence of each adversity quotient indicator on the ability to solve mathematical problems. The control indicator has an influence of 60.6%, the origin and ownership indicator has an influence of 43.8%, the reach indicator has an influence of 41.2%, and the endurance indicator has an influence of 31.4%. Based on the results of the analysis, it can be concluded that control indicators have the greatest influence on students' mathematical problem solving abilities.

If discussed more deeply, control indicators have sub-indicators, namely controlling emotions and facing problems. Based on students' responses in answering questionnaires, it is known that students have not been able to face problems well. Students tend to choose not to do homework if the questions given are difficult and choose to copy the work of friends rather than try to solve it themselves.

CONCLUSION

From this study, it can be concluded that the adversity quotient has a significant positive influence, it is known based on the results of a simple linear regression analysis which shows that the value of the constant is 12.013, meaning that if the adversity quotient is 0, then the student's mathematical problem solving ability is worth 12.013. The regression coefficient of the adversity quotient variable is 0.503, meaning that if the student's adversity quotient increases by one unit, then the student's mathematical problem solving ability will increase by 0.503 units. A positive coefficient means that there is a positive relationship between the adversity quotient and students' mathematical problem-solving abilities. If the student's adversity quotient is good, then so is the problem-solving ability. It was also found that the adversity quotient indicator that had the greatest influence on the ability to solve mathematical problems was the control indicator. This indicator is associated with self-control and willingness to face problems. From the results of research in the field, it is proven that students' willingness to face problems is still low. So in this case, it is necessary to evaluate whether the student's adversity quotient is good, especially in the control indicator that has the greatest influence on problem-solving ability. To improve students' problem-solving abilities, teachers or learning assistants must also improve students' adversity quotient. You should not decide a student is stupid just because they have not been able to solve problems well. Because it is proven that problem-solving ability is not only influenced by intelligence quotient (IQ) but also influenced by adversity quotient (AQ).

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