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Exploring the Impact of Adversity Quotient on Students' Mathematics Achievement in Junior High School

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Abstract: Adversity Quotient (AQ) is an individual's ability to face and overcome obstacles and has been found to be an important non-cognitive factor in student learning outcomes, especially in mathematics, a subject often perceived as difficult and stressful. This study aimed to examine the effect of AQ on grade VIII students' mathematics learning achievement at SMP Negeri 2 Parepare. A quantitative approach was used with 36 students selected through cluster random sampling. Data was collected using a validated AQ questionnaire based on Stoltz's CO2RE model, consisting of Control, Origin and Ownership, Reach, and Endurance, as well as students' mathematics learning achievement scores. Descriptive analysis showed that students generally had moderate AQ, with the highest dimension score in endurance, which means optimism and persistence, while the control dimension was the weakest. This means that although students are motivated to face challenges, they still struggle to manage their responses to learning pressure. The study applied Spearman's rho correlation analysis. This finding implies that non-cognitive skills such as AQ in mathematics education will improve their academic outcomes. A high AQ in students will tend to be able to overcome difficulties and problems well it has a good impact on their learning achievement. This study has limitations. Small sample size (N=36) limits generalizability beyond a specific school context. This study only focused on AQ as an internal factor without considering external factors such as socioeconomic status, parental support, or classroom atmosphere. Future research will expand the sample and include additional variables to understand the multifactorial nature of academic success.

Keywords: adversity quotient, achievement, learning, mathematics.

▪ INTRODUCTION

Student learning achievement is a multifaceted construct influenced by a combination of individual traits and environmental conditions. The two main determinants of student learning achievement are internal and external. According to Chong et al. (2018), internal factors are traits that are specific to the learner, including cognitive abilities, attitudes, learning habits, talents, interests, and intrinsic motivation. The learners' surroundings, such as family support, community expectations, school facilities, and classroom atmosphere, are all considered external factors. Ozcan (2021) asserts that a student's academic performance is greatly influenced by both internal (self discipline and motivation) and external (family educational background, school infrastructure, and teacher support) factors.

Specifically, this research focuses on one of the internal factors: intelligence. There are various types of intelligence. One type of intelligence that is pertinent to learning is AQ which Stoltz (2000) defined as a persons ability to persevere and overcome obstacles while maintaining hope and self-control in trying circumstances. While those with low AQ may perceive challenges as failure and perform worse academically students with high AQ are more likely to persevere through academic setbacks. When learning mathematics, which frequently entails abstract ideas and difficult problem-solving AQ becomes crucial for assisting students in controlling their frustration, maintaining

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motivation, and striving for achievement in spite of obstacles. Stoltzs (2000) research highlights that AQ involves more than just perseverance it also entails changing ones viewpoint to view challenges as opportunities. According to Martin and Marsh (2006) students who are more resilient and adaptable typically perform better academically, particularly in challenging subjects like mathematics.

In mathematics learning, students are often faced with a more challenging task. Learning is a person's mental process toward intellectual development, emotional mentality, and the ability of the whole individual as well as readiness to deal with problems that come to him (Lardika et al., 2022). Learning mathematics is a mental activity to understand meaning and structures, relationships, or symbols, as well as the manipulation of the concepts generated in real situations, which ultimately causes changes. The learning of mathematics is not only related to numbers and their operations, but mathematics also deals with ideas, structures, and relationships that are organized so that mathematics is related to abstract concepts as a structure and relationships. Mathematics requires symbols to facilitate the manipulation of rules with defined operations. In this context, students often find difficulties, impacting the mindset that mathematics is a complex subject and even avoided. Learning mathematics is often perceived as a complex and intimidating subject by students, influenced by factors such as conceptual understanding, cognitive barriers, and mathematics anxiety (Mangarin & Caballes, 2024).

Learning mathematics is a mental activity to understand the meaning of the relationship of symbols, then apply the generated concepts in real situations. Mustafa et al. (2021) explained that learning mathematics at school is not only intended to achieve the material objectives of mathematics education, which were to equip students to master mathematics and apply it in daily life. Moreover, mathematics learning is also intended to achieve the formal objectives of mathematics education: to organize students' logic and develop their personalities. Math subjects can broaden students' mindsets and develop an awareness of the values involved (Mahardika, 2021).

Learning mathematics is learning about mathematical concepts and structures contained in the material being studied and finding relationships between mathematical concepts and structures. Mathematics learning involves students actively constructing their mathematical understanding. Mathematics learning can be considered a teacher's effort to help students understand or master mathematics (Mustafa, 2021). Because of its abstraction, students can face several obstacles in the learning process. The teacher needs to improve learning quality to achieve high learning achievement. Learning achievement encompasses the development of knowledge, skills, attitudes, and values acquired through the learning process, enabling individuals to effectively address challenges and adapt to various situations (OECD, 2024). The assessment of students' mathematics learning achievement is conducted on affective, cognitive, and psychomotor abilities. Ndiung (2021) revealed that the assessment of learning achievement refers to the cognitive, affective, and psychomotor domains.

The AQ is a type of intelligence that reflects students' ability to face and overcome obstacles during the learning process. The main question this study attempts to answer is whether AQ influences mathematics learning achievement. Many students become frustrated and disengaged when they are unable to comprehend the abstract concepts that are commonly covered in math classes. Such difficulties present chances for growth rather

than obstacles for students with high AQ. Stoltz (1997) asserts that AQ is a psychological factor that establishes whether people remain hopeful and in control during trying times. Although the function of AQ in educational settings has been studied in the past, there is a noticeable lack of research on Indonesian junior high school student, especially about their learning of mathematics. For example, Gradini and Noviani (2024) examined the AQ profiles of Central Aceh high school students and discovered a strong positive relationship between AQ and math proficiency. However, junior high school students and the distinct educational contexts of other regions were not specifically addressed in their study. By investigating how AQ, specifically its four dimensions, control, origin, reach, and endurance, affect eighth-grade students' learning achievement in mathematics at Junior High School 2 Parepare, this study seeks to close this research gap. The results should provide information that helps develop methods for enhancing mathematics instruction by strengthening students' ability to bounce back from setbacks and solve problems.

Paul G. Stoltz first shared the idea of AQ as a type of smarts that shows how well a person can handle and get past life's hard times. Stoltz (2000) said that Intellectual Quotient (IQ) and Emotional Quotient (EQ) by themselves are not enough to guess who will be successful. He pointed out that other key skills, like drive, inner push, and personal strength, are needed to deal with tough times, which he called AQ. This means that getting success, including school success, needs more than just thinking or feeling smart; it requires the ability to keep going and change when faced with problems. Lontok et al. (2025) support this idea; they found that students with a big AQ are much better at handling school stress and getting past learning problems, which helps them do better in school. These findings reinforce the idea that AQ plays a crucial role in shaping students' success, particularly in challenging learning contexts such as mathematics education.

The adversity quotient is someone's ability to overcome life problems and their ability to survive. Someone's AQ can be determined by his ability to overcome life's most challenging problems without desperation. AQ is an individual's capacity to persist and adapt in the face of challenges, effectively transforming obstacles into opportunities for growth (Stoltz, 2000; Arabejo, 2024). Previous studies in Adversity Quotient (AQ) revealed that some individuals possess a high IQ and all the components of EQ, yet they fail to be successful. Hence, we can understand that neither IQ nor EQ was found to determine one's success, although both play a role. Therefore, it is unanswered how some people endure while some may be equally brilliant and well-adjusted may fail and quit.. Thus, it is apparent from the aforementioned that AQ is a very essential area for the better understanding of individual resilience. The AQ is constantly being depicted as something running together with man's psychological strength to deal with life's problems, change, and happiness (Anju & Sahoo, 2023). To be specific, in the sphere of education, adaptability is defined as a learner's determination to get out of trouble during the learning process, which is always the state of affairs that keeps the student ahead in their academic career (Mwivanda & Kingi, 2018).

Specifically, in the learning process, AQ informs individual students about their ability to deal with adversity and overcome it. Predicts individuals who are able and unable to deal with adversity, predicts those who will exceed and will fail to exceed expectations of performance and potential, and predicts individuals who will give up and those who will persist in the face of adversity. The AQ in students enhances their

resilience and ability to navigate challenges encountered during the learning process, contributing to improved academic outcomes (Lontok et al., 2025) If students have an adversity quotient in learning, then students will be able to analyze a problem in learning, not easily give up, and be able to solve problems by finding solutions from various sources, so that the material studied can be explored extensively by itself, and add knowledge for the students themselves. According to Stoltz (2000), AQ has three forms; they are (1) adversity quotient is a new conceptual framework for understanding and improving all aspects of success, (2) adversity quotient is a measure to determine individual response to adversity, and (3) adversity quotient is a set of scientifically based tools to improve individual responses to adversity which will improve the overall personal and professional effectiveness of individuals. Adversity Quotient (AQ) represents a form of intelligence that reveals a person's aptitude in confronting and overcoming the difficulties of life. Stoltz (2000) emphasized that IQ and EQ alone are not sufficient for achieving success; AQ, the factor that included motivation, inner drive, and a self-reliant attitude, was the key for dealing with challenges. This means that success in schools is mainly associated not only with the smart or the emotionally intelligent people, but also with those who dare to be patient and adapt to different situations. As an illustration of this idea, Hung et al. (2023) found a strong, significant connection between students' AQ and their academic achievement. Their study demonstrated that high AQ students were more capable of coping with the academic stress and were also showing a higher level of resolve in their work, thereby leading to better academic performance. These findings indicate AQ as a crucial factor of educational success in addition to IQ and EQ.

The Adversity Quotient (AQ) represents a person's capability to face up to and conquer demanding situations, especially in the getting to know surroundings. Stoltz (1997) brought the concept of AQ, emphasizing its four core dimensions: Control (the extent to which one perceives they can influence a situation), Ownership (the degree of personal responsibility one takes for outcomes), Reach (the scope to which adversity affects other areas of life), and Endurance (the perceived duration of adversity). Those dimensions together determine how college students respond to academic problems. Studies by Hulaikah et al. (2020) further support the importance of AQ in academic settings. Their observe found that scholars with better AQ levels exhibited better problem-fixing competencies and resilience in the face of instructional demanding situations. This resilience is critical for educational success because it enables students to navigate setbacks and persist in learning. In this study, AQ has four dimensions abbreviated as CO2RE, namely:

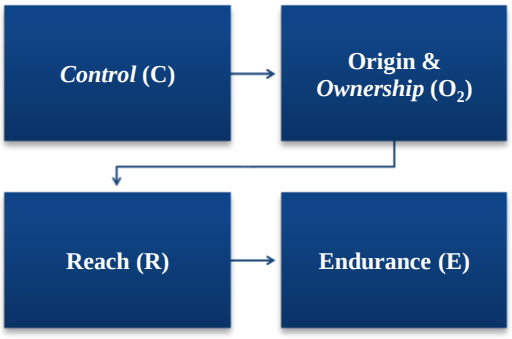

Figure 1. The dimension of adversity quotient

Control Dimension is related to the student's ability to control the adversity faced and how they perceive that these controls play a role in the learning process that causes learning difficulties. The greater the control, the more students are likely to survive in the face of difficulties, stay firm in their intentions, and be resilient in finding solutions to problems. On the other hand, the lower the control, the more the student becomes helpless in the face of difficulties and gives up quickly. In the control aspect, there are indicators of the ability to influence the situation positively and the ability to control the response to the current situation (Anggresela & Sulistiyorini, 2022). Individuals who have a high score on the control dimension will think that there must be something that can be done, there is always a way to deal with difficulties and not feel hopeless when in a difficult situation. Origin and ownership dimension, ownership or, in other terms, origins, and recognition, will be concerned with who or what caused the difficulty and the extent to which students perceive themselves as influencing the origins of the difficulty. An individual with a low origin score will think that all difficulties or problems are caused by their own mistakes or carelessness. In the origin and ownership aspect, there are indicators of having the courage to bear the consequences of the existing situation and being responsible for difficult situations. This dimension questions two things, namely what or who is the cause of a difficulty and to what extent a person can deal with the consequences caused by this difficult situation. The reach dimension is part of AQ that inquires to what extent difficulties will reach other parts of the individual student. Reach shows the ability to analyze the stressful workload. The higher a student's range, the more likely they are to respond to adversity as specific and limited. The higher a student's range, the more likely they are to respond to adversity as specific and limited. Reach has limiting indicators and does not mix up the issues at hand and the ability to maximize the positives of difficult conditions (Anggresela & Sulistiyorini, 2022). Individuals with high adversity intelligence pay attention to the failures and challenges they experience, not letting them affect their work and life circumstances.

In contrast, the more effective at containing or limiting the range of adversity, the more empowered the student will be. So that when he has problems regarding one aspect of his life, he does not have to feel that he is experiencing difficulties in all aspects of his life. The endurance dimension relates to students' perception of the difficulty's length. Endurance can lead to judgment about a situation. Students with high endurance will have hope and an optimistic attitude in overcoming difficulties or challenges. In the aspect of endurance, there are indicators for assessing difficulties or failures that are temporary and measuring optimism (Anggresela & Sulistiyorini, 2022). The higher the endurance, the more likely it is to view success as temporary, and students who have low AQ will think that the difficulties faced are eternal and challenging to fix. At the same time, AQ will be motivated to achieve its intended achievements (Rustan et al., 2022). This fourth dimension can be interpreted as resilience, namely the dimension that questions how long a difficult situation will last. Individuals who have high adversity intelligence have an extraordinary ability to remain hopeful.

Some factors that can affect AQ (Stoltz, 2000) which are: (1) Talent, describes the combination of skills, competencies, experience, and knowledge, such as what an individual knows and can do (2) Intention; describes the motivation, enthusiasm, passion, encouragement, ambition, and spirit, (3) Intelligence; there are seven forms of intelligence, namely linguistic, kinesthetic, spatial, mathematical logic, musical,

interpersonal, and intrapersonal. Individuals have all forms of intelligence to some degree, and some of them are dominant, (4) Health; Emotional and physical health are also influential in reaching success, 5) Personality characteristics; such as honesty, fairness, sincerity, wisdom, kindness, courage, and generosity are some of the essential characteristics in achieving success, (6) Genetics; the research results show that genetic factors are one of the factors that form the basis of behavior in individuals, (7) Education; the education affects intelligence, the formulation of a healthy habit, the development of character, skills, passion, and the output of performance, and (8) Faith; is the general characteristic of some successful people because faith is a crucial factor in expectations, morality, contributions, and how someone treats another individual.

The AQ refers to how people react to adversity. That is, facing setbacks, getting out of difficulties, and surmounting difficulties (Lin, 2018). individuals with high AQ will tend to be responsible for the problems they face when they are in trouble, can control problems, are good at finding solutions, and focus on solutions. Asni et al., (2021) explained that the AQ is one of the intelligence possessed by a person in managing difficulties into a challenge that must be resolved to achieve specific goals. Adversity Quotient (AQ) is a person's ability to respond to difficulties to survive and overcome them. Furthermore, it will transform it into a chance for success to create a positive change (Stoltz, 2000). A strong AQ boosts the feeling of accountability in addressing issues (Verma et al., 2017), improves self-assurance in tackling challenges, and enhances motivation for success (Sharma, 2024). Grounded in the theoretical framework and the recognized gap in current research, this study seeks to explore the degree to which students' Adversity Quotient (AQ) affects their achievement in mathematics learning. In particular, the research investigates this question: "Is there a significant relationship between students' Adversity Quotient (AQ) and mathematics learning achievement?". This is in accordance with the research objectives, namely to explore the effect of AQ on students' mathematics learning achievement.

▪ METHOD

Research Design

This study is quantitative research with type ex post facto, namely, a study that aims to determine reasons for changes in behavior, symptoms, or phenomena caused by an event. The population of this research was the students of Junior high school 2 Parepare. Ex post facto design, also known as retrospective design, involves studying events that have occurred to understand the relationship between variables (Locke et al., 2015). One of the advantages of ex post facto design is that it allows the examination of rare events or phenomena that may not have been anticipated or planned.

Sample and Data Collection

The population of this research was the students of Junior high school 2 Parepare. The sample used a cluster random sampling technique with the following steps: 1) Identifying all class VIII Junior high school 2 Parepare, 2) Choose one class at random from all class, 3) The class selected in point (2) as the research sample is class VIII.1 with a total of 36 students. Data was collected using questionnaire techniques and documentation techniques. The questionnaire technique was used to obtain Adversity Intelligence data after students had done the assignments given by the teacher, while the

documentation technique was used to collect data on students' mathematics learning outcomes obtained from a list of values in the form of the average value of students' daily test results. The data obtained is then processed and analyzed using descriptive statistical techniques and inferential statistics, the results are in the form of graphs and tables.

Analyzing of Data

The research instrument is an AQ questionnaire distributed using a Google form, and documentation of the student's score list of mathematics learning achievement.. The AQ questionnaire of this study is based on Stoltz CO2RE model, a 4 dimensions acronym that stands for Control, Origin and Ownership, Reach anf Endurance. All dimensions were developed into sound indicators and sub-indicators that capture students' resilience or adaptation to adversity in a learning context. The questionnaire consisted of 18 statements with choices to answer very agree, agree, neutral, disagree, and significantly disagree. Each indicator was derived from two or more items that are used to measure particular aspects and attitudes towards students overcoming obstacles (especially mathematics learning).

Table 1. Item score of adversity quotient quoestionnaire

Statements	Very agree	Agree	Neutral	Disagree	Very disagree
Positive	5	4	3	2	1
Negative	1	2	3	4	5

The scale used to measure AQ in this research is the Likert scale with five categories: very low, low, fair, high, and very high. The AQ questionnaire guideline to obtain valid data about students' adversity quotient was prepared as follows.

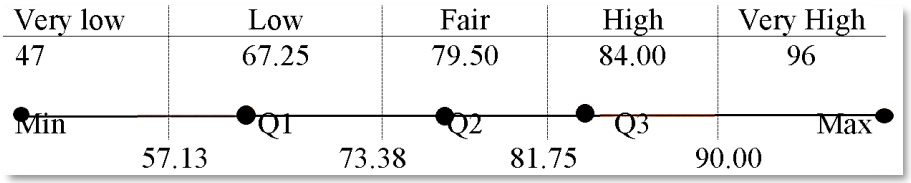

Figure 2. Likert scale model for scoring AQ category

Table 2. The questionnaire of adversity quotient

No	Explanation Indicator	Sub Indicator	Number of Statements
1	Control	Rebound easily from adversity	2
		Able to control self in the facing of difficulties/unwanted situations	2
2	Origin dan Ownership	Positioning guilt reasonably or appropriately	2
		Responsible	2
		Considering success as the result of hard work done	2
3	Reach	Able to maximize the positive side of difficulties	2
		Able to map the problem appropriately	2
4	Endurance	Optimistic	2

	Recognizing difficulties or failures as temporary	2
Total		18

Next, the category of mathematics learning achievement of students using a five scale with an ideal maximum score of 100. Categories of mathematics learning achievement were thus divided into five tiers according to scaled score ranges achieved in this study. 90 – 100: "very high" maximum level of mastery of the subject Scores between 80 and 89 was considered 'high', showing an extensive knowledge on learning content. Students receiving a score between 65 and 79 are considered as "fair" meaning they have mediocre levels yet with deficiencies. While those between 55-64 are moderate "low", meaning students have difficulty with the material. Scoring from 0 to 54 is defined as it is "very low" since it means the students need help to have those basic skills. These are used to measure students academic achievement in mathematics through the lens of learning.

Data were processed non-parametrically, with the specific statistical method used being Spearman's rho correlation test; to find out the association between independent (AQ) dependent (mathematics learning achievement) The following method was selected as the linearity assumption was not satisfying so simple linear regression analysis could not be done (appropriately) for our study.

Inferential statistical analysis was conducted in three steps. First, a normality test involving the Shapiro-Wilk test of SPSS version 24 was employed to analyze the distributions of variables. The results demonstrated that the variables of Adversity Quotient 0.092 and Mathematics Learning Achievement 0.078 in significant values. Both values are higher than the α level of 0.05, hence, the data for both variables are normally distributed. Next, a linearity test was carried out using SPSS with ANOVA as an F-test to test whether there is any linear relationship between these two variables. Its ANOVA test results for linearity are 0.603, and deviation from linearity of connected data of 0.670, which implies that there is an insignificant linear relationship. Finally, because of the linearity assumption violation, based on this result, data analysis using Spearman's rho correlation test to identify the magnitude and the direction of the association betweenAQ and mathematics learning achievement. Results of Spearman's rho (ρ) expressed as the correlation coefficient (ρ) and subsequently p (p-value) will indicate the existence or implication (size) of the relationship between these variables.

The instrument sheet used in this study was validated by two validators or experts who knew about the validity of the instrument, after being validated by the validator then analyzed using content validation according to Gregory to know whether the contents of the instrument used were valid or not. The content validity of an instrument occurs if the content validation coefficient is greater than 75%.

▪ RESULT AND DISSCUSSION

Results

This section presents Data Analysis of AQ (Adversity Quotient) with regard to mathematics learning achievement of students. The analysis will comprise descriptive statistics, normality testing and inferential statistics (using simple linear regression). We check the distribution normalilty of the data before hypothesis testing to make sure that parametric testing assumptions are met. Finally, the results are discussed in relation to

relevant theories and previous findings within the literature with respect to implications for mathematics education, and student resilience in staff mindset.

The normality test results indicate that for the AQ variable p = 0.092 and mathematics learning achievement variable p = 0.078 are the significant values. Both significance values lesser than α=0.05, the data are normally distributed. Still, the data also do not meet normality assumption (See: linearity test, p = 0.603) So simple linear regression is out of question, and a non-parametric Spearman's rho correlation test was used instead.

The questionnaire was distributed to the students through a Google form link. 36 students responded, and based on the results of completing the questionnaires, the following data were obtained.

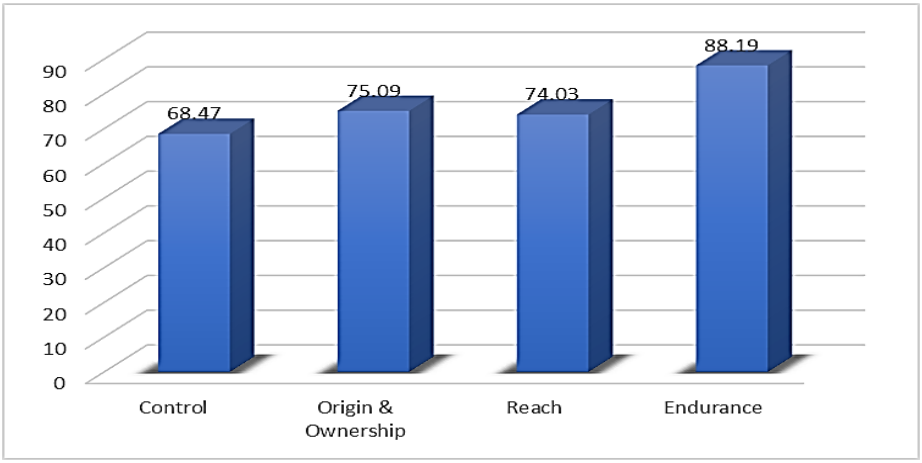

Figure 3. The score of the adversity quotient (AQ) indicator

Figure 3 illustrates the scores for each indicator. The data were obtained by averaging the positive and negative statements. The control indicator score was 68.47, or in the "low" category. This score indicated that the students were unable to control themselves and overcome difficulties, so they gave up quickly when dealing with mathematics problems. The origin and ownership indicator had an average score of 75.09, corresponding to a "fair" category. It means that students have a responsibility for the mathematics learning difficulties they face, although they sometimes struggle with self-control. The average score of the reach indicator is 74.02,, or in the "fair" category. It means the students overcame the difficulties and tried not to fail in the learning activities. The endurance indicator had an average score of 88.19, placing it in the "high" category, which means that the average student could not give up and still had hope of succeeding in overcoming difficulties in the mathematics learning process. Students with high AQ have a remarkable ability to be optimistic. Overall, the average score of the questionnaire indicates that students' AQ is quite good in the mathematics learning process, although there are still areas that need improvement in control indicators.

Figure 3 shows the mean results of each indicator of the Adversity Quotient (AQ): Control, Origin & Ownership, Reach, and Endurance in general. Analysis indicates variability in students' resilience scores related to mathematics learning. The Control indicator scored the lowest at 68.47, placing it in the low category. This result indicates that students have difficulty managing their emotional and cognitive responses to

academic problems in mathematics. They give up more easily with challenging problems. Stoltz (2000) defined the control dimension of AQ as an individual's perceived ability to influence outcomes, and it falls into the low category. This limited control shows a narrow view of oneself, which may prevent problem-solvers from tackling challenges or persisting in their efforts. Li & Lerner (2011) found that low perceived control predicted higher academic anxiety and less task engagement, particularly for subjects who have strong representations of difficulty, such as mathematics. The high-endurance indicator received an 88.19 score, which is a high rating. This implies that the students do still possess a robust capacity for hope and persistence despite low self-regulation under pressure. Endurance: Optimism and challenges are temporary (Duckworth et al., 2007), typically assessed in an environment where academic persistence is evaluated. These learners are predisposed to have more grit and fortitude, which are, in fact, both essential background qualities for success in the academy. Origin and Ownership, as well as Reach Indicators, scored Fair (75.09 and 74.03, respectively). Indicators indicate that, at best, students accept responsibility for learning outcomes and have a degree of compartmentalization from problems, discouraging them from spreading. Nevertheless, students may still struggle with internalizing the idea that this is how they will transform obstacles into triumphs. Shek et al. (2019) reported that the development of self-responsibility and cognitive flexibility in task framing is essential for the adaptive functioning of adolescents, particularly in a performance-driven academic context. As a whole, the mean AQ score indicates that students exhibit a degree of adversity response (e.g., hope maintenance or hope endurance), i.e., emotional regulation (control) remains an area for intervention. Contrary to this, these results suggest that instruction aimed at improving content comprehension without simultaneously enhancing coping efficacy may lack sufficient evidence to support student engagement in its teaching. Programs that incorporate emotional regulation and mindset practices into mathematics instruction may be expected to mitigate these imbalances (Yeager & Dweck, 2012).

Next, the result of the descriptive statistical analysis obtained an average score of 76.45, indicating that students' AQ in following the mathematics learning process generally falls into the "fair" category. It indicated that students have good enough AQ when learning mathematics. The frequency distribution and percentage of AQ categorization criteria are 13.89% of students, or five students who are in the very high category; 27.78% or 10 students are in the high category; 22.22% or eight students are in the fair category, 5.56% or twostudents are in a low category, and 30.55% or 11 students are in the very low category.

The results of descriptive statistical analysis on students' mathematics learning achievement, derived from the documentation of the score list, are presented in the following table.

Table 3. The data of descriptive statistical on mathematics learning

Statistic	Statistics Score
Sample measurement	36
Ideal score	100
Modus	92
Median	87
Scoring Range	23

Average Score	86.08
Lowest score	72
Highest score	95
Standard Deviation	6.281
Variance	39.450

The data displayed shows various statistics related to student learning achievement. The research sample consisted of 36 students, with an ideal maximum score of 100. The mode, or most frequently occurring score, was 92, while the median, the middle score of the sorted data, was 87. The range of scores showed variation in student achievement, at 23 points, with a mean student score of 86.08. The standard deviation value of 6.281 indicates the extent to which students' scores are spread out from the mean, while the variance of 39.450 confirms the variation in the data. The conclusion from these explanations is that student learning achievement in the study showed positive results, with most students achieving high scores. With the mode and median standing at 92 and 87, and the mean score reaching 86.08, this indicates that students generally understood the material well. The relatively narrow range of scores (23 points) and low standard deviation (6.281) indicate that students' learning outcomes did not vary significantly, suggesting consistency in achievement. However, while no students were in the low or very low categories, the variation in scores is still worth noting to further improve the quality of learning. This data reflects encouraging results in student learning achievement in the classroom.

As shown in Table 4, the descriptive statistics for mathematics learning achievement indicate that the 36 participants performed very well, with a mean score of 86.08 out of 100. This implies that, overall, the students demonstrated a depth of learning in the math material studied. In the results set, the modal scores (92) and median (87) both indicate an alignment with high achievement (not only were scores high, but they clustered together around this average). This quality is further emphasized by a moderate scoring range of 23 and a relatively low standard deviation (6.281), indicating that scores do not deviate significantly from the mean. Students were not varied along any continuum, which means an even understanding and mastery. Again, this is generally consistent with Hattie's (2009) synthesis from a meta-analytical review, which indicates that across a class, high performance often indicates effective teaching and learning supported by a positive climate and clear goals. In addition, Wang, Haertel, and Walberg (1993) stated that such factors as instructional quality, student motivation, and classroom management primarily determine student achievement. The uniformity in scores of this study may have resulted from these dimensions.

The distribution may be very tight and the scores high, but a 23-point gap between the lowest and highest scores (72–95) still provides evidence for targeted intervention, especially among students in the lower third. Safawi and Akay (2022) conducted a meta-analysis revealing that differentiated instruction significantly enhances students' academic achievement, emphasizing its importance in addressing diverse learning needs within classrooms. Using the descriptive data, students performed strongly as a whole and relatively uniformly; however, the minor dissimilarities present many chances for improvement and individualization of instruction. The findings reveal the importance of maintaining effective teaching practices, as well as the challenges of achieving this goal

by increasing equity and personal learning to help achieve better outcomes in mathematics. Next, the data is converted into a frequency distribution of students' mathematics learning achievement to determine the mathematics learning achievement as follows.

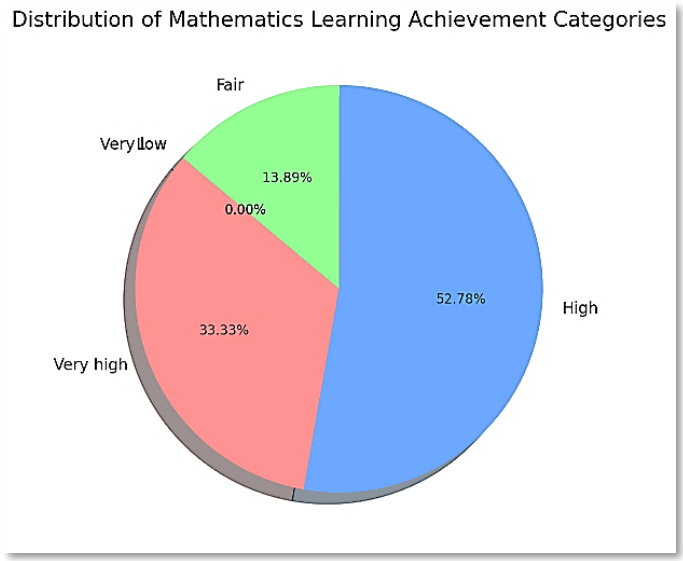

Figure 4. Distribution of mathematics learning achievement categories

Total mathematics learning achievement according to performance categories as seen in the pie chart. The data indicate a bright and hopeful student performance ascendency, with most students scoring high to very high achievement level. More specifically : Out of total 36 students, only 12 students (33.33%) scored in Very High category (90-100) and to High (80–89) level were there 19 students(52.78%). In other words, over 85% in number of students performed bang on with mathematics skill level or above and knowledge of the subject well. The results align with the OECD (2019) findings on the importance of having reproducible instructional quality and student motivation in mathematics learning, especially in organized educational settings.

The chart displaying the distribution of mathematics learning achievement reveals a promising trend among the students involved in this study. A large proportion of learners nearly 86% fall into the high or very high achievement categories, indicating that the majority not only understood the material well but were able to perform with consistency and precision on the assessments provided. A third of the students (33.33%) achieved scores in the very high range (90–100), suggesting that these learners possessed strong conceptual understanding and likely benefited from effective instructional practices. Additionally, over half (52.78%) scored in the high range (80–89). The combined total reflects a classroom learning environment that likely emphasized structured guidance, clear expectations, and student accountability. This trend supports research by Boaler (2016), who found that students achieve greater success in mathematics when they are engaged in conceptually rich and supportive instructional settings. Meanwhile, only a small group of students (13.89%) scored in the fair category (65–79). While these learners did meet the minimum expected level, their scores indicate

the need for additional academic support, perhaps through more personalized scaffolding or formative feedback. Encouragingly, no students scored below 65, which implies that all participants met basic competency thresholds. According to OECD (2019) data, such outcomes are relatively rare and point to a well-implemented curriculum and responsive instruction. It is worth noting, however, that even in high-performing classrooms, variability in learning still exists. As Tomlinson (1999) emphasizes, differentiation remains essential to ensure that every student is challenged appropriately. While the overall picture is positive, attention should still be given to ensuring equity in learning opportunities, especially for students who show signs of struggling to reach the highest levels of mastery.

Purpose of Linearity test: To find whether a significant linear relationship exists between AQ as independent variable and mathematics learning achievement as a dependent variable. The test is needed in order to apply linear regression analysis. SPSS ANOVA (F-test) was run on the test. The results of the linearity test are presented in Table 4 below:

Table 4. Linearity test between AQ and mathematics learning achievement

Variables Tested	Linearity (Sig.)	Deviation from Linearity (Sig.)
AQ and Mathematics Achievement	0.603	0.670

Table 4 also states the $Sig.linearity = 0.603$ and deviation for linearity = 0.670. Both of the values are over the significance level $\alpha = 0.05$ it means there is no significant relationship between variables linear-slope. Therefore, linearity assumption is not plausible and simple linear regression analysis can not be used in this study.

Non-linearity in the relationship was therefore investigated using Spearman's rho correlation test, as the assumption of linearity was ruled out, and used to determine the correlation and monotonic relationship between two non-parametric variables, without requiring a linear association. This statistical technique can also be used to determine p-values.

Table 5. Spearman's rho correlation between AQ and mathematics learning achievement

Variables	Correlation Coefficient (ρ)	Significance (p)
AQ and Mathematics Achievement	0.642	0.000

The analysis presented in Table 5 suggests that there is a strong relationship between students' AQ scores and how well they perform in mathematics. The Spearman's rho was 0.642 ($P<0.000$). It implies though, that students with high AQ scores regularly obtain higher scores in maths tests.. If a student is good at dealing with hard times, they usually keep trying when they face problems in school. Martin and Marsh (2006) say that these students keep going in their studies and push through tough times. Skills such as being able to bounce back, keep trying, and stay calm help a lot to make learning stronger, especially in math, which is important for many students.

This study also finds that AQ is not just about helping to calm stress. It also helps students get more involved in learning. Safi et al. (2021) found an AQ is a person's ability to manage difficulties and transform obstacles into opportunities. The adversity quotient

is one factor that affects a person's success since it correlates positively with a person's performance. A person who has a high adversity quotient will also have high performance. This result fits with more studies that say schools should help students grow not just their thinking skills, but also skills such as seeing the good in mistakes and dealing with stress. As Yeager and Dweck (2012) note, when students are taught that their ability to overcome challenges can grow with effort, their academic performance often improves in measurable ways. The statistical result is not only significant in the technical sense but also meaningful in practice. It suggests that strengthening students' AQ through targeted interventions could contribute to more consistent and confident mathematical performance across diverse learning contexts.

To achieve effective learning, individuals must possess the skills or capability required to tackle the challenges they may face in school or daily life. Individuals who have AQ or high fighting power have a good ability to respond to and overcome the difficulties they face, have high motivation, and are not easily discouraged by their inability or the difficulties they face. A high AQ for individuals shows that individuals have high motivation and enthusiasm as well as the ability to keep fighting and surviving and looking for ways to deal with difficulties or problems, thus making individuals good at solving problems and focusing on finding solutions. Individuals who have a good AQ tend to have an understanding that the difficulties they face are not a problem, but a challenge that must be faced which makes them prefer to solve and find solutions to get past difficult situations or obstacles that individuals with a good AQ will be more motivated to prepare his quality and competence in dealing various problems in real life.

The Adversity Quotient (AQ) can impact students' thinking processes in solving mathematical problems. Therefore, in learning mathematics, students' AQ needs to be considered, as their thinking processes in solving mathematical problems vary according to their AQ level. In learning problem-solving, it is necessary to emphasize an individual approach based on students' AQ levels. The Adversity Quotient (AQ) also influences the fighting power of students and is found to have a positive impact on their mathematical problem-solving abilities. The AQ owned by students must continue to be improved, as it has a positive influence on mathematical problem-solving abilities.

Adversity Quotient (AQ) can be increased. According to Stoltz (2007), strengthening the AQ can be achieved through the LEAD term "Listened, Explore, Analyzed, do": Listened (listen), try to listen, and be aware of the difficulties that arise. This is a crucial step in enhancing student AQ. In addition, AQ can also improve through dexterity games, according to the four dimensions of adversity intelligence: control, origin, possession, reach, and endurance. Each student has a different level of adversity intelligence, namely quitters, campers, and climbers, which can be described as follows:

The figure above is a simple illustration showing the progression of the Adversity Quotient (AQ) in a learning context, with three sections: Quitters, Campers, and Climbers. Quitter is the lowest level, where individuals choose to avoid obligations, retreat, and reject opportunities. They tend to seek escape to calm their minds when facing difficulties. In learning mathematics, quitters solve problems just to carry out the teacher's duties. In the context of learning, quitters often fail to attempt complex tasks and believe they are unable to cope with them. This is motivated by the lack of enthusiasm and commitment. According to Stoltz (2007), quitters can increase their adversity by assigning them tasks to take responsibility. Campers are individuals who choose to stop

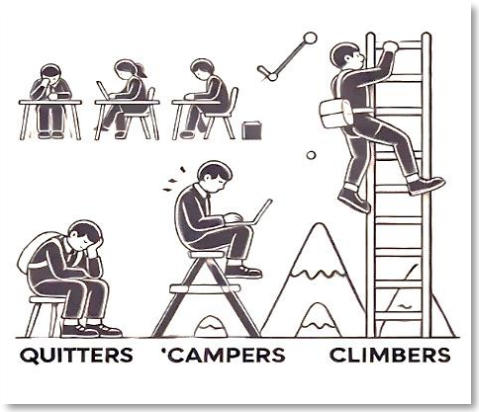

Figure 5. The adversity quotient (AQ) level

working on a problem and opt for their comfort zone, being satisfied with self-sufficiency and having no desire to develop themselves further. In a learning context, campers can understand some of the material, but they do not attempt to improve further or challenge themselves with more difficult problems. In learning mathematics, campers show some initiative, but little enthusiasm, and complete assignments only as a task fulfillment. It can be concluded that campers are hesitant to take more risks. Climbers are the highest level, comprising individuals who tend to make things happen by continually improving and seeking ways to grow and develop. In learning, climbers are students who not only accept challenges but also seek solutions, strive to overcome obstacles, and possess a strong determination to achieve success. Climbers possess strong beliefs and are characterized by persistence, tenacity, and responsibility. The high and low AQ of students is determined by four dimensions: control, origin, ownership, reach, and endurance. These four dimensions will collectively determine an individual's adversity intelligence and help students understand their level of adversity intelligence.

The findings in this study indicate that these characteristics align with those of students who have low scores on the "Control" dimension. This dimension reflects the extent to which individuals feel able to influence difficult situations. Students with a low control mean score (68.47) show limited self-control abilities and low self-confidence in facing academic obstacles. They tend to give up quickly when solving complex math problems, which reflects the "Quitters" profile in the AQ model developed by Stoltz (2000). However, not all students with low control show the characteristics of Quitters. Some of them still show involvement in the learning process, although only to meet minimum standards. This characteristic is closer to the "Campers" profile, namely individuals who stop developing after reaching a certain level of achievement. Based on this, it can be concluded that students with low control scores are on the spectrum between Quitters and Campers, depending on the extent to which they can survive and manage academic pressure. Understanding this category is crucial for designing targeted interventions, particularly in building students' self-confidence and ability to remain engaged in the learning process when facing challenges. Teachers need to support students with learning strategies that strengthen emotional regulation and create an environment that encourages challenge as part of a healthy learning process.

▪ CONCLUSION

This study reveals a significant relationship between AQ and the mathematics learning achievement of grade VIII students at SMP Negeri 2 Parepare. Although the relationship is not linear, the Spearman's rho test shows a positive correlation with a correlation coefficient of 0.642 and a p-value of 0.000. This means that the higher a student's ability to face difficulties, the higher the chance of achieving good mathematics learning outcomes. AQ is an important non-cognitive factor that supports students' success, especially in subjects that require logical reasoning and perseverance, such as mathematics. The analysis of AQ indicators reveals that the "Control" dimension scored the lowest, indicating that some students still struggle to manage academic pressure and challenges effectively. This is the profile of "Quitters" who tend to give up easily when faced with obstacles. The "Endurance" dimension scored the highest, meaning most students still have hope and perseverance in the learning process. These findings suggest that pedagogical interventions not only focus on academic aspects but also strengthen students' mental resilience, emotional regulation, and internal motivation, enabling them to survive and thrive in the face of learning challenges, especially in mathematics.

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