INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 12, Issue 1, (2023) E-ISSN: 2226-6348

Trend Analysis of Adversity Quotient (AQ) of Mathematics Teachers: A Systematic Literature Review

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To Link this Article: http://dx.doi.org/10.6007/IJARPED/v12-i1/16248 DOI:10.6007/IJARPED/v12-i1/16248

Published Online: 17 March 2023

Abstract

Adversity Quotient (AQ) means the endurance of an individual in facing problems or hardships in his life. AQ is important in determining individual excellence in various aspects including in teaching and learning mathematics. However, the study of AQ in the mathematics context which focuses on the teachers is not systematically discussed. Therefore, the study was conducted using a systematic literature review (SLR) related to the analysis of the trend of AQ among mathematics teachers. The SLR survey was studied based on trends in the country of study, trends in the year of publication, and trends in relevant variables carried out throughout the main phases of planning, analysis, and reporting. This study used three databases to search for articles, namely Scopus, Web of Science, and Google Scholar based on Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA). The findings of the trend analysis of the study countries show that there are only seven countries that conduct research and Indonesia is ahead of them in the five years from 2017 to 2022. The findings of the publication year trends show that the number of related studies is still very low, where there are only 9 articles. The findings of the trend analysis of related variables further found that there are 12 variables related to mathematics teachers' adversity quotient, which are dominated by self-efficacy. The implication of this study is to provide an overview to new researchers related to the trend of the country of study, the year of publication, and related variables related to the AQ. More in-depth research can be carried out and further developed by future researchers to determine other factors that can be linked to the AQ of mathematics teachers, such as the socio-economic status of teachers, teaching strategies, and facilities in schools or educational institutions.

Keywords: Adversity Quotient, Teachers, Mathematics, Systematic Literature Review, Trends

Introduction

The success of a teaching and learning process depends on several things and one of them is depending on the teacher himself as a knowledge conveyer. Burroughs et al (2019) agreed that teachers are one of the resources in schools that play a role in determining students' future academic success and lifelong outcomes. Several factors determine whether a teacher

can play a role well or otherwise in the classroom. Internal factors such as the teacher's attitude, skills, experience, and contribution in the context of his career and external factors such as infrastructure facilities, networks, and the support of fellow teachers (Hussin & Tamuri, 2017) are among these determining factors. Changes that often occur in the field of education can also be a determining factor in whether teachers can play the best role or not in the classroom. Curriculum changes and worsening challenges can result in teachers experiencing work pressure and because of that, the adversity quotient (AQ) is very necessary so that teachers can continue to carry out their duties as teachers well (Bangngu, 2019).

The adversity quotient (AQ) has a good influence on teacher performance and this statement is also supported by Tilova (2019) in his study, where it was found that the adversity quotient has a significant and positive effect on teacher performance. A person with a high adversity quotient can face difficulties or problems in life where, in general, each individual has a different level of adversity quotient and this causes when someone can survive, other individuals, to fail or give up (Farisuci et al., 2019). Hanifa (2017) stated that the adversity quotient is a person's ability to observe difficulties and manage the difficulties with the intelligence he possesses so that the difficulties become a challenge to solve them.

Therefore, the adversity quotient means the endurance of an individual in facing problems, difficulties, or difficulties in his life whether the individual will continue to survive or stop giving up. Stoltz (2000) in the same study outlined several factors that can affect the adversity quotient, namely competitiveness, productivity, creativity, motivation, risk-taking, persistence, and learning. Some aspects found in the adversity quotient as reported by Stoltz (2000) in a study by Azaria & Suprihatin (2018) are control, origin, ownership, reach, and resilience (Endurance) which is often also referred to as the CORE. Stoltz (2007) in a study by Nilasari & Anggreini (2019) voiced that there are three types of adversity quotient, namely climber (high AQ), camper (moderate AQ), and quitter (low AQ). Climbers are optimistic individuals because they never give up, that is, they always try to face problems that arise. A camper is an individual who doesn't use all his abilities but will stop when he feels he can't do anything after trying. A quitter is someone who easily gives up when facing problems in his life. The reasons why AQ needs to be investigated are because it affects an individual's success and it also indirectly affects an individual's performance. Chadha (2021) also suggested that individuals who effectively apply AQ in their life will perform ideally in difficulties, and challenges; little or huge that go up against them each day. We need to know about the growth of the AQ by reviewing the knowledge development because by knowing about it, we will be aware of how AQ affects someone's achievements in life and we may look for ways to improve our AQ. The Ministry of Education needs this information to do some interventions and changes in the education system to increase the number of educators who know about AQ and at the same time increase the number of those who seek to improve the level of their AQ.

Studies on adversity quotient have been carried out by previous researchers in different aspects such as the relationship between adversity quotient and stress at work (Singh & Sharma, 2017; Utama & Surya, 2019; Albarika et al., 2021), adversity quotient during the COVID-19 pandemic (Choompunuch et al., 2021; Kusdiartini, 2020; Hernanda, 2021), adversity quotient and entrepreneurship (Ajiwibawani & Subroto, 2017; Agustina, 2020; Agustina, 2022) and so on. In the context of education, studies related to the adversity quotient have been carried out by previous researchers, whether students as study subjects (Setyosari et al., 2021; Hulaikah, 2020; Jasak, 2020) or teachers as study subjects (Hidyat & Prabawanto, 2018; Anwar & Fitriani, 2020; Marashi & Rashidian, 2018).

Mathematics is a subject that must be taught at every level of education starting from early childhood education to higher education. In primary and secondary schools, mathematics is one of the subjects labeled as a core subject because this subject is important for students to master. Even so, until now, mathematics is often considered a difficult subject to master because mathematics involves numbers, calculations, and certain formulas. Learning mathematics is considered increasingly difficult by students as their level of education increases (Saifi et al., 2020). Sonnert et al (2020) in their study also stated that mathematics is considered a difficult subject to master. In Malaysia, the achievement of mathematics subjects can be concluded to be still at a low level. The statement by the Curriculum Development Center is that the achievement of students across the country in the subject of mathematics is still low in terms of quality and quantity (Abu & Eu, 2017). Another study by Siong & Osman (2018) informed that the achievement of the international assessment Trends in International Mathematics and Science Study (TIMSS) and Program International Student Assessment (PISA) is deteriorating and this reveals that the mastery of Malaysian students in the field of science and mathematics should be improved again. To improve students' math achievement, teachers are among the individuals who play a very important role. The ability of mathematics teachers to perform their duties as educators well while imparting mathematical knowledge is affected by the adversity quotient factor of a teacher.

The higher the level of a teacher's adversity quotient, the higher the chance of achieving success and excellence in carrying out his responsibilities as a teacher and this will in turn lead to an increase in student mathematics achievement. A study by Nas (2019) found that the adversity quotient positively and significantly affects mathematics learning outcomes. Research findings by Anwar & Fitriani (2020) show that emotional intelligence, interpersonal communication, and adversity quotient lead to the professional development of teachers and give advantages to teachers' success.

Several factors have been found to affect the level of adversity quotient of an individual, either internal factors or external factors. Pangma et al (2009) found that among the factors that affect an individual's adversity quotient are dominance, a sense of personal freedom, self-esteem, enthusiasm, self-confidence, ambition, and achievement motivation. A study by Qin et al (2019) who studied the analysis of the mathematics adversity quotient of primary school students in rural areas found that communication at home and school and the concerns of teachers and parents have a significant influence on the adversity quotient of students. Therefore, it can be stated here that aspects of communication and concern are also factors that affect an individual's adversity quotient.

To predict the factors that affect the level of adversity quotient of mathematics teachers and to study the effects of adversity quotient of mathematics teachers, some past researchers conducted studies related to adversity quotient. However, the development of past research shows that there is not much discussion of AQ aimed at the context of Mathematics teachers. Therefore, this study aims to identify the research trend of the adversity quotient of mathematics teachers which includes 1) country 2) year of publication, and 3) related variables using SLR. This study provides a significant exciting opportunity to advance our knowledge of AQ based on a systematic literature review of the articles from past researchers. Therefore, this study makes a major contribution to research on the AQ body of knowledge by expanding the AQ research systematic review focusing on the AQ of mathematics teachers. This project provided an important opportunity to advance the understanding of AQ by systematically reviewing recent papers on AQ in Mathematics according to specific trends mainly focusing on mathematics teachers. The study offers some important insights into the

focus group of students, teachers, and administrators by giving sort of ideas on how to empower the teacher's development strength on AQ by facing challenges in Mathematics. This review has a high need in intelligence theoretical development because a systematic literature review can effectively arrange the trends of AQ. This will help others to easily understand the knowledge of AQ of mathematics teachers which they can use in their research or for other needs.

Methodology

A systematic literature review (SLR) was used in this study. SLR is used to identify, review, evaluate, and interpret all existing research on a research topic with a specific research question related to it. Triandini et al (2019) explained that when the SLR method is used, it will help in the systematic review and identification of journals where each process is according to steps or protocols that have been set.

Search Strategy

There are three academic databases used in the search process for related articles: Scopus, Web of Science (WoS), and Google Scholar. Scopus and WoS both contain all journal articles and proceedings from different links so Scopus and WoS were selected as databases in this study. Zhu & Liu (2020) also revealed that the Scopus and WoS databases are the leading databases in the world and compete with each other because researchers from various countries or regions and various domains of knowledge also use these two databases. While the Google Scholar database was chosen because, in addition to being user-friendly, easy, and quick to access, this database is very suitable for further enriching the search results for articles related to the research topic, considering the results of the initial survey in the Scopus and WoS databases, it was found that the majority of articles related to adversity quotient use students or pupils as the subject of the study whereas this study should only use the teacher as the subject of the study.

In the process of searching for related articles, the keywords used are "adversity quotient", "adversity quotient of mathematics teacher", "science of resilience" and "science of resilience of mathematics teacher" in English. For searches using the Google Scholar database, the keywords in Malay used are "adversity quotient of math teachers" and "resilience of math teachers". For filtering and obtaining more accurate and appropriate search results, search functions such as field code functions, search phrases, wildcards, trimming, and Boolean operators are used when using the Scopus and WoS databases to process combinations of related terms. Next, the search for articles related to the adversity quotient is limited to the period 2017 to 2022 only, which aims to obtain the most recent articles from previous researchers (Table 1).

Table 1
Search String Used for the Systematic Review Process

Databases	Keywords used
Scopus	TITLE-ABS-KEY (("adversity quotient" OR "adversity quotient of mathematics teacher*" OR "science of resilience" OR "science of resilience of mathematics teacher*") AND ("mathematics" OR "mathematics teacher*")) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017))
Web of Science (WoS)	(((((ALL=(adversity quotient)) OR ALL=(adversity quotient of mathematics teacher)) OR ALL=(science of resilience)) OR ALL=(science of resilience of mathematics teacher)) AND ALL=(mathematics)) AND ALL=(mathematics teacher) Publication Date: 2017 – 2022
Google Scholar	"*Adversity quotient*" "guru matematik" "Daya tahan" "guru matematik" Custom range: 2017 – 2022 Sort by relevance Any type

Selection Criteria

There are several steps taken to obtain an article that is accurate and appropriate to the objective. The process of filtering and selecting the articles obtained is shown in Figure 1 where the selection process of this article has been adapted from Karabulut-Ilgu et al. (2018). This process complies with the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines which aim to ensure that the article search process is carried out systematically. During the first screening process, articles are selected based on certain acceptance and rejection criteria. The rejection criteria in the first screening process are 1) journals or proceedings that involve subjects other than mathematics, 2) studies that do not involve teachers, 3) articles from languages other than Malay, English, and Indonesian, and 4) articles published before the year 2017. Accepted articles must meet criteria such as 1) containing all the necessary keywords, 2) the study makes teachers the subject of the study, and 3) articles in Malay, English, and Indonesian.

If there are similar and repeated articles from different databases, those articles will be removed and this step is taken as the second step of article screening. This can be identified by looking at and reading the study's title, year of publication, and abstract. Finally, the analysis will be made by reading in depth the entire article involved and selected. By using the keywords and criteria of the search function as in Table 1, out of 91 articles from the three databases, only 9 articles met the set criteria and were subsequently selected in this study (Table 2).

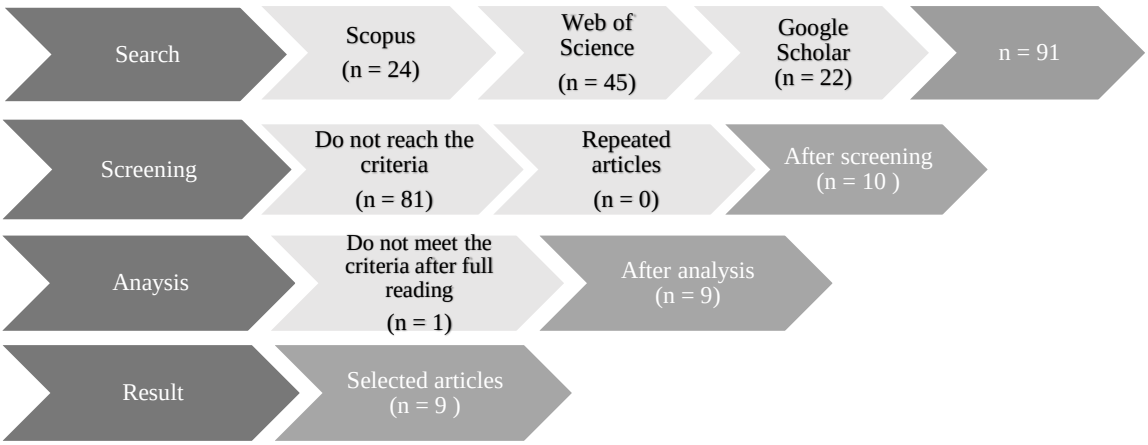

Figure 1 The Article Selection Process was Adapted from Karabulut-Ilgu et al (2018)

Research Findings

The main objective of this study is to identify previous research trends on the adversity quotient of mathematics teachers. A total of 9 selected articles used in this study are research articles published starting from 2017 until now. The subject of this study is a mathematics teacher. Next, the trend that is taken into account in this study is the trend of the country of study, the trend of the year of publication, and the trend of related variables related to the study of the adversity quotient of mathematics teachers. Table 2 briefly shows the name of the author of the article, the year of publication, the country, and the titles of the selected research articles. The findings of the study found that studies related to the adversity quotient of mathematics teachers from the period of 2017 to 2022 are still not conducted much because the final results show that only 9 articles meet the required criteria and coincide with the objectives of the study. Although initially there were 91 articles in all from the three databases, after going through the process of screening and selecting the appropriate and matching articles, it was found that most of the articles were more about students or students as the subject of the study and it was found that only 9 articles were related to the subject of mathematics.

Table 2
Overview of the Study

No.	Author and Year	Country	Title
1.	Ruqoyyah & Ristiana (2020)	Indonesia	Adversity quotient of prospective primary school teachers in making scratch-assisted math application
2.	Ristiana et al (2020)	Indonesia	Adversity quotient and logical thinking skills of prospective primary school teachers
3.	Hidayat & Husnussalam (2019)	Indonesia	The adversity quotient and mathematical understanding ability of pre-service mathematics teacher
4.	Yazon (2019)	Filipina	Pre-service teachers' adversity quotient and proficiency in English language and mathematics
5.	Hidayat et al (2018)	Indonesia	The mathematical argumentation ability and adversity quotient (AQ) of pre-service mathematics teacher
6.	Lutovac (2019)	Finland	Pre-service mathematics teachers' narrated failure: Stories of resilience
7.	Xenofontos & Andrews (2020)	Scotland dan Sweden	The discursive construction of mathematics teacher self-efficacy
8.	Wright et al (2019)	United States	Developing Resilient K-12 STEM Teachers
9.	Ching (2019)	Malaysia	Pengaruh Pembangunan Profesional dan Kompetensi Profesional Guru Terhadap Penambahbaikan Berterusan Sekolah di Sarawak

The First Research Finding

Studying the trend of adversity quotient of mathematics teachers which includes the study country trend

Table 3 below shows the list of study countries for 9 selected articles. Based on Table 3, it was found that 7 countries conduct research related to the adversity quotient of mathematics teachers in the range of 2017 to 2022. Most of the research articles, which are as many as 4 out of 9 articles, are studies from the country Indonesia and 1 article each from the country of Malaysia, the Philippines, Finland, Scotland, Sweden, and the United States where Scotland and Sweden share the same research article. The results of this study show that there is still less research related to the adversity quotient of mathematics teachers conducted by other countries.

Table 3
Study Country Trend

No.	Country	Frequency
1.	Indonesia	4
2.	Malaysia	1
3.	Filipina	1
4.	Finland	1
5.	Scotland	1
6.	Sweden	1
7.	United States	1

The Second Research Finding
Studying the trend of the adversity quotient of mathematics teachers which includes the trend of the year of the study

Table 4 below shows the trend of the year of the study for the 9 selected articles.
Table 4
Study Year Trend

No.	Year	Frequency
1.	2017	0
2.	2018	1
3.	2019	5
4.	2020	2
5.	2021	1
6.	2022	0

Based on Table 4, most of the selected articles (5 articles) related to the adversity quotient of mathematics teachers were published in 2019, 2 articles were published in 2020 and one article was published in 2018 and 2021. There were no research articles related to the adversity quotient of mathematics teachers published in 2017 and 2022. This trend shows that studies related to the adversity quotient of mathematics teachers conducted by previous researchers since 2017 until now. This trend also shows that the aspect of adversity quotient among mathematics teachers is still less well-known and this is proven through the relatively low number of published articles which is only 9 articles for the year 2017 until now. Academic researchers should realize that the adversity quotient of mathematics teachers has a strong impact on student performance in mathematics subjects. This means that more studies related to the adversity quotient of mathematics teachers need to be conducted by researchers in the future.

The Third Research Finding

Studying the trend of the adversity quotient of mathematics teachers which includes the trend of related variables

Table 5 below shows the list of variables used by previous researchers in the 9 articles that have been selected.

Table 5
Trends of related variables

No.	Related Variable	Frequency
1.	Self-efficacy	2
2.	Use of mathematical applications	1
3.	Logical thinking skills	1
4.	Mathematical comprehension ability	1
5.	Mathematical competency	1
6.	English language proficiency	1
7.	Achievement of mathematical argumentation ability	1
8.	Failure in mathematics	1
9.	Ecological adaptive capacity	1
10.	Mathematics achievement of the students	1
11.	Influence of professional development	1
12.	Professional competency	1

Based on Table 5, it was found that 12 variables have been identified together with the adversity quotient of mathematics teachers in related previous studies. These variables consist of independent variables or dependent variables that can affect the adversity quotient of mathematics teachers. The self-efficacy variable appeared twice in the selected research articles. A total of 11 other related variables were only used once in the articles involved. Variables of self-efficacy, use of mathematical applications, logical thinking skills, mathematical comprehension abilities, mathematical competence, English language competence, achievement of mathematical argumentation ability, failure in mathematics, ecological adaptation capacity, the influence of professional development, and professional competence are directly related to teachers. Meanwhile, the student's math achievement variable is the only correlation variable listed that is related to students or students.

From the highlights of this systematic literature review, the study found that the trend of the country of study and the trend of the year of study related to the adversity quotient of mathematics teachers can be said to be somewhat less diverse. As for the trend of correlation variables for studies related to the adversity quotient of mathematics teachers, it can be said to show diversity even though there have not been many studies that link the listed correlation variables with the adversity quotient of mathematics teachers conducted by previous researchers. Based on this trend analysis, it was found that there have not been many studies related to the adversity quotient of mathematics teachers conducted, and not enough to cover the lack of research on this aspect in the previous few years. Most previous studies related to adversity quotient are more focused on students.

Due to the trend of the study countries, there are only 7 countries that conduct research related to the adversity quotient of mathematics teachers, other countries can be used as a

gap to conduct research on this aspect in future studies. As for the trend of related variables, future researchers can further diversify the variables along with aspects of the adversity quotient of mathematics teachers, such as the economic status of teachers, teaching strategies, and the facilities available in schools or educational institutions. In addition, future researchers can also conduct a study using the variables of relevance listed together with the aspect of adversity quotient of mathematics teachers to further enrich related studies.

Conclusion

The findings of the study show that Indonesia conducts the most studies related to the adversity quotient of mathematics teachers, the year 2019 is the year in which the most studies related to the adversity quotient of mathematics teachers are conducted and the self-efficacy variable is one of the most popular related variables. Most existing studies examine students' adversity quotient, which is a limiting factor for this study. Another limitation is that many words are used to describe adversity quotient, which may cause the search results to only finding 9 related articles. Through this study, the database can be used as best as possible when searching for relevant research articles. This research trend analysis implies that it can help future researchers or those who want to obtain information related to the adversity quotient of mathematics teachers for research purposes and others. Future researchers will also be able to further develop the knowledge, and level of awareness and increase the adversity quotient of mathematics teachers, especially in the context of education in Malaysia. This study is expected to provide ideas to analyze other factors related to the adversity quotient of mathematics teachers. For future research, it is suggested that more studies related to the adversity quotient of mathematics teachers be conducted by various countries and conducted regularly every year so that the trend of the country of study and the trend of the year of study can be diversified will certainly provide benefits to more individuals, especially to mathematics teachers and students. Other trends such as diverse research participants and research methodology trends can also be considered by future researchers.

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