



A Literature Review Regarding the Position of Adversity Quotient in Mathematics Learning

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Abstract

The adversity quotient is the ability of the student to control themselves when facing problems and how the student can find a solution to the problems encountered to get out of difficulties. This research is a literature review that focuses on the position of adversity quotient in mathematical learning. This study reviewed 24 articles from Scopus, ERIC, and Science Direct. The research review of the position of adversity quotient in mathematical learning in this study explores three aspects including 1) the type of research used, 2) the research subject used, and 3) the position of adversity quotient in the learning of mathematics. Research on the position of adversity quotient in mathematical learning shows that 1) research with quantitative and qualitative types are the most common research types, 2) students on the junior high school bench become research subjects that dominate, 3) the position of adversity quotient in students' cognitive abilities is very much like critical thinking, learning outcomes and others however, based on the results of the review, cognitive abilities are dominated by students' ability to solve mathematical problems.

Keywords: *Adversity Quotient; Mathematics Education; Mathematics Learning*

Introduction

Education in the 21st century innovates by combining knowledge, information technology, and global competition. Facing the 21st century, all countries are competing to create and develop their human resources so that they can to work and compete in the global competition arena. Human resources are required to have competencies that are skilled in the 21st century (Sudirtha et al., 2021). The government has a breakthrough to realize the goals of education in the 21st century by designing learning which is composed of various learning achievements that are adjusted to the phase and subjects. One of the compulsory subjects taken from elementary to secondary levels is mathematics. Huan et al (2022) reflect that mathematics is a gateway to other disciplines such as science, engineering, and technology. Another opinion was expressed by Ziegler dan Loos (2014) that mathematics is the knowledge that is formed through the abstraction of a problem through the activity of calculating, calculating, measuring, and using systematic logic. Learning outcomes in mathematics are not only focused on arithmetic skills, but students are expected to have scientific attitudes such as critical-logical thinking, inventive-innovative, consistent, and adaptive thinking as well as instilling noble values and commendable attitudes

in social life that are oriented towards the nation, mathematics, science, and humanities (Afandi et al., 2019).

The individual's ability to deal with mathematical problems cannot be separated from the student's ability to survive. The ability to survive in solving problems can also be called fighting power or Adversity Quotient. One of the keys to success in learning mathematics is the adversity quotient (Qin et al., 2019). Dorji, R., & Singh (2019) explained that the adversity quotient is one of several types of indicators of a person's life success which is mainly useful in predicting behavior, mental stress, tenacity, learning processes, and a person's response in facing the environment. In line with this opinion, Nahrowi et al (2020) stated that the adversity quotient (AQ) is a form of effort from a person to face existing problems as a challenge that is a responsibility to be faced and resolved as well as possible. Darmawan et al (2019) concluded that AQ is the ability of students to survive all kinds of difficulties and find a way out, solve various problems, reduce obstacles and obstacles by improving their way of thinking and behavior towards these difficulties.

Stoltz (2005) divides AQ into three categories based on their ability to survive in the face of problems. Students in the quitter category assume that mathematics is complicated, confusing, and confusing. Students in the camper category are those who just tread water or students who do not want to take risks and are easily satisfied with the situation or circumstances that have been achieved. Students in the climber category are students who have commitments and goals. To achieve these commitments and goals, they work hard to face problems. In addition, they also have high courage and discipline. Stoltz (2005) explains that AQ is divided into four dimensions, namely CO₂RE. CO₂RE in detail is as follows

1. Control is a dimension related to influence and influencing. Students have full control over themselves.
2. Origin and Ownership is a dimension of recognition of who caused the difficulties and how far students can understand themselves as the cause of the origin of the difficulties that occur and a responsibility carried out by students for the difficulties they have made and how they are responsible for overcoming the situation
3. Reach is a dimension that looks at the extent to which the difficulties faced affect the activities of students
4. Endurance is a dimension in which students can survive in the face of difficulties or problems.

In line with the categories and dimensions that have been explained, a study conducted by Astiantari et al (2022) explains that students in the climber category have better cognitive abilities than students in the campers and quitters categories. In the learning process, students are expected to have a high fighting spirit, so that they can survive and find solutions to the problems given. This was emphasized by Hastuti et al (2018) that a student needs to have a high AQ to achieve success in learning and achieve high learning achievement. The AQ category between students is certainly not the same. The difference in AQ can cause differences in student learning achievement

The facts that occur in the field regarding students' ability to survive and face difficulties are explained by Wardani & Mahmudi (2019) that the average of students from the research sample are in the campers category which reaches 72% of the total sample. As many as 27% of students are in the climber category, and 1% of students are in the quitter category. This shows that most of the students' adversity quotient is quite good, but it needs to be developed because mathematics requires a high adversity quotient in the learning process. The results of this study are in line with the results explained by Anggraini & Mahmudi (2021) where the AQ of students when learning mathematics online is in the campers category.

A literature review on adversity quotient was reviewed by Putra & Roza (2020) who reviewed adversity quotient and self-efficacy, while Sutisna et al (2022) studied adversity quotient and problem-solving skills. A literature review on the role of adversity quotient in mathematics learning has not been

found. In this study, we will review in more depth 1) the type of research used, 2) the subjects selected and, 3) the position of the adversity quotient in mathematics learning.

Method

This study uses the Systematic Literature Review (SLR) method. The SLR review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Page et al (2021) to ensure the thoroughness and quality of the review process. The search strategy, selection criteria, and data analysis in this review are presented below

Search Strategy

The data used in this study came from academic journals, namely Scopus, Science Direct, and ERIC. First, the main relevant terms used in the literature, including synonyms and alternative spellings, were identified. The following search was used to find relevant articles: (“Adversity Quotient” “Adversity quotient AND Education”, “Adversity quotient AND Mathematics Learning”, “Adversity quotient AND Mathematics Education”)

Selection Criteria

Inclusion and exclusion criteria were applied to eliminate studies that were not relevant to the research to be conducted. The criteria are as follows: (1) Written in English, (2) Articles published from 2017-2023. (3) The research design used is clear (4) Research findings and conclusions are complete (5) The article can be downloaded (6) The article focuses on the position of the adversity quotient towards students' cognitive abilities in mathematics learning. These criteria can be seen in table 1.

Table 1. Selection Criteria

| Inclusion | Exclusion |
|--|--|
| Written in English | Written in another language |
| Articles published from 2017-2023 | Article published before 2017 |
| The research design used is clear | The research design used is unclear |
| Complete research findings and conclusions | Research findings and conclusions are incomplete |
| Articles can be downloaded | The article cannot be downloaded |
| Articles focus on the position of adversity quotient towards students' cognitive abilities in mathematics learning | Article on adversity quotient position outside of mathematics learning |

Searching articles from all selected databases resulted in 420 articles. A total of 289 articles came from Scopus, 90 articles from Science Direct and 41 articles from ERIC. A total of 210 articles remained after removing duplicates. After being reviewed based on the title and abstract, 80 articles were obtained. Based on the established criteria, namely articles with a focus on the position of adversity quotient in mathematics learning from the three selected journal sources, 24 articles were obtained that met. The description of the selection process based on PRISMA is as follows in Figure 1.

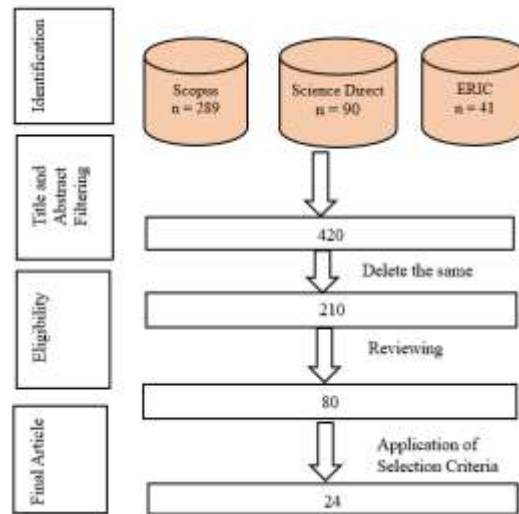


Figure 1. PRISMA Flowchart Article Filtering

Data Analysis

All data that has been collected is then grouped, coded and analyzed. Articles are analyzed and adjusted to the objectives of this study. The first analysis is that articles are grouped according to the type of research used. The second classification is that articles are grouped according to the participants of the study. The last classification is that articles are adjusted to their position in mathematics learning.

Results and Discussion

Types of Research on Adversity Quotient Positions in Mathematics Learning

Various types of research can be used by researchers. Researchers have the opportunity to adjust the type of research that will be applied according to research needs. The results of this review will discuss what types of research are used in research on adversity quotient positions in mathematics learning. The results can be seen in Table 2.

Table 2. Types of research

| Type of Research | Number of | Examples | Presentation |
|------------------|-----------|-----------------------------|--------------|
| Quantitative | 11 | Hidayat et al (2018) | 45,83% |
| Qualitative | 11 | Yazon (2019) | 45,83% |
| Mixed | 2 | Agoestanto & Masitoh (2021) | 8,33% |

Table 2 shows that the types of research used in the research on the position of adversity quotient in mathematics learning mostly use quantitative and qualitative types, where both types of research have a percentage of 45.83%. There are 2 articles that use mixed research methods, where the percentage of mixed research types is 8.33%. The research design used in each type of research is not always the same. Like the quantitative research design chosen by Darmawan et al (2019) is quantitative descriptive, while the design used by Hidayat et al (2018a) is a quasi-experiment. Unlike the two previous examples, the quantitative design used by Qin et al (2019) is a survey. An example of the difference in the design of the type of qualitative research used by Hastuti et al (2018) is a case study, while the qualitative design used by Sari et al (2019) is qualitative descriptive. The mixed research design used by Agoestanto & Masitoh

(2021) is sequential explanatory, while the design used by Anggraini and Mahmudi (2021) is analysis, survey and qualitative.

Research Subjects of Adversity Quotient Position in Mathematics Learning

The target subjects of research chosen by researchers in the field of education are usually students from elementary school level and college students. Based on the results of the study, it is known that research on the position of adversity quotient in mathematics learning involves many participants from both elementary level and student teachers. More clearly, this description can be seen in Table 3.

Table 3. Research Subject

| Research Subject | Number | Example | Presentation |
|---|--------|---------------------------|--------------|
| Elementary School | 1 | Suryaningrum et al (2020) | 4,16% |
| Junior High School/Islamic Junior High School | 11 | Qin et al (2019) | 45,83% |
| Senior High School/Vocational High School/Islamic Senior High School/Islamic Senior High School | 6 | Christinove et al (2022) | 25% |
| University | 6 | Ristiana et al (2020) | 25% |

Judging from Table 3, Suryaningrum et al (2020) used the elementary school level as the research subject. The research with the most subjects used was at the junior high school/Islamic junior high school level with a percentage of 45.83%. The research was conducted in grades VII and VIII. There was no research involving grade IX at the junior high school/Islamic junior high school level. At the senior high school/vocational high school/Islamic senior high school/Islamic senior high school/Islamic senior high school and university level, the percentage was the same, namely 25%. The subjects used at the university level were students who were studying in the education department, or other words, the subjects were prospective teachers. Meanwhile, at the senior high school/vocational high school/Islamic senior high school/Islamic senior high school level, the research subjects were grades X and XI. The research subjects in grade XII were used by Anggraini and Mahmudi (2021), because the research used all senior high school/vocational high school/Islamic senior high school/Islamic senior high school students throughout Indonesia through a survey. Based on the results of the review of the subjects used in the research, the Adversity quotient in mathematics learning focused a lot on junior high school/Islamic junior high school students.

Adversity Quotient Position towards Students' Cognitive Abilities in Mathematics Learning

Students' abilities in mathematics learning are certainly influenced by various reasons. This study will review in more depth how the position of adversity quotient towards students' cognitive abilities in mathematics learning. The review in this study was obtained from identifying findings, reviewing the discussion and conclusions of each article. Based on several manuscripts that have been reviewed, adversity quotient has a position towards problem-solving abilities, creative thinking, and others. The results can be seen in Table 4.

Table 4. Adversity Quotient Position

| Ability | Number | Example | Presentation |
|----------------------------------|--------|------------------------------|--------------|
| Mathematics Learning Achievement | 4 | Kartikaningtyas et al (2018) | 16,67% |
| Algebraic Reasoning | 1 | Aryani et al (2018) | 4,16% |
| Creative Thinking | 3 | Nahrowi et al (2020) | 12,5% |
| Mathematical Problem Solving | 5 | Yustiana et al (2021) | 20,83% |
| Mathematical Learning Outcomes | 3 | Rahayu & Istiani (2019) | 12,5% |
| Mathematical Argumentation | 1 | Hidayat & Prabawanto (2018) | 4,16% |
| Mathematical Understanding | 1 | Hidayat & Husnussalam (2019) | 4,16% |
| Mathematical Thinking Process | 1 | Sari et al (2019) | 4,16% |
| Refractive Thinking | 1 | Christinove et al (2022) | 4,16% |
| Mathematical Metacognition | 2 | (Zubaidah Amir et al., 2021) | 8,33% |
| Semiotic Reasoning | 1 | Suryaningrum et al (2020) | 4,16% |
| Mathematical Logical Thinking | 1 | Ristiana et al (2020) | 4,16% |

Table 4 shows that the position of the adversity quotient towards students' cognitive abilities in mathematics learning is mostly in problem-solving abilities with a percentage of 20.83%. The research was conducted ((Dina et al (2018); Wardani & Mahmudi (2019); Qin et al (2019); Ruqoyyah & Ristiana (2020); Yustiana et al (2021)). Based on the five studies conducted, explain that the categories in the Adversity quotient determine how students face and solve mathematical problems. The climbers category can solve problems better than the campers and quitters category. Students with the campers category solve mathematical problems better than students with the quitters category. The five studies explain that students in the quitter's category have difficulty solving mathematical problems. Furthermore, Wardani and Mahmudi (2019) explain that the average problem-solving ability of vocational high school students in Indonesia is in the campers category.

Learning achievement ability has a percentage of 16.67% in the research on the position of adversity quotient towards students' cognitive abilities. Learning achievement ability in mathematics learning was studied by Suryadi and Santoso (2017); Kartikaningtyas et al (2018); Darmawan et al (2019); Yazon (2019). The four studies explain that AQ has a position towards students' learning achievement. Darmawan et al (2019) explain that the AQ category affects how students' learning achievement in mathematics learning. The climber's category has better mathematics learning achievement among the three adversity quotient categories. The position of AQ and learning achievement will be different if the learning process is given a different treatment, the results of the study are explained by (Kartikaningtyas et al 2018). The facts occur in the field Yazon (2019) explains that prospective teacher students have low mathematics learning achievement. This is because the AQ they have is also still lacking.

The learning outcomes and creative thinking skills of students have a percentage of 12.5%. Hastuti et al (2018) explained that the higher the AQ category, the higher the learning outcomes obtained. In addition, AQ has a concrete relationship with student learning outcomes. This was expressed by Rahayu & Istiani (2019) who stated that students in the AQ climbers category have better learning outcomes than the campers and quitters category. At the same time, the learning model also affects the AQ of students. Many students still have learning outcomes in the campers category. This is evidenced by research by Anggraini & Mahmudi (2021) which explains that students are quite good at overcoming difficulties when learning mathematics, but they are quickly satisfied with unsatisfactory results. Students are less aware of developing themselves further.

The creative thinking ability of students in the research on the position of Adversity quotient towards students' cognitive abilities in mathematics learning is explained by Hidayat et al (2018a) that the Adversity quotient (AQ) category influences the increase in mathematical creative reasoning abilities of

prospective teacher students. This is in line with the research results explained by Agoestanto & Masitoh (2021) that AQ influence increasing students' mathematical creative thinking abilities. Reviewing the research results of Nahrowi et al (2020), the AQ category determines how students use their creative thinking abilities. The higher the AQ category, the higher the creative ability.

The metacognitive abilities of students in the research on the position of Adversity quotient towards students' cognitive abilities in mathematics learning have a percentage of 8.33%. Damayanti et al (2020) and Zubaidah Amir et al (2021) that the AQ category greatly influences students' metacognitive abilities. Students in the quitter's category give up easily when facing problems. Meanwhile, students in the camper's category in solving problems have the awareness to solve problems and find solutions, however, when they have found the solution, students in this category do not want to look for other solutions. Students in the climber's category always try to solve problems and find the most appropriate solution to solve problems.

Based on table 4, there are 7 articles on the position of adversity quotient against other cognitive abilities which have a percentage of 4.16%. The cognitive ability is algebraic reasoning studied by Aryani et al (2018) where the reasoning between AQ categories varies, depending on each category. The three categories represented by one student in each category find elements of pattern recognition in different ways or methods. They generalize the problem of pattern formation in different ways. The next cognitive ability is mathematical argumentation. Hidayat & Prabawanto (2018) explained that AQ has a concrete influence on the development of mathematical argumentation abilities of prospective mathematics teachers. Of course, prospective teachers in the climber's category have better mathematical argumentation abilities than the campers and quitters categories. This has the same research results as mathematical understanding abilities. Mathematical understanding abilities are explained by Hidayat & Husnussalam (2019) that AQ has an absolute influence on the mathematical understanding abilities of prospective mathematics teachers. There are differences in the achievement of mathematical understanding abilities of pre-service mathematics teachers based on the AQ category.

Cognitive abilities involving the thinking process are related to AQ. The position of AQ in the thinking process is explained by (Sari et al., 2019). Based on the findings of his research, no students were found to be in the quitters category in the thinking process. The position of the adversity quotient towards the thinking process varies. Students in the climbers category have a conceptual thinking process, while students in the campers category have conceptual, semi-conceptual, and computational thinking processes. This difference is in line with the research of Christinove et al (2022) regarding refractive thinking skills, that based on the results of the analysis it is known that subjects with high AQ can achieve all indicators of biased thinking. Medium AQ subjects have not been able to meet the strategic and evaluation indicators.

The ability of students in semiotic reasoning is explained by (Suryaningrum et al., 2020). The results showed that three participants identified objects by observing objects around them. In the sign-making stage, they made the same sign, namely a rectangular image. However, in the last three stages, namely interpreting signs, knowing the properties of signs, and finding the properties of rectangles, they do it differently in each category. The climber's category can solve the problem correctly. This finding is in line with the findings of logical thinking skills explained by (Ristiana et al., 2020). He explained that students' logical thinking skills are by their adversity quotient, namely students in the climbers category have very good logical thinking skills, the campers category have good logical thinking skills, and the quitters category have poor logical thinking skills.

Based on the previous description, many types of research are used to determine the position of the adversity quotient, especially in mathematics learning. The types of research applied consist of quantitative, qualitative, and mixed methods with various research designs that have the same goal, namely to measure the position of the adversity quotient in mathematics learning. Seeing various types of research with the same goal shows that the adversity quotient is increasingly being considered in research,

especially in mathematics learning, so it is possible that in the future there will be more types of research with different designs examining the position of the adversity quotient in mathematics learning.

The subject of research on the position of the Adversity quotient in mathematics learning is often found in students, especially in junior high school/MTs students. Kartikaningtyas et al (2018) explained that students or learners are the main figures and core of the learning process, so many researchers choose students as research subjects. Research with students as subjects in elementary schools is still very little. Only one study was found using elementary school students as subjects in the study of the position of adversity quotient in mathematics learning conducted by (Suryaningrum et al., 2020).

Overall, the studies that have been reviewed explain that the adversity quotient has a strong position in mathematics learning. Both are related to each other, this is in line with the statement expressed by Qin et al (2019) that one of the keys to success in mathematics learning is the adversity quotient. Examining various articles that have been reviewed, the results of the study show that the categorization of the adversity quotient explained by Stoltz (2007) quitters, campers, and climbers have different cognitive abilities in each category. The higher the adversity quotient category, the higher the ability of students in mathematics learning. Based on research findings, the position of the adversity quotient in mathematics learning, especially in students' cognitive abilities, is mostly found in problem-solving abilities. The results of the study explain that the categories in the adversity quotient determine how students face and solve mathematical problems. These results are in line with the research of Fauziah et al (2020) which interprets that the category of adversity quotient influence on students' mathematical solving abilities. Yustiana et al (2021) explains that the adversity quotient is not a permanent or innate intelligence, but AQ can be improved and enhanced. One way that can be done is to strengthen competitiveness, productivity, creativity, and motivation.

Conclusion

Looking at the literature that has been reviewed, adversity quotient is the ability of students to control themselves to face problems and how students can find solutions to problems to get out of difficulties. Based on the results of the review of several articles obtained, it can be concluded that the adversity quotient has a strong position in mathematics learning. Research on the position of adversity quotient in mathematics learning shows that 1) research with quantitative and qualitative types is the most common type of research, 2) Students in junior high school are the dominant research subjects, 3) the position of adversity quotient in students' cognitive abilities is very much such as critical thinking, problem solving and others, but based on the results of the review, cognitive abilities are dominated by students' abilities in solving problems. The results of the study explain that the categories in the adversity quotient (climbers, campers, quitters) determine how students face and solve mathematics problems. The higher the adversity quotient category, the higher the students' abilities in mathematics learning.

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