ANALYSIS OF CRITICAL THINKING ABILITY OF JUNIOR HIGH SCHOOL STUDENTS BASED ON ADVERSITY QUOTIENT ON ALGEBRA MATERIAL

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ABSTRACT
The research aims to evaluate students with critical thinking skills on Grade VII algebra material and focus on their Adversity Quotient (AQ). Using a qualitative approach, Grade VII students of SMP Negeri 2 Sempu were used in a study involving five students and each represented a different AQ category. This study employs ARP questionnaires, critical thinking test items, and interview guidelines to gather data. The findings indicate that students with a high AQ demonstrate better critical thinking skills than those with a low AQ. This difference is likely due to the influence of AQ on students' problem-solving methods. This research is significant because it identifies a correlation between AQ and students' critical thinking skills, allowing teachers to enhance their students' critical thinking abilities by effectively raising their AQ levels.

Keywords: Adversity Quotient (AQ), Critical Thinking

INTRODUCTION
The development of a nation is greatly influenced by education, so that it becomes an important part of life. A country is considered developing if the country has a quality education system. In the current century, demands in the field of education have increased significantly, with particular emphasis on the need for critical thinking skills (Fajrianthi, Hendriani, and Septarini 2016). According to Ennis (Kuswana, 2013: 22), critical thinking refers to deep and focused thinking in decision making. Individuals can be considered critical thinkers if they actively ask questions and seek necessary information. The information obtained is then used to solve problems logically, efficiently and creatively, which ultimately produces reasonable conclusions. Moreover, individuals apply this information to overcome the problems they face with proper analysis of the available information and the knowledge they have.

Critical thinking skills are very important for students. There are several reasons why it is important for schools to instill mathematics knowledge with students which are basically explained as relevance to daily activities. According to Cockroft and Abdurrahman (2003:253), students must understand two aspects of mathematics learning outcomes: mathematical computing and mathematical reasoning. The Mathematics Curriculum for Elementary and Middle Schools is in accordance with the Ministry of National Education (2006: 139) which stipulates that starting from elementary school, the field of mathematics study should be taught to all students to develop logical, analytical, structured thinking skills, as well as innovation and collaborative skills. According to Anderson (Lestari, 2014: 36) if
analytical skills are improved, individuals will seek the truth more often, be receptive and appreciative of new ideas, be able to describe problems well, think in a structured manner, and have a high desire to understand, thinking mature and able to think independently. Students who use reason as the basis for their thinking and are able to make decisions and are firm in the decisions they make are students who think critically (Splitter in Lestari, 2014: 36). Mathematics subjects and learning objectives cover various aspects of skills such as educating to think logically, structured, analytically, innovatively, thoroughly and objectively, and being able to solve everyday problems openly (Heris, Euis & Utari 2017). It even explains the basic mathematical skills that students must have in studying mathematics so that they can be accountable for the knowledge they have mastered and rational reasoning. It is important for students to have critical thinking because it can increase their understanding of ideas in mathematics and direct students in interpreting, parsing, assessing and arranging material in a structured and logical manner (Chukwuyenum, 2013). This is a good argument for adding critical thinking skills in mathematics learning, because thinking critically can make it easier for students to gain a deeper understanding of the concept.

Critical thinking skills can make it easier for students to solve mathematical problems. Students had mixed reactions to the completion process. Variations in responses can be influenced by students’ ability to overcome AQ difficulties (Stoltz, 2018). Adversity Quotient (AQ) shows students’ skills in turning challenges into opportunities (Stoltz, 2018). This intelligence describes how students respond to questions (Leonard & Amanah, 2014; Asiantari, et al., 2022). Students with high AQ levels tend to persist in solving problems (Hulaikah et al., 2020), while students with low AQ tend to avoid challenges (Hidayat et al., 2018). This difference can affect students’ critical thinking abilities, because avoiding problems can reduce their critical thinking abilities (Rahimah, 2019). Research reveals that in the problem solving process students play an important role in their critical thinking skills, especially in the context of algebra material.

**METHOD**

In this study, using a qualitative descriptive method can involve students as research subjects at SMP Negeri 2 Sempu in class VII. Students’ critical thinking is assessed based on the AQ category. There were five students from Class VII A of SMP Negeri 2 Sempu chosen randomly to represent various different AQ categories. The reason is, many students like mathematics in class VII, including class VII A. From research using instruments in the form of; Reaction to Adversity Profile (ARP) questionnaire, test questions, and interview guide. Both instruments were validated by 5 validators with scores ranging from 30 to 95, with effectiveness scores ranging from 0 (not effective) to 3.0 (very active).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interpretation</strong></td>
<td>Ability to organize relevant information from questions and answer questions asked.</td>
</tr>
<tr>
<td><em>(Understanding the problem)</em></td>
<td></td>
</tr>
<tr>
<td><strong>Analysis</strong></td>
<td>Ability to identify and explain relationships between ideas used in addressing problems.</td>
</tr>
<tr>
<td><em>(Planning completion)</em></td>
<td></td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td>Ability to demonstrate correct problem solving.</td>
</tr>
<tr>
<td><em>(Carry out a resolution plan)</em></td>
<td></td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
<td>Ability to make logical conclusions with questions asked.</td>
</tr>
</tbody>
</table>
Explanation Ability to make reasons that support the conclusions obtained.

Self-regulation Ability to review responses that have been given.

Evaluating students with critical thinking skills, case studies use test questions that include C3 and C4 indicators. In testing students’ critical thinking abilities, use the example test questions in table 2.

Table 2. Test Questions

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Question type</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>In a test consisting of 25 questions, the following rules are made: If you answer correctly you will get a score of 5, if you are wrong you will get a score of (-1) and if you don’t answer it you will get a score of (-2). Sandi answered 21 questions correctly and answered 2 questions incorrectly while the rest were not answered. The maximum score obtained by a password is...</td>
<td>Description</td>
<td>C4</td>
</tr>
<tr>
<td>2.</td>
<td>The length of the hypotenuse of a right triangle is ((7x - 5)) cm, while the length of the base is ((3x + 4)) cm and the height is ((4x - 8)) cm. Determine the perimeter and area of the triangle in algebraic form.</td>
<td>Description</td>
<td>C3</td>
</tr>
</tbody>
</table>

After calculating student test scores and classifying students’ critical thinking abilities, the calculation of scores follows the indicators that have been determined by researchers in table 3 Agnafia (2019).

Table 3. Critical Thinking Score Category

<table>
<thead>
<tr>
<th>Category</th>
<th>Value Variations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>80 – 100</td>
</tr>
<tr>
<td>Tall</td>
<td>60 – 79</td>
</tr>
<tr>
<td>Enough</td>
<td>40 – 59</td>
</tr>
<tr>
<td>Low</td>
<td>20 – 39</td>
</tr>
<tr>
<td>Very low</td>
<td>0 – 19</td>
</tr>
</tbody>
</table>

The study also involved students being interviewed to gain a clearer understanding of how students solve problems, with interview questions structured based on indicators of critical thinking skills (table 4).

Table 4. Interview Guidelines

<table>
<thead>
<tr>
<th>Critical Thinking Skills</th>
<th>Indicator</th>
<th>Question</th>
</tr>
</thead>
</table>
**Interpretation**

| a. Can explain the information clearly and precisely in the question. | Is the information presented in the question clear enough in your opinion? |
| b. Can identify the question asked by the question. | In your opinion, what information is contained in the question? |
| | What do you think is the question in this question? |

**Analysis (Planning solutions)**

| Can explain the relationship between basic understanding of mathematics that is relevant in solving the problem. | Using what material did you find in solving this math problem? |

**Evaluation**

| Can describe the problem solving process clearly and precisely. | What is the first action you can take to resolve this problem? |
| | Do you feel that the steps you have taken have covered everything that is necessary? |

**Conclusion**

| Can draw logical conclusions based on the information requested in the question. | Explain the conclusion you got from solving this problem! |

**Explanation**

| Can provide reasons that support the conclusions that have been made. | How do you explain the reasons behind the conclusions you draw? |

**Self-regulation**

| Can provide responses to answers that have been submitted | Why did you choose this method to solve the problem? |

This research utilized all available instruments and used data triangulation to verify the accuracy of the information. This triangulation process includes a method of adjusting data between test and interview results in order to evaluate the data as a whole, making it possible to produce valid conclusions.

**RESULTS AND DISCUSSION**

**Student Question Test 1 (AQ Very High Level)**

In research involving questionnaire tests, S1 was classified as a student with a very high level of Adversity Quotient (AQ). S1 received a score of 95 out of a maximum total score of 100. The results of S1’s answers to questions number 1 and 2 include illustrations in Figure 1.
Based on the results obtained in Figure 1, S1 has demonstrated adequate critical thinking skills in solving questions number 1 and 2. As stated in the following interview:

Q1: How do you express the problem in mathematical form?
S1: As I have answered in the answer sheet, ma'am

Q2: Are you sure that what you answered is correct?
S1: God willing, I'm sure ma'am

After analyzing the completion of S1, it was found that the total score was 95. Thus, S1 is included in the very high category of students with critical thinking skills.

**Student Question Test 2 (AQ Low Level)**

In research involving questionnaire tests, S2 is classified as a student with a low Adversity Quotient (AQ) level. S2 received a score of 30 out of a maximum total score of 100. The answers to questions number 1 and 2 can be found in Figure 2.
Based on the results obtained in Figure 2, S2 has almost achieved all critical thinking skills in question number 1. However, the solution to question number 2 is not yet optimal. This statement is in line with the following interview excerpt:

Q3: Why is the answer you wrote like this?

S2: I wrote the algebraic form first, ma'am, then solved it in the way I remembered.

After analysis, S2 can apply the indicator stages up to the evaluation stage. However, if you look at the results of the interview, S2 didn't pay enough attention to the final solution to the conclusion so he got a score of 30, therefore S2 was categorized as a student with low critical thinking skills.

**Student Question Test 3 (AQ Level Sufficient)**

In research involving questionnaire tests, S3 was classified as a student with a sufficient Adversity Quotient (AQ) level. S3 received a score of 40 out of a maximum total score of 100. S3's answer results for questions number 1 & 2 can be found in Figure 3.
Based on the results obtained in Figure 3, S3 has achieved some critical thinking abilities. In question number 1 S3 can achieve indicators of interpretation, analysis and evaluation. For question number 2, only a few indicators were achieved due to inaccurate answers. This is in accordance with S3’s statement in the following interview.

Q4: Do you think the procedures used are complete?

S3: In my opinion, the first one is good, but the second one still needs to be improved

Q5: Why wasn't number 2 done to completion?

S3: (silent and thinking) I was confused when calculating the final result ma'am, especially the part about multiplying by half

After analysis, completion of S3 resulted in a total score of 40, so that S2 was categorized as a student with sufficient critical thinking skills.

**Student Question Test 4 (AQ Level Enough)**

In research involving questionnaire tests, S4 is classified as a student with a sufficient Adversity Quotient (AQ) level. S4 received a score of 40 out of a maximum total score of 100. S4’s answer results for questions number 1 & 2 can be found in Figure 4.
Based on the results obtained in Figure 4, S4 has achieved some critical thinking skills. In question No. 1, the student managed to solve it correctly. However, on question number 2, S4 was still unable to solve it correctly. So that evaluation and self-regulation skills have not been fulfilled. S4 expressed doubts about the results of the work that had been provided and caused S4 not to continue the work until it reached a conclusion. This is consistent with the findings from the following interviews.

Q6: Why don't you provide a conclusion for questions number 1 and 2?

S4: At first I was unsure about my answer, so I continued as best I could.

After analysis, completion of S4 resulted in a total score of 40, so that S4 was categorized as a student with sufficient critical thinking skills.

**Student Question Test 5 (AQ Level Sufficient)**

In research involving questionnaire tests, S5 was classified as a student with a sufficient Adversity Quotient (AQ) level. S5 received a score of 40 out of a maximum total score of 100. S4's answer results for questions number 1 & 2 can be found in Figure 5.

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**Figure 4.**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Write down the information you know from the question</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Write down the score results for each answer found</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Write down how to calculate and answer correctly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Does not include conclusions according to the question asked</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Explanation of question number 1:**

1. Write down the information you know from the question
2. Write down the score results for each answer found
3. Write down how to calculate and answer correctly
4. Does not include conclusions according to the question asked

**Explanation for question number 2:**

1. Write down the information asked in the question
2. Write down the solution for perimeter and area, but still get the answer wrong
3. Do not provide conclusions based on the questions

---

Explanation of question number 1:

1. Write down the information you know from the question
2. Write down the score results for each answer found
3. Write down how to calculate and answer correctly
4. Does not include conclusions according to the question asked

Explanation for question number 2:

1. Write down the information asked in the question
2. Write down the solution for perimeter and area, but still get the answer wrong
3. Do not provide conclusions based on the questions
Figure 5.

Based on the results obtained in Figure 5, S5 has achieved several critical thinking skills. In question number 1, the student has understood the information in the question, but has not yet found the correct answer and the right conclusion. For question number 2, S5 succeeded in showing ability in interpretation and analysis. Even though S5 managed to answer correctly about circumference, he still answered the question about area incorrectly. This is in accordance with S5's statement in the following interview.

Q7: Are you confused? I see you have been able to write the formula

S511: I understand the formula, but when applying it there are difficulties, especially with the formula for area

Q512: What part is difficult?

S512: I don't understand how to do multiplication by $\frac{1}{2}$ ma'am

After analysis, S5 work resulted in a total score of 40, therefore S5 was categorized as a student whose critical thinking skills were still considered sufficient.

Of all the answers obtained from research subjects, graphs depicting the provision of indicators of students' critical thinking skills can be reviewed in Figures 6 and 7.
From the overall results, variations in students' Adversity Quotient (AQ) were visible. The findings prove that undergraduates who have a high AQ are successful in meeting all indicators of critical thinking skills. On the other hand, Masters who have low AQ are only able to fulfill some indicators, namely interpretation and evaluation. S3, S4, and S5 which have sufficient AQ, fulfill the indicators for interpretation, analysis and evaluation. AQ encourages students to reflect on their knowledge and evaluate their understanding. This process is crucial in developing critical thinking skills because students learn not to receive information passively, but to analyze and evaluate it. Thus, AQ greatly influences students' critical thinking abilities. A high AQ encourages students to view problems as challenges that must be overcome rather than obstacles that cannot be avoided. This improves their ability to analyze situations, consider multiple solutions, and choose the best one, all of which are important aspects of critical thinking. This finding is in line with previous research conducted by Anggrain and Mahmud (2021), and Riftiani Dwi Wulandari et al. (2022). Variations in AQ can cause some students to feel trapped in problems that are considered difficult to overcome, which ultimately prevents them from fulfilling critical thinking instructions. The ability to meet critical thinking criteria is a factor that differentiates each student in their critical thinking abilities (Rahimah, 2019). Another study by Puspitatancandri and colleagues (2020), as well as research results by Hidayat and Sari (2019), shows that AQ not only influences students' critical thinking abilities, but also influences several other factors.

**CONCLUSIONS AND SUGGESTIONS**

Based on the results of ARP questionnaires, tests and interview guides, this research concludes that differences in students' Adversity Quotient (AQ) can result in variations in their critical abilities. High AQ students tend to demonstrate higher critical thinking skills. AQ helps students overcome challenges and obstacles, making them better prepared to deal with problems in a critical and analytical way. To improve the development of critical thinking skills optimally, efforts are needed to increase students' AQ. Schools and educational institutions need to integrate AQ development in their curriculum. Programs that focus on improving mental resilience, problem-solving abilities, and adaptation to change can help students improve their AQ. Active learning, such as project-based learning, case studies, and simulations can improve students' AQ and critical thinking abilities. This method opens up opportunities for students to face situations that clearly require critical thinking and resilience.

**REFFERENCES**


