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MATHEMATICS LITERACY ANALYSIS REVIEWED FROM JUNIOR HIGH SCHOOL STUDENTS' ADVERSITY QUOTIENT

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ABSTRACT

Mathematical literacy is an essential skill of the 21st century, while AQ provides a non-cognitive perspective that has been under-appreciated in the study of mathematical literacy. This study aims to analyze the mathematical literacy ability of junior high school students reviewed from the Adversity Quotient (AQ), which is the ability of individuals to face challenges and pressures in the learning process. This study uses a qualitative approach of case studies with the subjects of grade VIII students of SMP Istiqomah Sambas Purbalingga who were selected based on the high, medium, and low AQ categories. Data collection techniques include context-based tests, in-depth interviews, and document analysis of student work. The results of the study showed that students with high AQ (climber type) were able to formulate mathematical problems from the context of the problem, compile the SPLDV model, and interpret the results accurately. Students also show high self-control, responsibility, and perseverance. On the other hand, students with moderate AQ (camper) have mathematical representation skills but are less thorough in interpreting results, while students with low AQ (quitter) have difficulty in compiling mathematical models and easily give up. These findings can be the basis for designing learning that strengthens students' character and fighting power in mathematics.
Keywords: adversity quotient, learning resilience, mathematical literacy.

INTRODUCTION

Mathematical literacy skills include not only numeracy skills, but also the ability to formulate problems from real contexts, apply mathematical concepts and procedures, and interpret and evaluate the results in a reasonable manner (Rahim et al., 2023) However, the results of international studies such as PISA show that the mathematical literacy of Indonesian students is still below the international average, indicating the need for serious attention in development ability. The results of the latest research by the International Student Assessment Program (PISA) in 2022 show that the literacy ability of Indonesian students has decreased, especially in reading and mathematics literacy. Indonesia's ranking has risen several positions compared to the 2018 PISA results, but its reading and mathematics literacy scores remain below the OECD country average. Indonesia's reading literacy score in PISA 2022 is 359 points, which is the lowest score since 2000. This score is lower than the average score of OECD countries (around 472-480 points) and some neighboring countries in Southeast Asia, such as Brunei Darussalam and Vietnam. Indonesia's ranking in reading literacy is 70th out of 81 participating countries.

Several studies state that students' low mathematical literacy is caused by a lack of understanding of concepts, low mathematical representation skills, and limitations in interpreting information in contextual problems (Faisal et al., 2024; Rahim et al., 2023; Utomo et al., 2020). Many previous studies in improving mathematical literacy have focused on learning approaches such as problem-based learning (Erria et al., 2023), STEM-based learning (Rahmadhani et al., 2023), reviewed from cognitive style (Utomo et al., 2020), learning style (Rahim et al., 2023), and high-level thinking (Aningsih, 2018). However, non-cognitive aspects related to students' endurance, emotional control, and resilience in dealing with math problems still receive minimal attention.

One of the relevant non-cognitive concepts to be studied in the context of mathematical literacy is the adversity quotient (AQ). The aspect of adversity quotient (AQ) is a concept introduced by Paul G. Stoltz to measure a person's ability to face difficulties and challenges (Winata et al. 2024). The aspect of AQ consists of three types, namely climber, camper, and quitter, which reflects the level of resilience of individuals in dealing with problems (Chabibah et al., 2019; Septiani & Nurhayati, 2019). In the context of education, AQ can affect the way students solve math problems, especially in challenging situations (Widyastuti, 2015).

Research examining the relationship between AQ and mathematics learning outcomes has been conducted stating that there is a direct influence between the adversity quotient and mathematics learning outcomes of 0.314 This shows that the contribution of adversity quotient to learning outcomes is 31.4% (Setyobudi et al., 2023) However, the study is still quantitative and oriented towards final grades, not on students' thinking processes. Meanwhile, through a qualitative study at the junior high school level, it was concluded that students with high AQ were able to formulate systematic and flexible solution steps in contextual mathematics problems, although the focus was still limited to certain types of questions (Septiani & Nurhayati, 2019).

This study tries to fill this gap by examining students' mathematical literacy abilities reviewed from AQ through an in-depth qualitative approach. Unlike previous studies that tended to be quantitatively oriented or only focused on test results, this study sought to explore students' thinking processes from their responses to contextual questions, which were analyzed through mathematical literacy indicators and the QA dimension. The speciality of this research also lies in its context, namely in SMP Istiqomah Sambas Purbalingga, a school that applies an Islamic character education approach, so as to allow the exploration of AQ in a learning environment that supports mental resilience.

Through this approach, the research aims to gain a more complete understanding of how AQ contributes to students' mathematical literacy, as well as provide a basis for designing learning strategies that not only emphasize mastery of concepts, but also the formation of mental toughness and character. Thus, the results of this research are expected to make a theoretical and practical contribution to the development of mathematics education in Indonesia that is more comprehensive and contextual.

RESEARCH METHODS

This study uses a qualitative approach with an exploratory case study design (Sugiyono, 2016). This approach was chosen because it is suitable for delving deeply into the thinking process and students' responses to contextual mathematics problems analyzed from the perspective of Adversity Quotient (AQ). This design allows researchers to understand phenomena contextually and holistically based on the subject's real experiences and behaviors. The case study was chosen because it focused on one specific context, namely grade VIII students of SMP Istiqomah Sambas Purbalingga who are considered to represent diverse characteristics of AQ.

The population in this study is all grade VIII students of Istiqomah Sambas Purbalingga Junior High School in the 2024/2025 school year. Sample selection was carried out by purposive sampling technique, which is to select students based on certain criteria. The criteria are: students who have filled out the Adversity Quotient questionnaire, students who are included in the high (climber), medium (camper), and low (quitter) categories based on the AQ score, and students who are willing and able to participate in the entire series of research activities. From this population, four students with different AQ characteristics were selected as the main subject, namely one student from each category (climber, camper, quitter). To facilitate analysis, the three subjects were assigned symbols of CL (Climber), CA (Camper), and QU (Quitter) respectively.

The main instruments in this study are: context-based mathematical literacy tests, Adversity Quotient questionnaires, semi-structured interview guides, and documentation of student work results. The context-based mathematics literacy test is in the form of a contextual narrative that measures three aspects of mathematical literacy, namely formulating, applying, and interpreting. The questions are compiled based on PISA indicators and are associated with the SPLDV (Two-Variable Linear Equation System) material. The Adversity Quotient questionnaire is adapted from Stoltz's (1997) model, consisting of 40 items that measure four dimensions of AQ: control, origin & ownership, reach, and endurance. This questionnaire is used to group students into climber, camper, and quitter types. Semi-structured interview guides are used to further explore students' thought processes when solving problems and their responses to challenges in math learning. Documentation of student work is used for written analysis of the process of solving mathematics problems. The instrument was developed by validation by expert lecturers and readability tests were carried out on students in classes outside the main sample.

Data were analyzed using thematic analysis which included the following steps: data reduction (selecting important parts of the interview results and documents), data presentation (grouping information based on mathematical literacy and QA indicators), and drawing conclusions (interpreting the relationship between QA level and the quality of mathematical literacy). This technique was chosen because it is suitable for interpreting the meaning that emerges from qualitative data in depth (Sugiyono, 2018).

RESULTS AND DISCUSSION

This study aims to describe the relationship between students' Adversity Quotient (AQ) levels and their mathematical literacy ability in solving contextual problems based on the two-

variable linear equation system (SPLDV). The analysis was carried out on four students from Istiqomah Sambas Purbalingga Junior High School who represented the categories of high (climber), medium (camper), and low (quitter).

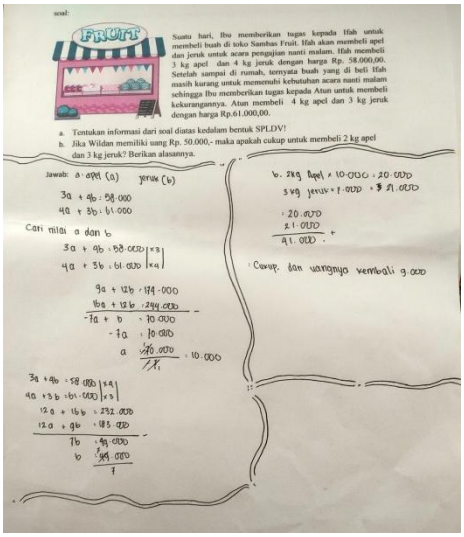

Figure 1. CL Subject Answers

Based on figure 1, students' ability to understand and formulate problems into mathematical forms is very important. From the students' answers above, students were able to turn the story question about the price of apples and oranges into a two-variable linear equation system (SPLDV). The two equations derived, namely 3a + 4b = 58,000 and 4a + 3b = 61,000, show that students understand how to translate the information from the problem into a mathematically correct form. The next step that students take is to apply the elimination method. He multiplied the two equations by a certain number in order to eliminate one of the variables. After that, students systematically compiled the completion steps until they got the final result, namely the price of apples of Rp10,000 and the price of oranges of Rp7,000. The value was then verified back into one of the equations, which proved the accuracy of the results.

In addition to calculating the unit price, students also continued by calculating the total purchase price of 2 kg of apples and 3 kg of oranges. The calculation results showed a total of Rp41,000. From this, students can conclude that with Rp50,000, Wildan still has Rp9,000 change. This ability shows that students can not only calculate, but also understand the context of the question and interpret the results reasonably. Students' ability to solve this problem can also be seen from the perspective of Adversity Quotient (AQ), which is the ability to face challenges. In the control aspect, students are seen to be able to control their thinking process well, without showing confusion, and are able to apply elimination methods flexibly. This reflects a mature mastery of strategy in solving problems. In terms of origin and ownership, students seem to be fully responsible for their work. He solves the problem independently, not just guessing or experimenting, but really understands every step taken. In the reach aspect, students are also not distracted by the story in the question and stay focused on the important information needed to solve the problem. In the endurance aspect, students show good thinking endurance. Even though the questions are quite long and require a multi-layered process, he still solves them completely,

even explaining whether the money he has is enough or not. From the analysis, students showed excellent mathematical literacy as well as a high level of AQ.

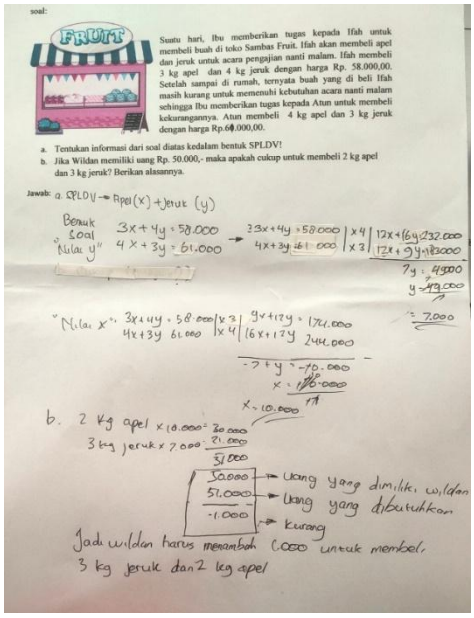

Figure 2. CA Subject Answers

Students' mathematical literacy abilities are reflected in their ability to turn everyday problems into formal forms of mathematics. In figure 2, students succeeded in compiling a two-variable linear equation system (SPLDV) from the contextual situation regarding the price of apples and oranges. By making apples as the variable x and oranges as y, students write down two equations that show mastery of concepts and a good understanding of context. Next, students use the elimination method to complete the system. He took systematic steps, starting from equalizing the coefficients to reducing the equation. The end result is y = 7,000 and x = 10,000, which is then verified through substitution to one of the initial equations. This shows that students are able to apply mathematical concepts appropriately and efficiently. However, in the interpretation part of the results, students make minor mistakes in drawing conclusions. He calculated that the total price of 2 kg of apples and 3 kg of oranges was Rp41,000, while Wildan's money was Rp50,000. Unfortunately, the students concluded that Wildan was short of Rp1,000, when he should still have Rp9,000 left. Although the calculation was correct, errors in interpretation showed the need for further precision in interpreting the final result.

In terms of Adversity Quotient (AQ), students showed quite strong performance in solving challenging problems. In the Control aspect, it organizes the completion steps logically and neatly. Seen in terms of Origin and Ownership, solving the problem independently and responsibly. and staying focused until the end even though there is a slight disturbance in the interpretation of the question when viewed from the Reach aspect. In the aspect of endurance, students even show extra effort by compiling additional elaborations in the form of money comparison blocks. Overall, students show strong mathematical literacy and a resilient attitude in facing challenges. A small mistake in deducing the final result does not diminish the quality of his logical and consistent

thought process. Based on the AQ indicator, students are included in the category of "*Climber*", a type of learner who is persistent, responsible, and able to deal with the complexity of the problem well. In line with the research of Fertikawati et al., (2025) and Wardani et al. (2023) who explained that students with the AQ climber and camper types are able to fulfill the literacy process starting from formulating, employing, and interpreting. Because the student also has an attitude of enthusiasm and never gives up, the problem-solving process can be solved correctly and appropriately.

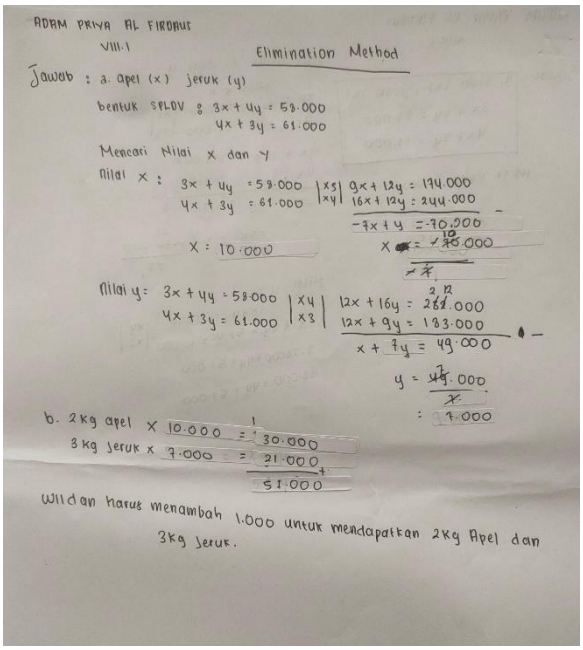

Figure 3. QU Subject Answers

The QU subject showed a good understanding of math story problems. Students are able to convert information from the question into a two-variable linear equation system (SPLDV), namely 3x + 4y = 58,000 and 4x + 3y = 61,000, as shown in figure 3. This ability reflects strong mathematical literacy because the subject can relate everyday context to algebraic concepts. To solve the problem, the subject chooses the elimination method, the right way to solve the SPLDV. The subjects performed systematic steps: multiplying the equation, subtracting to eliminate one of the variables, and then calculating the price of apples (Rp10,000) and oranges (Rp7,000). Despite the small scribbling, his thought process remains clear and logical. After obtaining the results, the subject calculated the price of 2 kg of apples and 3 kg of oranges, namely Rp20,000 and Rp21,000 for a total of Rp41,000. However, at the bottom it is written 2 kg of apples = Rp30,000, this possibility is just a misspelling. Even so, the Subject still drew the correct conclusion that Wildan needed to add Rp1,000, which meant that he could still interpret the final result correctly.

CONCLUSION

Based on the results and analysis conducted on four students with different adversity quotient (AQ) levels, it can be concluded that there is a strong correlation between students' AQ levels and their ability in mathematical literacy to solve contextual problems based on the two-

variable linear equation system (SPLDV). Students with high AQ, known as climbers, show strong abilities in math literacy, which is demonstrated by their ability to create mathematical models. In addition, they demonstrate strong thinking skills, consistency, and a responsible attitude towards their processes and work results. Students with moderate AQ (camper) are able to solve problems procedurally and show an understanding of concepts, but tend to make mistakes in interpreting results or not being thorough in drawing final conclusions. Meanwhile, students with low AQ (quitter) experience difficulties in completing SPLDV completely, rely on intuition, and are inconsistent in their thinking process, although they still show effort and independent reflection in facing challenges.

These results confirm that AQ plays an important role in helping students become more proficient in math. In addition to using an in-depth qualitative approach, the study incorporated cognitive and non-cognitive elements into the actual learning context, which made it significant. Therefore, the findings of this study make a theoretical and practical contribution to the development of mathematics learning that focuses not only on ideas but also on the formation of students' character, particularly in dealing with learning difficulties. One of the strategic approaches to improve overall mathematics literacy is education that increases enthusiasm, responsibility, and perseverance through strengthening AQ.

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