

# Analysis of Student Quotient Adversity in Problem Solving HOTS (High Order Thinking Skill) Mathematics Problems

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DOI: [10.22178/pos.65-4](https://doi.org/10.22178/pos.65-4)

LCC Subject Category:  
[LB2300-2430](#)

Received 16.11.2020  
Accepted 25.12.2020  
Published online 31.12.2020

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**Abstract.** Problem-solving of High Order Thinking Skill (HOTS) problems Mathematics is a part of the mathematics learning process that requires high-level adversity quotient (AQ) for students. This study aims to analyze the AQ level of students in solving mathematics HOTS problems. This research uses a case study-based qualitative approach. Research participants consisted of 47 students of class XI at an MA in East Lombok, NTB, in the even semester of the 2020-2021 academic year. The research sample was determined by purposive sampling. The instrument used was a diagnostic test consisting of descriptive questions and multiple-choice, AQ questionnaire, and interview guidelines. The results showed that: 1) the AQ level of the students was in the medium category in solving HOTS mathematics questions, 2) there was no relationship between the level of mathematics problem-solving ability and the AQ level of students in solving the HOTS mathematics problems, 3) the students quickly gave up in solving HOTS mathematics questions, and 4) Students have difficulty in the aspects of language, concepts, and strategies in solving HOTS Mathematics problems.

**Keywords:** problem solving; high order thinking skill; adversity quotient.

## INTRODUCTION

Mathematics learning in the industrial revolution era 4.0 is a form of mathematics learning that emphasizes work and problem-solving skills. These two aspects of gifts are also part of student mathematics learning in madrasas in the 2013 curriculum. Therefore, each teacher's mathematics learning is expected to provide a mathematical problem characterized by high order thinking skills (HOTS) questions. The goal is for students to get used to solving complicated problems and requires a deep understanding of the material and creativity in solving excellent and innovative. Also, solving math HOTS questions is a good strategy for teachers in knowing students' fighting power in a madrasah in solving complicated and complex problems. Problem-solving is one of the mathematics learning competencies that are expected to grow in students. However, the facts in the field show that students still have difficulty solving HOTS problems in mathematics. This can be seen from the excerpt from an interview with one of the class XI MA students in East Lombok as follows:

*Researcher: When the teacher gives math HOTS questions to students, can you solve them?*

*Student: My friends and I are still having trouble, sometimes my friends and I can't, and I easily give up."*

*Researcher: Why?*

*Student: We are not used to it and do not know how to solve it. Even if they know how to do it, they like to be stagnant so it can't be resolved.*

Previous research results are also not much different from the facts in the field above, which indicate the low ability of high school / MA students' mathematical problem-solving in solving Mathematical HOTS problems. The following are some of the research results, namely (1) [9] that students are unable to represent problems, develop strategies, and implement these strategies; (2) [8] that students have difficulty understanding, analyzing, and interpreting problems; and (3) [4] that students are not able to make mathematical models of problems.

Students' low ability to solve HOTS questions in mathematics is not only influenced by a lack of understanding of concepts, mathematical skills, and student experience in solving HOTS questions. Still, psychological aspects and students' ability to face difficulties are influenced by adversity quotient (AQ) [3]. The results [6] shows that the AQ level of students has a significant effect on the level of students' critical thinking skills in facing problems both in difficulty and failure. Therefore, the AQ factor of students needs to get the teacher's attention in every mathematics lesson. Students who have low and moderate AQ levels do not easily give up in solving math HOTS problems. In HOTS mathematics questions, students are often easily stressed and discouraged in the solving process, which is influenced by a diversity of difficulty.

Based on the background description above, the writer is interested in conducting a research study entitled "Analysis of Students' Adversity Quotient in Solving Problems of Mathematical HOTS Problems". The topic of the problem in this study was studied with a qualitative research approach with a problem limitation on the concept of adversity quotient (AQ), the ability of madrasah students to solve math HOTS problems in mathematics learning. The formulation of this study's situation is how the AQ level of madrasah students solve mathematics HOTS problems in mathematics learning. *This study aimed* to describe the AQ level of students in solving mathematics HOTS problems in mathematics learning.

A HOTS question is a math problem if there is a challenge that requires students' creativity and skill in thinking to build an appropriate and correct solution strategy. The characteristics of HOTS questions were (1) the questions measured students' higher-order thinking abilities and skills; (2) non-routine questions; and (3) problems based on contextual issues. HOTS questions are also part of the concept of thinking skills developed based on Bloom's taxonomic model. The level of Bloom's taxonomic thinking skills can be seen in Figure 1 below.

HOTS questions are part of problem-solving. Authors [5] define a problem formally as follows: "A problem is a situation, quantitative or otherwise, that confront an individual or group of individual, that requires resolution, and for which the individual sees no apparent or apparent means or path to obtaining a solution. This definition explains that the problem is a situation faced by a

person or group that requires an explanation. Still, the individual or group does not have a direct way to determine the answer. Author [7] states that there are two types of mathematical problems, namely:

- (1) the issue to find, problems that aim to find, determine, or obtain the value of an object that is not stated in the question;
- (2) problem to prove, problems that require a procedure to show whether a statement is true or not.

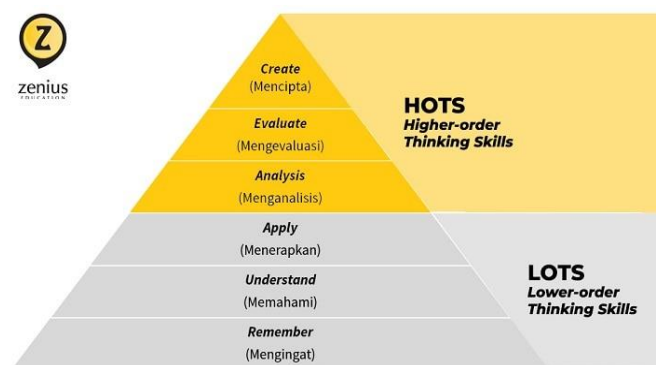


Figure 1 – Bloom's Taxonomy Thinking Skills Level [2]

The completion of HOTS questions is different problem-solving strategies used to answer low-order thinking skills (LOTS) questions. Problem-solving is one of the abilities that must be developed in solving mathematics HOTS problems. Problem-solving is seen as a process that provides a context between students' concepts and skills to build from learning materials. In solving HOTS questions, students' willingness to be involved in a problem is needed because students can develop themselves to be constructive and reflective in solving problems. Besides, the teacher's ability to solve HOTS questions can be fostered through mathematics learning which develops aspects of student mathematical problem solving, namely (1) building mathematical knowledge through problem-solving; (2) implementing and adapting a variety of appropriate strategies to solve problems; (3) observing and developing the process of solving mathematical problems; and (4) solving math problems that arise in other contexts.

In solving HOTS questions, there are several activities carried out by students in obtaining answers to these questions. The familiar stages of problem-solving activities used in mathematics learning are the Polya stage. Author [7] said that there were four stages of activities carried out, namely

(1) understanding the problem. This stage required students' understanding of a problem faced by identifying what was known, what was asked, and what elements were there, numbers, relationships, and associated values and what they are looking for;

(2) planning a solution (devise a plan), this stage the students identify what operations and strategies are involved in solving the problem;

(3) Carry out the project (carry out the plan), this stage what is done in action based on the program that has been designed;

(4) looking back, at this stage, students re-examine the processes that have been carried out during problem-solving.

Author [11] states that the AQ determines student success in a job. Students' success in overcoming difficulties is very much determined by the AQ factor of students in madrasah. AQ is a unique intelligence related to students' ability to face their problems [11]. From the description of the definition of AQ above, it can be concluded that AQ is the intelligence of students' fighting power in facing and overcoming any difficulties encountered in learning mathematics. This means that the higher the student's AQ will positively affect student success in solving HOTS questions.

Author [11] states that there are three forms of AQ, namely (1) AQ as a new conceptual form of work in understanding and enhancing types of success; (2) AQ as a measure of response to adversity; and (3) AQ as a form of essential scientific tools in improving any reaction to adversity. Also, author [11] identifies individuals into three groups, namely: (1) a quitter is someone who stops in the middle of the road; (2) a camper is someone who feels satisfied in a particular position; and (3) a climber is someone who wants to continue to be successful.

Authors [10, 11] say that AQ has four main dimensions, namely:

(1) control (C), C means how much power a person feels over challenges or difficulties at work;

(2) Origin and ownership (O2), O2 means how a person views the source of the problem and how much is involved in overcoming difficulties;

(3) Reach (R), R denotes the extent to which these difficulties reach other parts of a person's life;

(4) Endurance (E), E means how one's endurance in dealing with problems that arise in work.

## METHODS

This research is descriptive qualitative research. The study was conducted at one of the State MA in East Lombok with 47 students of class XI consisting of 13 male students and 34 female students. The technique of taking participants by using a purposive sampling technique. Data collection was carried out by test and non-test. The test was conducted to measure the students' ability to solve mathematics HOTS questions, and the non-test was undertaken to determine the AQ level of students.

The data obtained will then be analyzed both from test and non-test data. The objective is to get a description of the AQ of students in solving mathematics HOTS problems. Knowing the level of student adversity quotient, the researcher developed a questionnaire guideline for students' AQ response profile based on the four-dimensional AQ indicator. The AQ questionnaire uses a Likert scale. The Likert scale is used to measure people's attitudes, responses, and perceptions towards a social phenomenon. According to [1], the criteria for grouping can be seen in the following table.

Table 1 – Criteria for Student Adversity Quotient Level (AQ)

The score of Adversity Quotient (X)	Classification
$X < (\mu - 1,0\sigma)$	Quitter
$(\mu - 1,0\sigma) \leq X < (\mu + 1,0\sigma)$	Camper
$(\mu + 1,0\sigma) < X$	Climber

Notes:  $\mu$  – Average AQ score,  $\sigma$  – Standard deviation of AQ score

The components of data analysis activities in this qualitative research, namely

(1) data reduction, this stage the researcher reduces the field finding data either through written tests, AQ questionnaires, interviews, observations, and documentation studies;

(2) data display, the researcher presents research data in the form of descriptive data on the students' abilities, difficulties, moderate Islamic thinking, and AQ in solving HOTS math problems;

(3) data conclusions: drawing / verifying, the researcher uses the analysis results to present the data on the data display in making descriptions of the abilities, difficulties, Islamic moderation

thinking, and AQ of students in solving HOTS math problems.

In testing the validity of data or findings, researchers apply validation procedures, such as triangulation, member checks, negative case analysis, an extension of observations, retention of persistence, and discussions with peers. In addition to data validation, researchers will also conduct triangulation tests of data sources and data collection techniques.

## RESULTS AND DISCUSSION

From the results of a good documentation study of the MA students' problem-solving ability tests in solving HOTS mathematics questions, it can be seen that 70% of students have a language difficulty, 27% of students have a problem in modeling, and 40% of students have difficulty in application. This is based on the indicators set by the researcher in knowing the abilities and issues of students in solving mathematics HOTS problems, namely:

(a) the language aspect, namely (1) students do not understand the meaning of keywords, and (2) students do not understand the importance of the sentence in the problem;

(b) conceptual aspects, namely (1) students are not able to make representations, and (2) students do not understand strategies;

(c) applied aspects, namely (1) students cannot use methods, (2) students are wrong in the process, and (3) students do not verify answers.

Also, the results of interviews, observations, and field notes showed that students quickly gave up solving HOTS questions. There was no relationship between students' problem-solving skills and students' AQ levels in solving HOTS math problems.

In connection with class XI students' adversity quotient, the following results of the AQ level distribution of class XI MA students in solving HOTS Mathematics questions can be seen in the table below.

Table 2 – AQ Level of Class XI MA Students

No	Criteria	Classification	F	%
1	$X < 74.91$	Quitter	8	17
2	$74.91 \leq X < 96.53$	Camper	29	62
3	$96.53 < X$	Climber	10	21

Based on the table above, it can be seen that the level of adversity quotient of class XI MA students, namely 17% of students have low AQ levels, 62% moderate levels, and 21% high-level students. This data can provide sufficient information for the madrasah, especially teachers, in knowing students' AQ level in mathematics learning. From this data, it can also be seen that most of the class XI students have a moderate AQ level (camper) so that this data represents that students need to get attention, motivation, and teacher guidance so that students do not give up easily and give up hope in facing all obstacles in learning mathematics especially when students solve Mathematics HOTS questions.

From the AQ questionnaire results, it can also be seen that the level of each AQ dimension of class XI MA students in facing a problem. The following is the level data for the AQ dimensions of students in each size:

*Control (C).* The process of analyzing the findings of students' level control data on the questionnaire results was carried out in the same way as the AQ level analysis of students by grouping the control level of students into three classes, namely low, medium, and high levels. The distribution of student control levels can be seen in the table below:

Table 3 – Level of Control for Class XI MA Students

No	Criteria	Classification	F	%
1	$X < 18.28$	Quitter	10	21
2	$18.28 \leq X < 24.34$	Camper	31	65
3	$24.34 < X$	Climber	6	14

This data certainly provides sufficient information to all school members for consideration, especially teachers knowing the level of student self-control in mathematics learning. However, the percentage of student self-control is greater than the rate of low and high levels. However, the portion of students' self-control at a low level is more significant than the share of students' self-control at a high level. This indicates the need for teacher guidance in controlling students' self-control so that students do not carry out any activity that can harm and harm themselves both in school and outside school.

*Origin and ownership (O2).* The process of analyzing students' O2 level data findings on the AQ questionnaire results was carried out in the same

way as the AQ level analysis of students by grouping students' O2 levels into three levels, namely low, medium, and high levels. The distribution of students' O2 levels can be seen in the table below.

Table 4 – O2 Level Students of Class XI MA

No	Criteria	Classification	F	%
1	$X < 20.83$	Quitter	7	14
2	$20.83 \leq X < 26.27$	Camper	32	69
3	$26.27 < X$	Climber	8	17

This data illustrates that the percentage of O2 levels in the medium category is more than the share of O2 groups for students in the low and high classes. This information is sufficient to be used as input and consideration for teachers in providing useful guidance in learning and forming good self-recognition characters in knowing the source of the problem and finding a way out of students' education issues.

*Reach (R).* Analyzing student reach level data findings on the AQ questionnaire results is carried out in the same way as the AQ level analysis of students by grouping them into three levels: low, medium, and high levels. The distribution of student reach levels can be seen in the table below.

Table 5 – Student Reach Levels of Class XI MA

No	Criteria	Classification	F	(%)
1	$X < 16.66$	Quitter	11	24
2	$16.66 \leq X < 22.51$	Camper	31	66
3	$22.51 < X$	Climber	5	10

This data provides information that the percentage level of reach (Students) in the high category is smaller than the percentage level of space (Students) in the low and medium classes. This means that it is essential for students to be given motivation and guidance so that students' reachability in learning is better or increases their hard skills and soft skills in learning mathematics.

*Endurance (E).* The process of analyzing the findings of students' endurance level data on the AQ questionnaire results was carried out the same as the analysis of students' AQ levels by grouping students' endurance levels into three groups, namely low, medium and high classes. The distribution of students' endurance levels can be seen in the table below.

Table 6 – Endurance Levels of Class XI MA Students

No	Criteria	Classification	F	(%)
1	$X < 16.84$	Quitter	8	17
2	$16.84 \leq X < 25.71$	Camper	26	55
3	$25.71 < X$	Climber	13	28

This data provides information that students' level of endurance in the high category is lower than that of students in the medium class even though the percentage is still higher than those in the low class. However, it appears that the percentage difference between high and low levels is not much different. This means that the student's endurance in facing a challenge or difficulty is still low so that guidance and motivation from the school, especially teachers, are expected to be able to motivate students that students can overcome and find solutions to every problem, both problems that include learning and other issues.

Based on the document data of the results of students' abilities in solving HOTS questions and the results of the questionnaire on the AQ profile of students in solving mathematics HOTS questions, it illustrates that there is no relationship between the level of students' mathematical problem-solving abilities and the AQ level of students in mathematics learning. This is shown in some students with moderate AQ level having high mathematical problem-solving skills. Also, not a few students with low AQ levels have mild mathematical problem-solving skills.

## CONCLUSIONS

Based on the findings and discussion in this study, it can be concluded that most students easily give up and give up hope in facing difficulties in solving HOTS questions. The AQ level of students cannot determine students' ability to solve mathematics HOTS problems. This is because students who have a high AQ level cannot necessarily solve math problems at a high level either. Also, students with low AQ levels do not necessarily have low AQ dimensions and dimensions C, O2, R, and E. In students' AQ levels, the levels of each size C, O2, R, and E can be the same or different. Students also have difficulty in several factors, namely the language, concept, and application factors in solving HOTS Mathematics questions.

For students, the research results can be used as material for self-reflection in mathematics learning to improve math problem-solving

competencies and the level of adversity quotient in education.

For teachers, the research results can be used as a positive input as a trigger for improving performance and competence in learning in helping

students improve their problem-solving abilities and AQ level in learning.

For researchers, this study's results can be used as material for further research on the same topic in mathematics learning with a different approach.

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