# Systematic Literature Review: Analysis of Mathematical Problem Solving Ability based on Adversity Quotient in Problem Based Learning

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Abstract

The world of mathematics education is certainly inseparable from various problems that must be resolved. Likewise with students who are required to be able to solve the mathematical problems they face. This is where the role of mathematical problem solving skills plays an important role. Problem solving ability is one part of the 21st century skills that need to be developed in the process of learning mathematics, because having good problem solving skills can make it easier for students to solve math problems. The purpose of this study was to analyze mathematical problem solving abilities based on the Adversity Quotient in Problem Based Learning. This research was conducted using the Systematic Literature Review (SLR) method for articles published in 2017-2023 regarding problem solving abilities based on Adversity Quotient in Problem Based Learning learning. There are 20 national or international articles obtained from the Google Scholar database. The results showed that the problem-solving skills of students using problem-based learning models were better than other learning, the Adversity Quotient had an effect on problem-solving abilities, and students with high Adversity Quotient (climber) had good problem-solving skills.

Keywords:

. Mathematical Problem Solving Ability, Adversity Quotient, Problem Based Learning.



## 1. Introduction

In the world of education and everyday life certainly can not be separated from a problem. Each individual has different ways and abilities in dealing with and solving a problem. The ability to solve problems must be possessed by students so that students are able to overcome problems related to material at school, especially mathematics. According to Riedesel, mathematics is a collection of truths and rules, mathematics is not just counting. Mathematics is a language, activities for generating problems and for solving a problem, activities for finding and for studying patterns and relationships. Therefore, students are expected to have the ability to solve good problems in order to be able to understand mathematics well (Riedesel).

In learning mathematics, problem solving is the core of learning which is a basic ability in learning activities. Through mathematics learning activities, students are required to be able to solve problems and find solutions to problems given by the teacher. Branca stated the importance of mathematical problem solving skills because of three things, namely problem solving can include methods, procedures, and strategies or methods used which are the core and main processes in the mathematics curriculum; problem-solving ability is a general goal of learning mathematics, even as the heart of mathematics; and problem solving is a basic ability in learning mathematics (Rahmi D et al., 2021). This shows that problem solving abilities have an important role in the process of learning mathematics.

Problem solving abilities can be enhanced by developing skills in understanding problems, creating mathematical models, solving problems, and interpreting solutions. Mathematical problem solving abilities support the potential of students to be able to do problem solving. There are several factors that affect problem solving abilities, one of which is the learning model. The learning model that has quite an effect on problem solving ability is Problem Based Learning (PBL). Problem Based Learning is a learning model in which students learn through a problem to solve problems (Hmelo-Silver, 2004; Ismawati et al, 2017). In PBL, a situation or problem becomes a starting point for learning to understand concepts, principles, and develop problem-solving skills. The main focus of PBL is to position the teacher as a designer and organizer of learning so that students have the opportunity to understand and make sense of mathematics through learning activities (Herman, 2007; Ismawati et al, 2017). The PBL learning model can improve students' mathematical problem solving abilities (Sudarman, 2007; Ismawati et al, 2017).

In addition to the learning model, there are other things that can affect the level of students' problem-solving abilities, one of which is the Adversity Quotient (AQ) possessed by students. Adversity Quotient is a psychological aspect that characterizes students in facing difficulties (Septiani & Nurhayati, 2019). A student must have an attitude of not giving up easily when facing difficulties because during the problem solving process, students will be faced with various difficulties. Student performance in dealing with problems can be seen from the Adversity Quotient (AQ).

Based on student responses in solving a problem, AQ is divided into three categories, namely: quitter, camper, and climber (Stoltz, 2000; Sutisna et al., 2022). Quitter is someone who easily throws away an opportunity, avoids a problem, and quickly gives up on a problem faced, Camper is someone who rarely takes risks, is quickly satisfied with what has been obtained without trying new things, and Climber is someone who are ready to face a problem, always want the best in everything (Bruno et al., 2021; Chabibah et al., 2019; Sutisna et al., 2022). Thus a person's success when solving a problem is influenced by AQ, which shows how a person's response to a problem can lead to the best solution to the problem at hand.

Previous research on AQ showed positive results in learning activities, such as students with high Adversity Quotient (AQ) having better problem-solving skills than students with medium and low AQ (Rahmi et al., 2021); Adversity Quotient has a positive effect on the ability to solve mathematical proof problems both individually and simultaneously (Hakim & Murtafia, 2020). Other research shows that the Problem Based Learning learning model can improve students' mathematical problem solving abilities, such as the application of the Problem Based Learning model can improve the mathematical problem solving abilities of class VII students of SMP N 9 Pekanbaru (Novianti et al., 2020); the problem-solving abilities of students who use problem-based learning models are better than conventional learning (Samandy et al., 2021); and students' mathematical problem solving abilities through the Problem Based Learning (PBL) model achieve learning mastery (Septiani, 2019). Thus, the Adversity Quotient and the Problem Based Learning learning model affect the level of students' mathematical problem solving abilities.

Based on this background, this study aims to analyze mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning learning which are detailed (1) to analyze the objectives, types, and research designs used; (2) to analyze

the selected learning model; (3) to analyze research trends in 2017-2023 related to mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning.

## 2. Method

This research was conducted using the Systematic Literature Review (SLR) method. Research is a process that aims to identify, review, evaluate, and interpret some of the existing research. In this study, researchers conducted a series of review processes and identified several articles in a structured manner following the steps (Triandini et al., 2019), including the following. First, Research Question (RQ). RQ is made based on needs according to the chosen topic. The RQ in this study includes (RQ1) What are the objectives and types of research used in the article about mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning in 2017-2023?; (RQ2) What is the learning model chosen in the article regarding mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning in 2017-2023?; (RQ3) What are the research trends regarding mathematical problem solving based on the Adversity Quotient in Problem Based Learning in 2017-2023.

Second, the search process. The purpose of this search process is to use it to obtain relevant data to answer research questions. The search process is carried out through the Google Scholar database with the keywords mathematical problem solving ability, Adversity Quotient, Problem Based Learning. Third, inclusion and exclusion criteria. Inclusion and exclusion criteria were used to determine whether the data obtained could be used in SLR research or not. The inclusion and exclusion criteria can be seen in the table below.

**Table 2. 1** Inclusion and Exclusion Criteria

| Inclusion | Exclusion |
|---|---|
| National or international articles that are relevant to mathematical problem solving skills based on Adversity Quotient in Problem Based Learning learning. | National or international articles that are irrelevant to mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning learning. |
| National or international articles in accordance with the title and research topic. | National or international articles that do not match the title and research topic. |
| Articles published in 2017-2023. | Articles published before 2017. |
| The language used is Indonesian or English. | The language used is other than Indonesian or English. |

Fourth, Quality Assessment (QA). The data that has been obtained is evaluated based on the assessment criteria. The QA in this study includes (QA1) Was the article published in 2017-2023?; (QA2) Does the article state the purpose of the research or the type of research used?; (QA3) Does the article write down the learning model used? From the 3 QA, answers will be obtained in the form of yes or no. Fifth, data collection. In this study, the data used for review were primary data, namely data collected through interviews, observation, or adjusting the needs to support the research. Then data

analysis. The data that has been obtained and collected will be analyzed referring to the Research Question (RQ). Lastly, deviation from protocol. During the research there were changes, namely refinement of word equivalents for search keywords in the database.

## 3. Result and Discussion

Obtained 20 articles that are relevant to the keywords that have been determined. Then, researchers reviewed articles that were relevant to mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning learning.

**Table 3. 1** Number of Studies Based on Characteristics

| Characteristics | Information | Frequency |
|---|---|---|
| Year of Publication | 2017 | 1 |
| | 2018 | 2 |
| | 2019 | 3 |
| | 2020 | 5 |
| | 2021 | 4 |
| | 2022 | 4 |
| | 2023 | 1 |
| Educational Level | JHS | 8 |
| | SHS/VHS | 10 |
| | College | 1 |
| Type of Research | Quantitative | 5 |
| | Qualitative | 8 |
| | Systematic Literature Review | 2 |
| | Quasi Eksperimental | 1 |
| | Mixed Method | 4 |

**Table 3. 2** Research results related to Mathematical Problem Solving Ability Analysis based on Adversity Quotient in Problem Based Learning

| No. | Author, Year | Journal Name | Participant | Research Result |
|---|---|---|---|---|
| 1. | (Septiani, 2019) | Prosiding Seminar Nasional | All students of class VIII JHS Negeri 2 Tasikmalaya | Students' mathematical problem solving abilities through the Problem Based Learning (PBL) model achieve learning mastery |
| 2. | (Sutisna et al., 2022) | Jurnal Ilmiah Pendidikan Matematika | SHS/VHS students | PBL has a positive influence on students' problem solving abilities |
| 3. | (Lusiana et al., 2021) | Jurnal Pendidikan Matematika | Class XI State SHS 1 Jiwan | The PBL learning model is better than the STAD learning model on mathematics learning achievement |
| 4. | (Samandy et al., 2021) | Jurnal Biofiskim | 48 students of class XI State SHS 1 Kontukowuna | The problem solving abilities of students who use problem-based learning models are better than conventional learning, the problem solving abilities of students who have a high average adversity quotient are better than students who have a low average adversity |

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|---|---|---|---|---|
| | | | | quotient. |
| 5. | (Baharullah et al., 2022) | Jurnal Program Studi Pendidikan Matematika | Class VIII State JHS 3 Sungguminasa | There is a difference between the three adversity quotient categories in mathematical problem solving abilities, where; students in the climbers category have excellent ability to solve problems by fulfilling the four indicators, namely understanding, planning, implementing problem solving, and re-evaluating. |
| 6. | (Verenia et al., 2022) | Jurnal Ilmiah Mahasiswa Pendidikan Matematika | Class VII State JHS 1 Langsa | Different AQ intelligences have different outputs of fighting power regarding whether or not they are able to complete mathematical problem solving. |
| 7. | (Nalurita et al., 2021) | Unnes Journal of Mathematics Education Research | 23 students of class VII JHS Sultan Agung 4, Semarang | Problem Based Learning assisted by E-Comic Math is effective and the description of problem solving skills is seen from the adversity intelligence of students based on three categories through different E-Comic Assisted Problem Based Learning. |
| 8. | (Arrohman & Zuhruf, 2023) | Repository Universitas Jambi | Class XII State SHS 10 Bungo | The research results obtained, researchers found the diversity of the results of problem solving abilities according to the Adversity Quotient (AQ) intelligence possessed by each student. |
| 9. | (Naimnule et al., 2020) | Unnes Journal of Mathematics Education Research | Class VIII State JHS 1 Miomaffo Timurr | The results showed that the problem based learning model with peer feedback was effective and the description of problem solving abilities in terms of the adversity quotient in the high, medium and low categories of the problem based learning model with peer feedback had mixed results. |
| 10 | (Yustiana et al., 2020) | Journal of Physics | Class XI VHS S Muhammadiyah | The results of this study indicate that students with the quitter type are able to take |

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|---|---|---|---|---|
| | | | | steps to understand the problem. Students with the AQ type of campers are able to take steps to understand problems, plan solutions and implement settlement plans. |
| 11. | (Malik et al., 2019) | Jurnal Profesi Keguruan | Class VIII State JHS 1 Sumber | The results showed that the quitter student group had not been able to carry out all the steps of problem solving, including understanding the problem, planning problem solving, solving problems, and reviewing answers. |
| 12. | (Sari et al., 2022) | Prosiding Seminar Nasional Matematika | - | Based on the results and discussion, it was found that the Problem Based On STEAM Learning (PBL-STEAM) model had an effect on increasing students' Adversity Quotient. |
| 13. | (Purwanti et al., 2019) | Prosiding Seminar Nasional Matematika dan Pendidikan Matematika | Class X SMAIT Insan Harapan | The results showed that the level of Adversity Quotient (AQ) high school students in learning mathematics analyzed through problem-based learning is still low, namely with a percentage of 90% of 20 students. |
| 14. | (Novianti et al., 2020) | Journal of Education and Learning Mathematics Research (JELMaR) | Class VII State JHS 9 Pekanbaru | The application of the Problem Based Learning model can improve the mathematical problem solving abilities of class VII students of SMP N 9 Pekanbaru |
| 15. | (Rahmi et al., 2021) | Suska Journal of Mathematics Education | Class XI State SHS 5 Pekanbaru | Students with high adversity quotient (AQ) have better problem solving skills than students with moderate and low AQ. |
| 16. | (Hidayat & Sariningsih, 2018) | Jurnal Nasional Pendidikan Matematika | Class VIII JHS in West Bandung Regency | AQ quitters students in solving problems are able to understand the problem by writing down what is known and what is asked and |

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| | | | | explaining the problem in their own sentences; AQ campers students in solving problems are able to carry out the three stages of Polya, namely understanding the problem, planning a solution, and carrying out the plan. |
| 17. | (Hakim & Murtafia, 2020) | Jurnal Matematika dan Pembelajaran | Students of the Mathematics Education Study Program, University of West Sulawesi | Adversity quotient and resilience have a positive effect on the ability to solve mathematical proof problems both individually and simultaneously. |
| 18. | (Aini & Mukhlis, 2020) | Jurnal Pendidikan dan Pembelajaran Matematika | Class X State SHS Arjasa Jember | Students with the climber type are able to fulfill all problem solving indicators on word questions which include indicators of understanding the problem, planning a solution, carrying out a settlement plan and rechecking. Camper type students fulfill all problem solving indicators except at the re-examination stage. Quitter type students in solving word problems fulfilled the stages of understanding the problem and planning solutions, while the stages of carrying out the plan and re-checking were not fulfilled by quitter students. |
| 19. | (Ismawati et al., 2017) | Unnes Journal of Mathematics Education Research | Class XI State SHS Pecangaan | Students who have AQ in the climber category have good ability to solve mathematical problems, while students who have AQ in the camper category have good ability to solve mathematical problems. |
| 20. | (Sunandar et al., 2018) | Unnes Journal of Mathematics Education Research | Class X VHS Muhammadiyah 3 Weleri | PBL models Learning with the PBL model with ethnomathematics nuances has an impact on the quality of students' problem solving abilities. |

**(RQ1) What are the objectives and types of research used in articles about mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning in 2017-2023?**

**Figure 3. 1** below shows research in 2017-2023 regarding mathematical problem-solving abilities based on Adversity Quotient in Problem Based Learning, there are differences in research focus. There are 6 research focuses found from 20 articles. The focus of research to analyze problem-solving abilities based on the Adversity Quotient shows a percentage of 50%. It can be concluded that research in 2017-2023 concerning mathematical problem solving abilities based on the Adversity Quotient in Problem Based Learning tends to focus on problem solving abilities based on the Adversity Quotient.

**Figure 3. 1** Research Focus

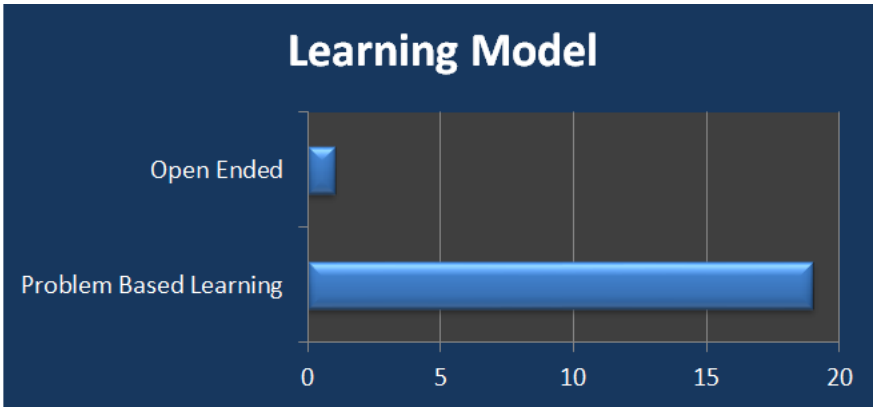

In **Figure 3. 2** below, it shows that out of 20 articles there are 5 types of research used on mathematical problem solving skills based on Adversity Quotient in Problem Based Learning published in 2017-2023. Qualitative research with a percentage of 40%, illustrates that this type of research tends to be used more in research on mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning. In addition to focusing on research on problem-solving skills based on the Adversity Quotient, research in 2017-2023 tends to be carried out using qualitative research.

**Figure 3. 2** Type of Research


**(RQ2) What is the learning model chosen in the article regarding mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning in 2017-2023?**

**Figure 3. 3** below illustrates the learning model used in research regarding mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning. The figure shows that the Problem Based Learning (PBL) learning model tends to be used in published research in 2017-2023.

**Figure 3. 3** Learning Model



**(RQ3) What are the research trends regarding mathematical problem solving based on Adversity Quotient in Problem Based Learning in 2017-2023?**

**Figure 3. 4** Educational Level


**Figure 3. 4** hows that research on mathematical problem solving skills based on the Adversity Quotient in Problem Based Learning is carried out at several levels of education, namely junior high school, high school/vocational school, and university. Research conducted at the junior high school level shows a percentage of 40%, at the SHS/VHS level it shows a percentage of 50%, and at the student level it shows a percentage of 5%. It can be concluded that research on mathematical problem solving skills based on the Adversity Quotient in Problem Based Learning tends to be conducted on high school/vocational (SHS/VHS) school students.

In addition, some of the mathematics learning materials selected in the research on mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning in the 2017-2023 publication include material on the Two-Variable Linear Equation System, Three-Variable Linear Equation System, Number Patterns, Flat Shapes, Statistics, Sets, Geometry, and Algebraic structures.

Of the 20 articles that have been reviewed, research on mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning shows good results. The problem-solving skills of students using problem-based learning models are better than other learning (Samandy et al, 2021; Nalurita, B. R et al, 2021; Naimnule, M et al, 2020; Novianti, E et al, 2020; Sunandar, M. A et al, 2018). Then the Adversity Quotient affects problem solving abilities (Hakim, F & Murtafiah, 2020; Arrohman, Moh Zuhruf, 2023). In addition, students with a high Adversity Quotient (climber) have good problem solving abilities (Aini, N & Mukhlis, M, 2020; Ismawati, A et al, 2017).

## 4. Conclusion

Based on the results and discussion of the literature review of 20 articles published in 2017-2023, it can be concluded that. First, research on mathematical problem solving abilities based on Adversity Quotient in Problem Based Learning learning was found to

have a tendency to test problem solving abilities based on Adversity Quotient. Then the next trend is the use of qualitative research types. Second, research on mathematical problem solving skills based on Adversity Quotient in Problem Based Learning published in 2017-2023 found that they tend to use the Problem Based Learning (PBL) learning model. Third, research on mathematical problem-solving skills based on the Adversity Quotient in Problem Based Learning that was published in 2017-2023 was more often conducted on high school/vocational high school students. Then, the problem solving abilities of students who use problem-based learning models are better than other learning, the Adversity Quotient influences problem solving abilities, and students with high Adversity Quotient (climber) have good problem solving skills.

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