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# ADVERSITY QUOTIENT PROFILE OF MADRASAH ALIYAH STUDENTS AND THEIR ACTIVITY PATTERNS DURING PROBLEM-BASED MATHEMATICS LEARNING

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## Abstract

Adversity Quotient (AQ) is widely theorized to predict student engagement in challenging mathematics learning, yet the assumption that this stable psychological trait manifests directly in observable classroom behavior has rarely been tested with direct observational data, particularly within Indonesian madrasah aliyah populations. This study aimed to (1) profile the AQ of Grade X students at a state Islamic senior high school along Stoltz's three categories and four $CO_2RE$ dimensions, and (2) examine whether AQ category is reflected in observable activity during Problem-Based Learning (PBL). A descriptive quantitative design was applied to 20 purposively selected students. Data were collected via an adapted Adversity Response Profile (21 items; Gregory content validity = 0.952; Cronbach's alpha = 0.90) and a 17-indicator observation sheet covering the five PBL syntactic phases (1–5 scale). Three findings emerged. First, the AQ distribution was dominated by low- and moderate-resilience profiles (50% Quitters, 45% Campers, 5% Climber), converging strikingly with the larger ARP-ML survey of (Gradini & Noviani, 2025) and indicating a recurring pattern of low resilience among Indonesian mathematics learners in this regional context. Second, the $CO_2RE$ dimensions, although uniformly classified as High to Very High, were unevenly developed. Control and Reach were strongest (81.25%), while Origin and Ownership lagged (75.38%), with the weakest single item reflecting anxiety about group-leadership responsibility. Third, AQ category was essentially uncorrelated with observable PBL activity ($r = 0.156$; $p = 0.511$; 95% CI [-0.30, 0.56]; reported as exploratory given $n = 20$). A Quitter recorded the second-highest activity score, while the only Climber recorded below-average activity. This trait-process dissociation suggests that AQ operates over cumulative learning timescales rather than within single sessions, and that group-based PBL may function as social scaffolding that compensates for individual trait limitations. The study contributes a rare direct observational examination of the AQ-PBL behavioral linkage in an Indonesian madrasah context and identifies Origin and Ownership as a priority pedagogical target.

## INTRODUCTION

Students' ability to face difficulty is one of the important predictors of success in mathematics learning. Mathematics is often perceived as a difficult and abstract subject, so that students who give up easily when confronted with non-routine problems tend to obtain lower learning outcomes. A widely used psychological construct for explaining students' resilience toward academic difficulty is Adversity Quotient (AQ), proposed by Stoltz. AQ represents an individual's capacity to respond to, manage, and endure difficult situations, and is regarded as complementing the role of Intelligence Quotient and Emotional Quotient in academic success (Stoltz, 2010). In the context of mathematics learning, AQ is assumed to influence how students approach problems, persist when initial strategies fail, and arrive at solutions.

Stoltz categorizes individuals into three types, Quitter, Camper, and Climber, formed from four dimensions: Control, Origin & Ownership, Reach, and Endurance ($CO_2RE$) (Gradini & Noviani, 2025; Stoltz, 2010). Several Indonesian studies indicate that students with higher AQ tend to demonstrate better mathematical problem-solving and reasoning abilities (W Hidayat et al., 2019; Wahyu Hidayat & Sariningsih, 2018; Saniyyah & Winiati, 2020; Setiawan & Sulistiani, 2019). However, most of those studies were conducted in general secondary-school contexts in Java, focusing on the relationship between AQ and achievement or between AQ and specific cognitive abilities. The madrasah aliyah context, especially outside Java, has rarely been examined, despite the fact that the socio-cultural characteristics and backgrounds of madrasah students possess distinctive features that may influence their patterns of response to difficulty.

On the other hand, the changing paradigm of mathematics learning demands instructional models that cognitively and affectively engage students. One of the most widely recommended models is Problem-Based Learning (PBL). PBL situates authentic problems as the starting point of learning, encouraging students to construct new knowledge through investigation, group discussion, and presentation of solutions (Ali, 2019; Hmelo-Silver et al., 2019; Lewis et al., 2019; Miller & Krajcik, 2019). A common assumption in the literature is that students with high AQ will be more actively engaged in PBL because PBL presents difficulties that must be overcome, while students with low AQ will tend to be passive. This assumption is largely theoretical and is rarely tested with direct observational data at the individual level.

Research on Adversity Quotient (AQ) in mathematics learning has expanded rapidly over the past decade and has produced three streams of inquiry relevant to this study. The first stream highlights the direct relationship between AQ and students' mathematical abilities, particularly problem-solving ability. A study showed that AQ significantly predicts junior secondary students' mathematical problem-solving ability, complementing the role of intelligence quotient, which has long been dominant in explaining academic attainment (Wahyu Hidayat & Sariningsih, 2018). A similar finding was reported by (Yustiana et al., 2021), who found that AQ category predicts the completeness of Polya's stages among vocational high school students when solving mathematical problems. (Rahayu & Alyani, 2020) further extended this finding into the domain of mathematical critical thinking by reporting a monotonic relationship between AQ category and critical thinking scores: climbers significantly outperformed campers and quitters on items demanding inference and the evaluation of arguments. (Putra et al., 2023) enriched these findings by showing that

high-AQ students not only excel in the stages of understanding, planning, executing, and evaluating problem solutions but also exhibit stronger semiotic reasoning, the ability to represent and transform mathematical objects into various symbolic forms that is essential for mathematical problem solving.

The second stream examines the interaction between AQ and problem-based learning models. (Sahyar & Fitri, 2017) conducted a 2 × 2 factorial experiment and reported three findings frequently cited in the Indonesian literature: (a) the problem-based learning (PBL) class outperformed the conventional class in problem-solving ability; (b) high-AQ students outperformed low-AQ students across both conditions; and (c) an interaction effect showed that the PBL advantage was amplified for high-AQ learners. A similar interaction pattern was reported by (Wicaksana et al., 2016) on the topic of sets, where PBL outperformed discovery learning particularly for students in the climbers category, whereas in the campers and quitters categories the differences between models were not significant. Within the inquiry-based family of models cognate to PBL, (Wahyu Hidayat et al., 2018) reported main effects of argument-driven inquiry and AQ on mathematical creative reasoning but did not find a significant interaction effect, a finding suggesting that AQ's role in inquiry-based learning is not entirely moderative. (Dewanto & Pratiwi, 2019) added another layer of evidence by demonstrating a significant interaction between learning model (TAPPS, TSTS, discovery learning) and AQ category on mathematics learning achievement. (Syarifah & Agoestanto, 2023) added evidence concerning a model cognate to PBL, namely creative problem solving (CPS), by showing that CPS implementation, examined through the lens of AQ category, consistently enhances students' mathematical creative thinking ability, because high-AQ students are better able to generate diverse alternative solutions. More specific evidence on the PBL × AQ interaction is reported in a systematic literature review (Supono, Lilik & Agoestanto, 2023), which concluded that PBL effectively enhances students' mathematical connections by situating learning within everyday problem contexts, and that students with stronger AQ tend to display more robust mathematical connections in understanding and applying mathematical concepts to real-world situations.

The third stream, closest to the design of the present study, consists of profile studies mapping the characteristics of student problem solving across AQ categories. (Dina et al., 2018) showed that climbers displayed substantially higher strategic flexibility, especially when initial strategies failed. (Sari et al., 2019) analyzed the thinking processes of madrasah tsanawiyah students on flat-side spatial geometry and found that climbers completed all four Polya stages, whereas quitters typically halted at the planning stage. (Purwasih, 2019) focused on junior secondary students of the climbers type and identified creative-thinking patterns characterized by spontaneous strategy shifts and metacognitive monitoring. (Aisyah et al., 2021) reported a complementary analysis of student difficulties across AQ categories: quitters were dominated by procedural-execution errors, campers by conceptual-mapping errors, whereas climbers were dominated by strategy-monitoring errors, errors arising from the attempt to deploy higher-order strategies rather than from deficiencies in basic competence. (Baharullah et al., 2022) extended this profile to a broader sample of junior secondary students with consistent findings.

A comprehensive mapping of this literature was conducted by (Lestari et al., 2023), synthesizing twenty-nine Indonesian publications on mathematical problem-solving ability examined through the lens of AQ between 2018 and 2023. The review reported that sixty-

two percent of the studies employed descriptive qualitative designs, twenty-four percent used quasi-experimental designs, and the remainder applied mixed methods. This descriptive predominance establishes profile studies as the main genre in the Indonesian AQ literature. In the context of online learning during the pandemic, (Anggraini & Mahmudi, 2021) found that AQ predicts student persistence, while (Suryaningrum et al., 2021), using a sample of state Islamic senior high-school students, demonstrated that AQ predicts performance, learning autonomy, and academic achievement. This last study is particularly relevant to the present research because it is one of the few investigations of AQ in a madrasah aliyah population. The systematic review by (Irfiani et al., 2023) confirms a consistent pattern in the domain of mathematical critical thinking, demonstrating that AQ consistently exerts a positive influence on students' ability to solve complex mathematical problems. The convergence of the (Lestari et al., 2023) and (Irfiani et al., 2023) reviews reinforces the status of AQ as a construct that influences multiple dimensions of mathematical competence, from problem solving to critical reasoning.

Synthesizing these three streams of prior research yields three observations that ground the identification of a research gap. First, the majority of profile studies operationalize AQ as a predictor of, or analytic lens for, the outcomes of problem solving, test scores, completeness of Polya's stages, error types, rather than patterns of observable activity during instruction. The theoretical claim that high-AQ students will be more active in problem-based learning is rarely tested directly with observational data. Second, studies using PBL as an experimental context tend to focus on between-model comparisons rather than on describing the process of student participation within a single PBL session. Third, from a contextual standpoint, the majority of samples come from junior and senior secondary schools in Java; investigations of madrasah aliyah students, particularly outside Java, remain very limited (Suryaningrum et al., 2021), even though the distinctive features of the madrasah curriculum, which integrates general subjects with the strengthening of Islamic values, may shape the formation of students' academic resilience.

These three observations establish the novelty of the present study. Rather than adding further evidence to the already saturated literature on the AQ–learning-outcome relationship, this study juxtaposes AQ category with observed student activity across the five PBL syntactic phases in a state madrasah aliyah context located in Aceh Province. This approach enables an empirical examination of an assumption that has been stated more theoretically than tested directly whether AQ as a psychological trait genuinely manifest in the state behavior of students during PBL participation?

This gap is the focus of the present study. The question is no longer “does AQ influence PBL learning outcomes,” but what is the AQ profile of madrasah aliyah students, and is students' AQ category genuinely reflected in their activity patterns during PBL participation? This question matters for two reasons. First, an accurate AQ profile in the madrasah aliyah context contributes to the psychological mapping of Indonesian students, which has hitherto been dominated by general junior- and senior-secondary samples in Java. Second, juxtaposing AQ category with observable activity allows empirical testing of the theoretical claim that AQ manifests in learning behavior, a claim often assumed to be true without direct examination.

The study was conducted at a state Islamic senior high school (Madrasah Aliyah Negeri) in Aceh Province. This context is relevant because (1) madrasah aliyah schools in

Aceh integrate the general curriculum with the strengthening of Islamic values, so that students' resilience profile is formed in an ecosystem different from that of general schools, and (2) the AQ profile of madrasah students in the Sumatra region, particularly Aceh, has not previously been reported in the literature. The research subjects were 20 Grade X students who participated in one mathematics learning session using the PBL model. Data collection used two instruments: (1) an AQ questionnaire adapted from Adversity Response Profile (ARP) of Stoltz, modified for the mathematics context, and (2) a student-activity observation sheet covering the five PBL syntactic phases.

In response to these gaps, this study aims to (1) describe the AQ profile of students at the study site based on Stoltz's categories (Climber, Camper, Quitter) and the four $CO_2RE$ dimensions; (2) map students' activity patterns by AQ category during PBL mathematics instruction; and (3) discuss the implications of these findings for the choice of mathematics teaching strategies in madrasah aliyah. The study is expected to contribute in two ways. First, it enriches the empirical base of Indonesian student AQ profiles with data from a madrasah aliyah context in Indonesia. Second, it provides an initial empirical examination of the assumption that AQ category is reflected in observable activity during PBL sessions, an assumption that has been stated more theoretically than empirically tested.

## METHOD

### Research Design

This study employed a descriptive quantitative approach aimed at mapping the Adversity Quotient (AQ) profile of students and relating it to their activity patterns during Problem-Based Learning (PBL). A descriptive design was chosen because the study aims to describe conditions as is, without intervention or manipulation of variables. The study does not aim to test the effect of PBL on AQ; rather, it juxtaposes two data sources, the distribution of AQ and the patterns of activity, collected within the same learning context.

### Research Subjects

The research subjects were 20 Grade X students of a state Islamic senior high school (Madrasah Aliyah Negeri) in Aceh Province. Subjects were selected purposively on the following grounds: (1) the class was studying material amenable to the presentation of authentic PBL problems; (2) the subject teacher was willing to facilitate the implementation of PBL syntactic phases; and (3) the class size allowed individual observation of every student by the observer. The small sample size is recognized as a limitation; the findings are accordingly positioned as a case description requiring replication in broader contexts.

### Research Instruments

Two instruments were used in this study. First, the Adversity Quotient questionnaire, adapted from Stoltz's Adversity Response Profile (ARP), consisting of 21 statements representing the four $CO_2RE$ dimensions, Control (4 items), Origin & Ownership (8 items), Reach (4 items), and Endurance (5 items). Each item is answered on a five-point Likert scale: Strongly Agree (SA = 5), Agree (A = 4), Undecided (U = 3), Disagree (D = 2), and Strongly Disagree (SD = 1). The statements were modified to fit the mathematics learning situation. Content validity was assessed by two mathematics-education experts using the Gregory coefficient, yielding a value of 0.952 (very high). Reliability was assessed via Cronbach's Alpha, yielding a coefficient of 0.90 (very high).

Second, an observation sheet of student activity in PBL containing 17 behavioral indicators distributed across the five PBL syntactic phases (Fathurrohman, 2017): (1) orienting students to the problem, (2) organizing students to learn, (3) guiding individual and group investigation, (4) developing and presenting the work, and (5) analyzing and evaluating the problem-solving process. Each indicator was rated on a 1–5 scale by trained observers.

**Data Collection Procedure**

Data were collected in one mathematics learning session using the PBL model. During the session, observers recorded the activity of each student on the observation sheet. At the end of the session, students completed the AQ questionnaire independently. Questionnaire administration was scheduled after PBL to minimize anticipation bias and to ensure students responded based on reflection on the learning experience just completed. It should be noted that the AQ questionnaire measures students' general psychological trait, not their response to that specific PBL session.

**PBL Implementation**

The PBL session was conducted in a single mathematics class period of approximately 90 minutes covering the topic of linear equations and systems of linear equations, a core Grade X curriculum component amenable to authentic problem presentation. The 20 students were organized into four heterogeneous groups of five, with group composition determined prior to the session based on general academic record rather than AQ category, so that AQ category did not confound group composition. The session followed the five PBL syntactic phases described by Iskandar (Fathurrohman, 2017) with the following time allocation. Phase 1 (orienting students to the problem, approximately 10 minutes), where the teacher presented an authentic problem situated in the students' daily context, involving a real-life scenario in which two unknown quantities had to be jointly determined from given constraints. Phase 2 (organizing students to learn, approximately 10 minutes), worksheets and supporting materials were distributed, and roles within each group were briefly negotiated. Phase 3 (guiding individual and group investigation, approximately 30 minutes), students worked collaboratively to identify variables, formulate equations, and explore solution strategies; the teacher circulated among groups to monitor progress. Phase 4 (developing and presenting the work, approximately 30 minutes), each group's representative presented the group's solution and reasoning to the class. Phase 5 (analyzing and evaluating the problem-solving process, approximately 10 minutes), the teacher guided whole-class reflection on strategies used and on the mathematical concepts applied. Throughout the session, the teacher's role was facilitative rather than directive: monitoring group progress, posing scaffolding questions when groups encountered difficulty, and refraining from supplying solution strategies, in line with the constructivist orientation of PBL.

Classroom observation was conducted by two trained observers using the same structured rubric, working independently and in parallel during the PBL session. Both observers received prior training on the 17 indicators of the observation sheet, with anchored behavioral descriptors for each rubric point. Inter-rater agreement was assessed by computing percent agreement across all paired ratings, yielding an overall percent agreement of approximately 88%. Discrepancies between observers were resolved through discussion immediately after the session to reach a consensus rating for each indicator. The

percent agreement is presented as a basic indicator of observational consistency; more stringent reliability indices (e.g., Cohen's kappa) were not computed because of the small sample of paired ratings within a single session, and this is acknowledged as a methodological limitation.

**Ethical Considerations**

This study adhered to standard ethical principles for educational research. Permission to conduct the study was obtained from the school administration prior to data collection. Informed assent was obtained from each student participant, and informed consent was obtained from their parents or guardians given the participants' minor status. Students were informed of the study's purpose, of the voluntary nature of their participation, of their right to withdraw at any point without academic consequence, and of the measures taken to protect their identities. All data records were anonymized using respondent codes (e.g., R01–R20); no individually identifying information appears in this report. Data are stored securely on a password-protected device accessible only to the research team and are used solely for the research purposes of this study. The manuscript reports aggregate analyses and anonymized individual cases (R10, R11) consistent with these confidentiality safeguards.

**Analysis Technique**

Analysis was conducted in three stages. The first stage was individual AQ classification, where each student's total questionnaire score was computed and converted to a percentage relative to the maximum score. Students were then classified into three categories using (Arikunto, 2013) standard-deviation criterion: Climber (High) if score > mean + 1.5·SD; Camper (Medium) if mean ≤ score ≤ mean + 1.5·SD; and Quitter (Low) if score < mean.

The use of the three-category Climber-Camper-Quitter classification follows (Stoltz, 2010) original theoretical framework, which conceptualizes Climbers as individuals who persist through difficulty toward sustained achievement, Campers as individuals who pursue goals only partially and settle for a comfortable plateau, and Quitters as individuals who abandon goals at the first substantial obstacle. The standard-deviation cut-off applied here (Climber if score > mean + 1.5·SD; Camper if mean ≤ score ≤ mean + 1.5·SD; Quitter if score < mean) is a commonly used operationalization in Indonesian AQ research (Arikunto, 2010) and approximates Stoltz's tripartite framework using sample-relative thresholds. This operationalization classifies students relative to the sample distribution rather than against absolute external norms; this is acknowledged as a methodological choice with implications for cross-sample comparability and is revisited in the limitations section.

The second stage was computation of the $CO_2RE$ dimension index. For each dimension, the total score across all items (sum of response frequencies multiplied by Likert weights) was computed and divided by the maximum dimension score (number of items × 5 × *n* respondents) and converted to a percentage. Dimension indices were interpreted using the criteria: Very High (>80%), High (61–80%), Medium (41–60%), Low (21–40%), Very Low (≤20%).

The third stage was the mapping of AQ × PBL activity. Each student's observed activity score was cross-tabulated with their AQ category. Mean, minimum, maximum, and standard deviation of activity were computed for each AQ category. The linear association

between AQ score and activity score was computed using Pearson's correlation coefficient, with the caveat that the small sample size limits inferential interpretation.

## RESULTS AND DISCUSSION

### Results

### Profile of Student AQ Classification

The questionnaire responses from 20 Grade X students yielded a score range of 59–97, a mean of 82.10, and a standard deviation of 9.12. Applying Arikunto's criterion, the boundary between Medium and High lies at a score of 95.79 (mean + 1.5·SD), producing the AQ classification shown in Table 1.

**Table 1**
**AQ Classification of Students (*n* = 20)**

| Category | Score Interval | n | Percentage (%) |
|---|---|---|---|
| Climber (High) | P > 95.79 | 1 | 5 |
| Camper (Medium) | 82.10 ≤ P ≤ 95.79 | 9 | 45 |
| Quitter (Low) | P < 82.10 | 10 | 50 |
| **Total** | | **20** | **100** |

*Source: Primary data, processed.*

Most students (50%) fell into the Quitter category, followed by Camper (45%), with only one student (5%) in the Climber category. This composition indicates that the resilience of madrasah students toward mathematical difficulty tends to fall at the low to medium level. No student had a score in an extreme Very High or Very Low range.

### AQ Dimension Profile ($CO_2RE$)

Analysis of the per-dimension indices shows that all four AQ dimensions fall between the High and Very High categories (Table 2).

**Table 2**
**AQ Dimension Index of Madrasah Students**

| Dimension | Item Count | Total Score | Max Score | Index (%) | Category |
|---|---|---|---|---|---|
| Control | 4 | 325 | 400 | 81,25 | Very High |
| Origin & Ownership | 8 | 603 | 800 | 75,38 | High |
| Reach | 4 | 325 | 400 | 81,25 | Very High |
| Endurance | 5 | 388 | 500 | 77,60 | High |

*Source: Primary data, processed.*

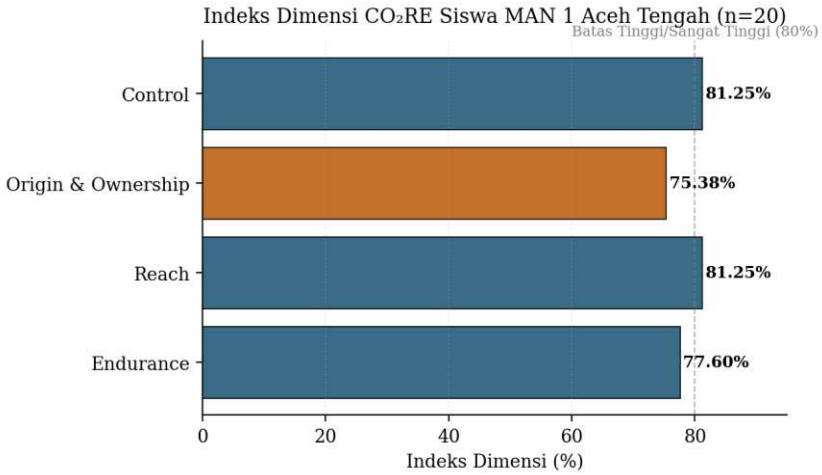


**Figure 1**
**Visualization of the $CO_2RE$ Dimension Index of Madrasah Aliyah Students**

The Control and Reach dimensions hold the highest indices (81.25%) in the Very High category, indicating that students are relatively strong in controlling responses to difficulty and in containing the reach of difficulty so that it does not spread to other life domains. By contrast, the Origin & Ownership dimension occupies the lowest index (75.38%), though still in the High category, revealing students' relative weakness in acknowledging the origin of difficulty and taking ownership of its resolution.

Item-level inspection reveals a more specific pattern. Item 9 ("I feel anxious when chosen as a group leader during mathematics learning, because if we fail it becomes my responsibility") registered the instrument's lowest index of 59% (Medium category). Its response distribution shows that 40% of students agreed or strongly agreed with that anxiety. Item 18 ("I am confident I can complete mathematics tasks within the given deadline") obtained an index of 69%, still High, but exhibited the largest Undecided proportion (60%). These two items signal two distinct weak spots: reluctance to accept group-leadership responsibility, and uncertainty about time-management capacity in mathematical task completion.

By contrast, the strongest items are distributed across all dimensions: Item 3 ("I will continue to try when I fail to complete a mathematics task or problem") obtained an index of 89%, indicating students' commitment to perseverance; Items 14 and 8 both obtained 85%, indicating students' capacity not to treat success as a source of arrogance nor failure on an examination as a source of despair.

**Student Activity in PBL Learning**

The mean student activity score based on the observation sheet was 63.55 (maximum scale 85), equivalent to 74.76% on a percentage scale. Using the observation rubric employed, 5 students (25%) were classified as Good (≥80%) and 15 students (75%) as Fairly Good (<80%), consistent with the distribution shown in Table 4. The mean score per PBL syntactic phase shows that the highest activity occurred in the organizing-students phase (mean score 4.45; students grouped according to teacher assignment), while the lowest

occurred in the developing-and-presenting phase (mean score 3.35–3.40; students actively asking and answering during presentations).

**Mapping of AQ × PBL Activity**

The cross-tabulation between AQ category and PBL activity score is presented in Table 3.

**Table 3**
**Mean PBL Activity by AQ Category**

| AQ Category | n | Mean Score | Mean % | Min–Max | SD |
|---|---|---|---|---|---|
| Climber | 1 | 60,00 | 70,58 | 60–60 | N/A* |
| Camper | 9 | 64,11 | 75,42 | 54–71 | 6,21 |
| Quitter | 10 | 63,40 | 74,58 | 54–70 | 4,53 |

* SD cannot be computed for n = 1
*Source: Primary data, processed.*

These results display a pattern that contradicts theoretical expectations. The Climber-category student ($n$ = 1) in fact obtained the lowest activity score (70.58%), while the Campers and Quitters achieved nearly equal scores (75.42% and 74.58%; a difference of only 0.84 percentage points). The activity-category distribution (Table 4) reinforces this pattern: of 5 students in the Good activity category, 4 are Campers and 1 is a Quitter; none is a Climber.

**Table 4**
**Cross-tabulation of AQ Category × PBL Activity Category**

| AQ Category | Good (≥80%) | Fairly Good (<80%) | Total |
|---|---|---|---|
| Climber | 0 | 1 | 1 |
| Camper | 4 | 5 | 9 |
| Quitter | 1 | 9 | 10 |
| **Total** | **5** | **15** | **20** |

*Source: Primary data, processed.*

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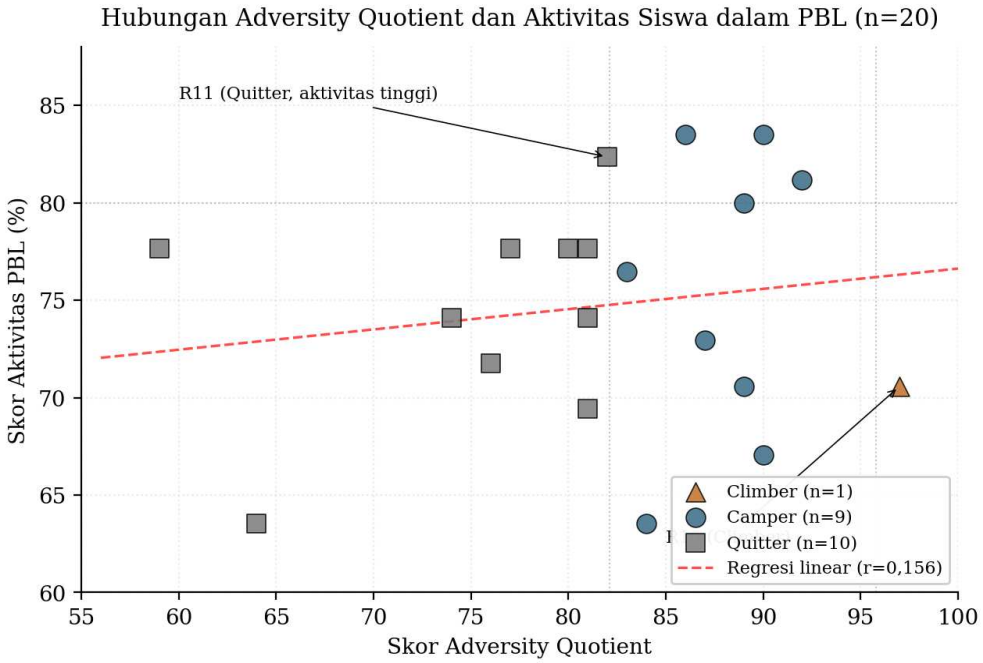


**Figure 2**
**Relationship between Adversity Quotient Score and Student Activity in PBL**

Pearson's correlation coefficient between AQ score and PBL activity score is r = 0.156 (n = 20; t(18) = 0.670; p = 0.511, two-tailed; 95% CI [-0.30, 0.56]) with a coefficient of determination $r^2 = 0.024$. That is, only 2.4% of the variance in PBL activity can be associated with variation in AQ score. The association is statistically non-significant and the confidence interval is wide, so the correlation should be interpreted as exploratory rather than as a definitive null finding. Given the small sample (n = 20), the analysis is reported as an exploratory descriptive examination, not as a confirmatory test. Notable individual cases: Respondent R11 (AQ Quitter, score 82) obtained the second-highest activity score (82.35%, Good category); conversely, R10, the sole Climber (AQ score 97), obtained only an activity score of 70.58%.

## Discussion

### Interpretation of the Main Findings

and Ownership dimension lagged conspicuously behind Control and Reach, and the weakest single item across the entire instrument, concerning anxiety about accepting group leadership, belonged to this same dimension. Third, the relationship between AQ category and observable activity during Problem-Based Learning was statistically non-significant in this exploratory analysis (r = 0.156; p = 0.511; 95% CI [-0.30, 0.56]; $r^2 = 0.024$; n = 20). The conventional theoretical expectation that high-AQ students would dominate the most demanding instructional model was not borne out by direct observation.

The first finding speaks to the distributional realities of student resilience in Indonesian mathematics classrooms. A near-absence of Climbers indicates that the dispositional configuration most theoretically predictive of successful problem solving is, in fact, rare among ordinary students. The second finding suggests that resilience is not a

monolithic capacity but a structured one: students may possess substantial reserves of self-control and the cognitive ability to compartmentalize difficulty while simultaneously lacking the agentic orientation needed to claim responsibility for problem solving. The third finding, the most theoretically consequential, demands close interpretation. Several mechanisms can be advanced. First, AQ as measured by an adapted Adversity Response Profile is a stable *trait*, whereas observed activity in a single instructional session is a momentary *state*, and the trait-state distinction in psychology has long indicated that the two are imperfectly coupled in short-term measurements. Second, group-based Problem-Based Learning provides social scaffolding that can elevate the participation of low-trait individuals through peer cooperation, while simultaneously dampening the visibility of high-trait individuals whose independent working styles may be less suited to overtly collaborative settings. Third, the activity measure itself captures only observable participation behaviors, such as question asking, presentation, and attentive listening, and may underrepresent the internal cognitive engagement of more reflective learners.

**Comparison with Previous Studies**

The three findings stand in informative dialogue with the existing literature on AQ in mathematics education, both reinforcing and complicating prior conclusions. To organize this comparison clearly, the discussion is structured into three groups: findings consistent with, contradicting, and extending previous studies.

Concerning findings consistent with previous studies, the dominance of Quitter and Camper categories is remarkably congruent with prior reports. (Gradini & Noviani, 2025), in their large-scale survey of 168 tenth-grade students across six senior secondary schools in the same provincial context, reported a virtually identical distribution, which is approximately 50% moderate AQ, 45% low AQ, and only 5% high AQ. The convergence is striking not only in proportion but also in regional context, lending substantial weight to the interpretation that the low resilience of Indonesian mathematics learners reflects a recurring rather than purely incidental pattern within this regional context. (Purwanti & Munandar, 2019) reported an even more extreme distribution among senior secondary students in West Java (0% Climber, 10% Camper, 90% Quitter), and (Wahyu Hidayat & Sariningsih, 2018) documented similar Quitter-Camper predominance in junior secondary samples. These convergent findings, drawn from disparate educational levels and geographic regions, undermine any explanation rooted purely in sample-specific characteristics. At the outcome level, the positive association between AQ and mathematical performance documented by (Sahyar & Fitri, 2017), (Yustiana et al., 2021), (Rahayu & Alyani, 2020), and (Putra et al., 2023) is consistent with the broader theoretical commitment that AQ matters for learning. (Gradini & Noviani, 2025) additionally reported a significant positive correlation between AQ and mathematics achievement among their larger sample, with higher AQ students scoring higher on Control, Origin and Ownership, Reach, and Endurance than their moderate and low AQ counterparts. Two systematic reviews, those of (Lestari et al., 2023) and (Irfiani et al., 2023), corroborate this overall pattern across the Indonesian literature.

Concerning findings that contradict previous studies, the central paradox of the present study lies in the discordance between AQ and observable PBL activity, which directly challenges a widely held assumption in the literature. (Sahyar & Fitri, 2017) reported an

interaction effect indicating that the benefits of PBL accrued disproportionately to high-AQ learners, a finding that has shaped subsequent assumptions about the AQ × PBL interaction in Indonesian mathematics education. (Wicaksana et al., 2016) likewise reported PBL advantages concentrated among Climber-type students. The present study, in contrast, finds that the lone Climber in the sample showed below-average activity, while the second-highest activity score belonged to a Quitter. Two reconciling considerations are relevant. First, prior studies measured outcomes (problem-solving ability scores), whereas the present study measured process (observable activity within a single session). The discordance does not invalidate the prior findings but situates them at a different timescale. AQ may shape cumulative outcomes through sustained persistence across multiple learning episodes, even when its influence on any single session's participation pattern is negligible. Second, group-based PBL structurally redistributes participatory opportunity in ways that may attenuate trait-based differences within a single session. The finding also stands in tension with (Wahyu Hidayat et al., 2018), who reported that argument-driven inquiry did not produce a significant interaction with AQ on creative mathematical reasoning. The convergence between that study and the present one suggests that, at least within single-session inquiry-based instruction, AQ may exert weaker moderating influence than the dominant assumption suggests.

Concerning findings that extend or refine previous studies, the present work contributes three refinements. First, the marked dimensional anomaly, with Origin and Ownership lagging behind the other three $CO_2RE$ dimensions, is not foregrounded in prior Indonesian work, which has predominantly treated AQ as a unitary construct. (Gradini & Noviani, 2025), although examining the four dimensions in a larger sample, did not isolate Origin and Ownership as a singular weak point at the item level. The identification of Item 9 (anxiety about group leadership) as the weakest single item across the entire instrument provides a granular empirical target for intervention that prior studies have not surfaced. Second, the dissociation between AQ category and observable activity refines the conclusion of (Anggraini & Mahmudi, 2021), who reported that AQ predicts student persistence in online learning during the pandemic. The present results suggest that persistence over an extended learning period and momentary participation in a single session are distinct behavioral phenomena that may relate to AQ in qualitatively different ways. Third, by anchoring the study in a state Islamic senior high school in Aceh Province, this work extends the regional coverage of the Indonesian AQ literature, which has been heavily concentrated in Java-based samples, and complements the broader regional mapping initiated by (Gradini & Noviani, 2025).

**Theoretical Implications**

The findings have implications for three layers of theoretical commitment within the AQ-PBL nexus. At the level of Stoltz's foundational framework, the present results affirm the descriptive utility of the $CO_2RE$ typology while simultaneously revealing internal asymmetries that the framework, as conventionally interpreted, does not predict. The four dimensions are theorized as parallel components of a unified resilience construct, but the empirical data suggest that they are differentially developed within the same individuals. This dimensional asymmetry calls for a refinement of Stoltz's theoretical claim: the four dimensions may share a common construct space but follow distinct developmental

trajectories, particularly within educational contexts shaped by specific cultural and pedagogical traditions.

At the level of trait-state psychology, the findings extend the long-standing concern, originating in (Mischel, 1968) and refined by subsequent personality research, that traits measured at one timescale do not reliably predict behaviors observed at a different timescale. The present study provides direct educational evidence for this principle: AQ scored on a general self-report instrument captures a stable dispositional tendency, while observable activity in a single PBL session reflects a complex confluence of situational, social, and momentary factors. The implication is that AQ research within mathematics education would benefit from explicit attention to the level and scale of behavioral outcomes being predicted.

At the level of theory about PBL, the findings invite reconsideration of the often-implicit assumption that PBL is a model whose benefits depend on the prior resilience of learners. The case of the highest-activity Quitter participant, who outperformed the only Climber in observable activity, suggests that group-based PBL functions as a social scaffold that can elevate the participation of low-resilience learners by distributing the cognitive and emotional load across the group. This reframing positions PBL not as a demanding model best suited to already-resilient learners but as a participatory architecture that may compensate for individual trait limitations, provided that group composition is sufficiently supportive.

**Contribution to the Literature**

This study contributes to the body of Indonesian AQ research in four respects. First, it provides an initial direct empirical examination of the assumption that AQ category will be reflected in observable activity during PBL, using systematic per-student observation across the five PBL syntactic phases. The Indonesian literature has been dominated by descriptive profile studies operationalizing AQ as a predictor of test-based outcomes; this study introduces process-level evidence that complicates the outcome-focused account. Second, by anchoring the inquiry in a state Islamic senior high school context outside Java, the study addresses a contextual gap identified across multiple systematic reviews (Irfiani et al., 2023; Lestari et al., 2023) and reinforced by the call of (Gradini & Noviani, 2025) for further investigation of madrasah-aliyah populations. Third, the identification of Origin and Ownership as the relatively weak dimension, accompanied by the specific item-level diagnosis of group-leadership anxiety, transforms a coarse construct-level finding into an actionable pedagogical target. Fourth, the empirical dissociation between AQ and single-session PBL activity refines a generation of literature that has assumed, often without direct test, that high-AQ students will be more active participants in challenging mathematics learning.

**Practical Implications**

The findings carry several actionable implications for mathematics educators, school administrators, and curriculum designers. For classroom teachers, the demonstrated discordance between AQ and single-session activity suggests that AQ should not function as a basis for ad hoc grouping decisions in short-term collaborative tasks. The trait may be more usefully consulted in the design of longer arcs of learning, such as multi-week problem-

solving projects, where persistence in the face of accumulating difficulty becomes consequential. For curriculum developers, the dimensional weakness in Origin and Ownership identifies a concrete target for intervention. Three specific strategies emerge from the present data: deliberate rotation of group-leadership roles so that every student experiences and rehearses the leader position; structured reflective debriefs that name and recognize each student's contribution to the group's solution; and explicit teacher recognition of decision-making processes rather than solely of final answers. For school administrators considering the broader adoption of PBL in mathematics, the present findings provide reassurance. PBL appears appropriate even for classrooms dominated by Quitter and Camper students, because group-based instruction can scaffold participation beyond what individual trait capacities alone would predict. At the policy level, the convergence of profile findings across regional Indonesian samples (Gradini & Noviani, 2025; Wahyu Hidayat & Sariningsih, 2018; Purwanti & Munandar, 2019) suggests that AQ-targeted pedagogical interventions deserve consideration in mathematics teacher-education programs, particularly within madrasah systems. Broader policy implications would require evidence from larger and more diverse samples before firm recommendations can be made.

**Limitations and Future Research Directions**

Several limitations qualify the inferences that can be drawn from this study and indicate directions for productive follow-up research. First, the small sample size (n = 20), and especially the presence of only a single Climber, severely constrains the statistical power for testing trait-based effects and renders the Climber comparison anecdotal rather than evidential. Larger samples with adequate Climber representation are needed before firm claims can be made about Climber-specific participation patterns. Second, observation was confined to a single PBL session, meaning that observed activity reflects state behavior at one moment rather than a stable behavioral pattern. Replication with multi-session observation, in which each student is observed across several PBL sessions, would clarify whether the AQ-activity dissociation reported here persists or attenuates over time. Third, the instrument used in this study, although derived from Stoltz's Adversity Response Profile and modified for the mathematics context, differs from the more refined Adversity Response Profile in Mathematics Learning (ARP-ML) developed by (Gradini & Noviani, 2025), which employs 20 items with equal dimensional distribution and has been psychometrically validated for the Indonesian senior secondary context. Future replication studies should adopt ARP-ML for direct comparability with this emerging measurement standard. An additional measurement limitation is that the AQ classification cut-offs applied here are sample-relative (defined as mean ± 1.5·SD of the sample), which constrains the comparability of category labels across studies that use different cut-offs or absolute external norms. Furthermore, although inter-rater percent agreement was computed for the observation data, more stringent reliability indices such as Cohen's kappa were not estimated; future studies with larger samples should employ such indices to provide more rigorous reliability assessment. Fourth, situational factors potentially influencing observable activity, including group composition, student mood and physical condition, and the specific dynamics of teacher facilitation, were

Beyond these methodological refinements, several substantive directions warrant attention. Longitudinal designs tracking the AQ trajectory of individual students across one

or more academic years would clarify whether cumulative PBL exposure builds AQ over time or merely reveals stable individual differences. Studies combining ARP-ML with classroom observation and outcome assessment, in a fully crossed design, would permit empirical disentanglement of the trait-process-outcome chain that this study has only begun to interrogate. Qualitative companion studies exploring how students themselves account for their participation patterns would supply the interpretive depth needed to understand mechanisms that observational data alone cannot reveal. Finally, comparative studies between madrasah aliyah and general senior secondary school samples in the same region would clarify whether the Quitter-Camper predominance observed here is a feature of Indonesian mathematics education broadly, of the madrasah aliyah context specifically, or of the intersection between the two. Taken together, these directions extend an agenda that the present study, in dialogue with (Gradini & Noviani, 2025) and the broader literature, has helped to motivate: a research program in which AQ is investigated not only as a predictor of outcomes but as a construct whose behavioral expression in learning contexts is itself worth understanding.

## CONCLUSION

This study set out to map the Adversity Quotient (AQ) profile of Grade X madrasah aliyah students and to examine, through direct classroom observation, whether AQ as a stable psychological trait is reflected in students' moment-to-moment activity during Problem-Based Learning (PBL). The three findings carry implications that extend beyond the immediate case.

First, the dominance of Quitter (50%) and Camper (45%) categories, with only one student classified as Climber, is not an isolated case but converges remarkably with prior Indonesian evidence, most notably the larger-scale survey of (Gradini & Noviani, 2025). This cross-study convergence reframes low resilience among Indonesian mathematics learners as a recurring rather than purely incidental pattern, although broader generalization requires evidence from larger and more geographically diverse samples.

Second, the dimensional analysis revealed that AQ should not be treated as a unitary construct: Control and Reach were uniformly Very High (81.25%), while Origin and Ownership lagged at 75.38%, with the weakest item across the entire instrument reflecting student anxiety about accepting group-leadership responsibility. This dimensional asymmetry identifies a concrete pedagogical target that prior outcome-focused studies have not surfaced, and it suggests that the four $CO_2RE$ dimensions, although theorized as parallel components of a unified construct, follow distinct developmental trajectories within specific cultural and pedagogical contexts.

Third, and most consequentially for theory, the statistically non-significant correlation between AQ category and observable PBL activity in this exploratory analysis ($r = 0.156$; $p = 0.511$; $n = 20$) challenges a widely held but rarely tested assumption in the literature that high-AQ students are more active participants in trait-process dissociation suggests that AQ exerts its influence over cumulative learning trajectories rather than within single instructional sessions, and that group-based PBL functions as a social scaffold that can elevate low-AQ learners beyond what their individual trait capacities would predict. The case of a Quitter who outperformed the only Climber in observable activity is anecdotal but

theoretically suggestive: behavioral expression of AQ in classroom learning may be heavily mediated by the participatory architecture of the instructional model in use.

Taken together, these findings contribute to both theory and practice. Theoretically, the study provides an initial direct observational examination of the assumed AQ-PBL behavioral linkage in an Indonesian madrasah aliyah context, refines Stoltz's $CO_2RE$ framework by demonstrating dimensional asymmetry, and extends the trait-state distinction in personality psychology into educational research on mathematics learning. Practically, the findings suggest that AQ assessment is best used to guide long-arc instructional design rather than ad hoc grouping decisions; that interventions targeting the Origin and Ownership dimension, particularly through rotated group leadership, reflective debriefs, and process-focused recognition, deserve priority in mathematics teacher education; and that PBL is appropriate, indeed beneficial, for classes dominated by Quitter and Camper students because group-based instruction can scaffold participation beyond what individual trait capacities would predict.

Acknowledging the small sample and single-session design as constraints on generalization, the study calls for replication using the more refined Adversity Response Profile in Mathematics Learning (ARP-ML) of (Gradini & Noviani, 2025), multi-session longitudinal observation, and mixed-methods designs that complement behavioral data with qualitative insight into student experience. The broader research agenda this study helps to motivate treats AQ not only as a predictor of outcomes but as a behaviorally expressed construct whose manifestation in learning contexts is itself worth understanding. Continued investigation along these lines promises to deepen the conceptual and empirical foundations on which AQ-informed mathematics pedagogy can be built, in Indonesian madrasah classrooms and beyond.

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