Systematic Literature Review : Students' Mathematical Problem Solving Ability in View of Adversity Quotient Through Problem Based Learning Model with STEM Approach

Popy Nur Hikmah[a*]

[a]*Mathematics Education, FMIPA, Universitas Negeri Semarang, Sekaran Kampus Gunungpati, Semarang 50229, Indonesia*

**Email: Popynurhikmah03@students.unnes.ac.id*

ABSTRACT

Prob;em solving ability is among the learning objectives of mathematics that must be achieved. Problem Based Learning model is one of learning innovation that expected to be able to imorove student's problem-solving abilities. In addition, problem-solving skills are also influemced by the Adversity Quotient and a globally competitive learning approach, namely the STEM approach. This research aims to describe students' mathematical problem solving abilities in view of adversity quotient through a problem based learning model and STEM approach. This research is using Systematic Literature Review (SLR) method. The study was conductud by reviewing 17 journals from 2017-2022. The result showed that learning with Problem Based Learning model and a STEM approach affected students' problem solving abilities. And there is a relationship between adversity quotient and students' problem solving skills.

Keywords : *Problem-solving skills, Adversity Quotient, PBL, STEM*

1. Introduction

Education is one of the factors that determinr the quality of human resources. The govenment has made various efforts to improve education quality through curriculum improvements (Yusri et al., 2018). National Education Regulation No. 22 of 2006 in the Education Unit Content Standard paragraph 1 states that one of the main subjects that must be taught to students is mathematics (Abdiyani et al., 2019). According to Sumarmo in (Sri Septiani & Nurhayati, 2019), it is stated that mathematics has special characteristics, including mathematics as an efficient, meaningful symbol language, and produces mathematical kodels needed in problem solving, other sciences and everyday life prblems. According to NCTM in (Yuhani et al., 2018), stated that the main standards in learning mathematics include communication skills, problem solving, rasoning skills, connection skills and representation.

Problem solving abilities is one of the goals of mathematics learning that must be achieved. Problem solving is the abilites usually related to real problems. Learning to solve problems emphasizes processes and strategies. Therefore, process and strategic skills in solving these problems become basic abilities in learning mathematics (Yuhani et al., 2018). Problem solving is essential in learning mathematics, it can even be said that problem solving as the heart of mathematics means that problem solving ability is a fundanmental skill that students must have in learning mathematics (Abdiyani et al., 2019). In addition, according to Novianti et al (2020) in (Septianingtyas & Jusra, n.d.) said that mathematical problem solving

skills are needed by students not only to facilitate students in learning mathematics but in other learning and in everyday life.

The mathematical problem solving ability of students is still below international standards (Faoziyah, 2021). This is shown in a survey conducted by PISA (*Programme for International Students Assessment*). This survey was conducted in 2018, where the average mathematics score of Indonesian students was 379 from the international average of 489. From these results, Indonesia ranked 72 out of 78 countries involved. According to Effendi (Faoziyah, 2021), students' low problem-solving ability is caused by difficulty in understanding sentences in the problem, students cannot distinguish known information and question requests, have difficulty using known knowledge, weak strategies in converting story into mathematical sentences, and use different ways in planning the resolution of a problem. One other factor is the model of lesson presentation. Therefore, solutions and innovations are needed in mathematics learning, both strategies, methods, models, and appropriate learning approaches whose results are able to improve students' mathematical problem solving abilities. One of the innovations that exist in mathematics learning is problem-based learning or the Problem Based learning model(Yuhani et al., 2018).

According to Arends in (Sri Putri et al., 2019), Problem Based Learning (PBL) is a learning approach, in which students work on authentic problems to build their own knowledge, builds questioning and higher-order thinking skills, develop self confidence and independence. In line with this opinion, Slameto (2013) in (Widyastuti & Airlanda, 2021)states that Problem Based Learning is learning models which in the process provides training and development of problems from students' actual lives to stimulate high-level abilities. Kodariyati &; Astuti (2016) in (Widyastuti & Airlanda, 2021)describes the stages / syntax of the PBL model, including: introducing students to student problems both independently and in groups, presenting work, evaluating and analyzing the problem-solving process that has been carried out. The *Problem Based Learning* (PBL) learning model is expected to help students to get used to solving and analyzing a problem so students' problem-solving skill will be formed optimally.

In addition to an appropriate learning model to increase students' problem-solving skills, a globally competitive learning approach is also needed. 21st century skills must be possessed by the new generation in Indonesia as an effort to face a competitive life in the future. 21st century skills not only equip students to succeed in all areas of school, but they are also provisions for individuals to adapt and thrive in an ever-changing world (P21, 2019). Kelley and Knowles (2016) in (Faoziyah, 2021) stated that integrated STEM education is an approach used to work on two or more STEM fields through STEM practice to connect other STEM fields aimed at improving student learning.

The Mathematical problems abilities can also be influenced by a person's ability to master challenges or commonly referred to as *the Adversity Quotient* (AQ). According to Dewi (2017) in (Yusri et al., 2018) states that *Adversity Quotient* (AQ) or resilience is a person's ability to master existing challenges and turn these challenges into opportunities. Based on student response in solving a problem, AQ is divided into three categories, namely; quitter,

camper and climber. Stoltz (2000) states that not only IQ and EQ but *Adversity Quotient* also have a great influence in determining student success in learning. *Adversity Quotient* can give an impact on students' mathematics learning outcomes, because in learning mathematics students may be faced with mathematical problems that are closely related to everyday life (Nurlaelah et al., 2021).

According to the explanation above, this stdy is aim at describing the results of research related to students' mathematical problem solving ability in view of adversity quotient through a model problem -based learning with a STEM approach.

2. Method

This article uses the *Systematic Literature Review* (SLR) writing method. In this SLR research there are 5 stages, the first stage formulates the problem. In this stage, the author writes a problem statement that will be discussed in the article in depth. Formulate problems by making questions based on the needs of the topic to be chosen, including: (Q1What are the objectives, and research methods used in the article on Students' Mathematical Problem Solving Ability Considered from Adversity Quotient Through Problem Based Learning Model with STEM Approach in 2017-2022?; (Q2) How is the research trend on students' mathematical problem solving abilities viewed from the *Adversity Quotient* through the Problem Based Learning Learning Model with a STEM approach in 2017-2022?

The second step is the Search Process, used to other related references and obtain relevant sources and is used to answer research questions (RQ). The process is using *a Google Scholar* database with keywords, mathematical problem solving skills*, Adversity Quotirnt,* Problem Based Learning *learning models*, and STEM.

The next step is the inclusion and exclusion criteria. Inclusion and exclusion criteria include

Table 2. 1 Exclusion Inclusion Criteria

Inclusion	Exclusion
National and international articles that are appropriate to the toic students' mathematical problem solving abilities in view of adversity quotient Na through the problem-based learning model with STEM.	National and international articles that are not appropriate to the topic students' mathematical problem solving abilities in view of adversity quotient Na through the problem-based learning model with STEM
National and international articles that appropriate to the topic of research.	National and international articles that are not appropriate to the topic of research
Articles that published in 2017-2022	Articles that published before 2017

The articles is used Indonesian or English language	The articles is used instead of Indonesian and English

The next step is Quality Assessment (QA). That is, evaluating the data obtained according to the following criteria.Quality Assessment or QA for this study is (QA1) Does the article published in 2017-2022? And (QA2) Does article show the objectives of the study, the type of research, or the research design used?. The fifth is *data collection*. The data collected to be studied in this study is primary data. Then analyze the data that has been obtained based on RQ. The last step is *deviation from protocol*.

3. Result And Discussion

The literature review search was conducted in April 2022, articles collected by year of publication between 2017-2022 using the keywords "problem-solving ability", "Adversity Quotient" and "Problem Based Learning" and "STEM". Obtained 17 articles relevant to the keywords used. The data from this study are documented as shown in table 2.

Table 3. 1 Number of studies based on characteristics

Characteristics	**Information**	**Frequency**
Year of Publication	2017	1
	2018	3
	2019	5
	2020	4
	2021	3
	2022	2
Education Level	Elementary School	4
	JHS	8
	SHS/Vocation	5
	College	1
	Kuantitatif	3
	Mixes Method	3

Reseach Metod	Experiment	4
	Quasi-Experimental	1
	True-experimental	1
	Pre-experimental	2
	Descriptive Research	2
	Qualitative	1
	Ex-Post Facto	1

Table 3. 2 Research Results Related to Students' Mathematical Problem Solving Ability in Review of Adversity Quotient Through Problem Based Learning Model with STEM Approach

Sources	Author, Years	Reseaech Method	RESUME
Google Scholar	(Afri, 2018)	Quantitative approach with correlational research methods.	Junior high schools' mathematical problem solving abilities have a positive and significant relationship with adversity quotient. For the percentage of adversity quotient contribution to problem solving ability is 62%.
Google Scolar	(Septianingtyas & Jusra, 2020)	Quantitative Research Methods	A significant relationship exists between mathematical problem-solving abilities and AQ.
Google Scholar	(Arifin, 2020)	Experimental Research	Differences are observed in the fighting power and mathematical problem-solving skill of PGSD students between the STEM problem-based learning models and convential model.
Google Scholar	(Hulaikah et al., 2020)	Quai-experimental approach	Significant differences were seen in problem solving ability between students with high and low adversity quotient.

Google Scholar	(Yuhani et al., 2018)	Experimental Method	The problem solving ability of students who utilize the Problem Solving Model approach in learning is better than that of a group of students who receive ordinari learning practice.
Google Scholar	(Sa'bani, n.d., 2017)	True experimental design	The mathematical problem solving abilities of class X students of Ngunut High School in the 2017/2018 academic year are influenced by the Problem Based Learning model.
Google Scholar	(Iolanessa et al., 2020)	Pre-eksperimental desain *one group pretest-posttets*	The problem-solving ability of students in the medium category was increased after the application of the PBL (Problem Based Learning) model with the STEM approach.
Google Scholar	(Sri Putri et al., 2019)	*Pre-eksperimen*	Better problem solving abilities can be achieved by students through the utilization of the PBL model, particularly for those who are included in the high problem-solving ability category.
Google Scholar	(Yusri et al., 2018)	*Pra-Eksperimen*	An effect is observed on students' mathematical problem-solving abilities in class of VII of SMP N 1 Pangkajene after the application of the Problem Based Learning model.
Google Scholar	(Abdiyani et al., 2019)	Descriptive Research with a Qualitative Approach	All four step of Polya's problem-solving cannot be properly implemented by quitters students, the resul and process they have done cannot be rechecked by campers students, and all four step of Polya's problem-solving can be properly implemented by climbers students.

Google Scholar	(Nurlaelah et al., 2021)	Ex-Post Facto Research	The mathematical problem solving abilities of elementary school students in Malili District are influenced, both jointly and partially by Adversity Quotient and self determination.
Google Scholar	(Sri Septiani & Nurhayati, 2019)	*Mixes methods with isequential explanatory type.*	Students' mathematical problem-solving abilities through PBL achieved learning mastery.
Google Scholar	(Febrianti et al., 2022)	Descriptive research with a qualitative approach.	The result indicate that two steps can be carried out by quitters students, three steps can be carried out by campers, and four steps of Polya's problem-solving can be carried out by climbers.
Google Scholar	(Anwar & Rusani, 2021)	Qualitative research with descriptive type	The results showed that subjects with the campers type in the questions given tended to be able to determine the necessary requirements in the stage of compiling the problem, to be able to solve the problem with the correct and appropriate steps, but tended to not be able to get the information that was already there to re-check the answers.
Google Scholar	(Faoziyah, 2021)	Classroom action research	It was revealed by the result that the mathematical problem-solving ability of X-Multimedia 1 students at SMK Muhammadiyah Tegal City could be improved through the application of the PBL-Based STEM Approach.
Google Scholat	(Nabila et al., 2022)	Pre-test post-test experimental research	Problem solvinga bilities after the implementation of STEM-based PBL-based learning model has the high category.

Google Scholar	(Naimnule et al., 2020)	Sequential mixed methods	There are differences in solving ability in each category.

Of the 17 articles that have been reviewed, there is a relationship between the STEM-based problem-based learning model and problem-solving abilities, as well as a relationship between Adversity Quotient and problem-solving abilities.

1. **What are the objectives, and the research method used in the article about Students' Mathematical Problem Solving Ability in View of Adversity Quotient Through the Problem Based Learning Model with the STEM Approach?**

Figure 1 presented below depicts the research conducted between 2017 and 2022 on students' mathematical problem-solving abilities concerning the Adversity Quotient using a problem-based learning model with the STEM approach. A total of 17 articles yielded four research focuses. The research focused on assessing the effectiveness of learning using a PBL-based STEM approach in enhancing students' mathematical problem-solving abilities, accounting for 37% of the research. In conclusion, the research conducted between 2017 and 2022 on students' mathematical problem-solving abilities in relation to the Adversity Quotient through the Problem Based Learning Model with the STEM Approach predominantly aimed at improving students' mathematical problem-solving abilities.

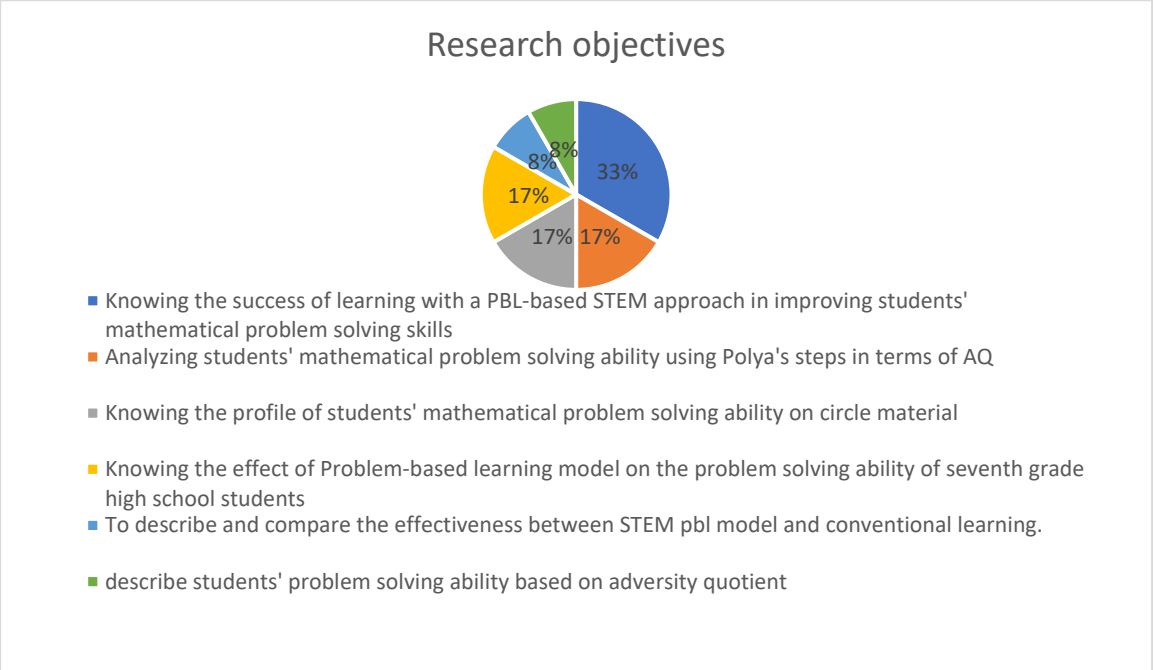

Figure 3. 1 Research Objectives

Meanwhile, the focus of the analysis of the ability to solve students' mathematical problems using polya steps in terms of AQ shows a proportion of 18%. The tendency to focus on analyzing mathematical problem solving abilities in terms of AQ can still be developed further.

As shown in Figure 2, there are 17 articles with 9 research methods used in examining students' mathematical problem solving ability in terms of adversity quotient through a problem-based learning model with a STEM approach published in 2017-2022. Experimental research with a proportion of 22%, illustrates that this type of research tends to be widely used in researching students' mathematical problem solving ability in terms of adversity quotient through a problem-based learning model with a STEM approach.

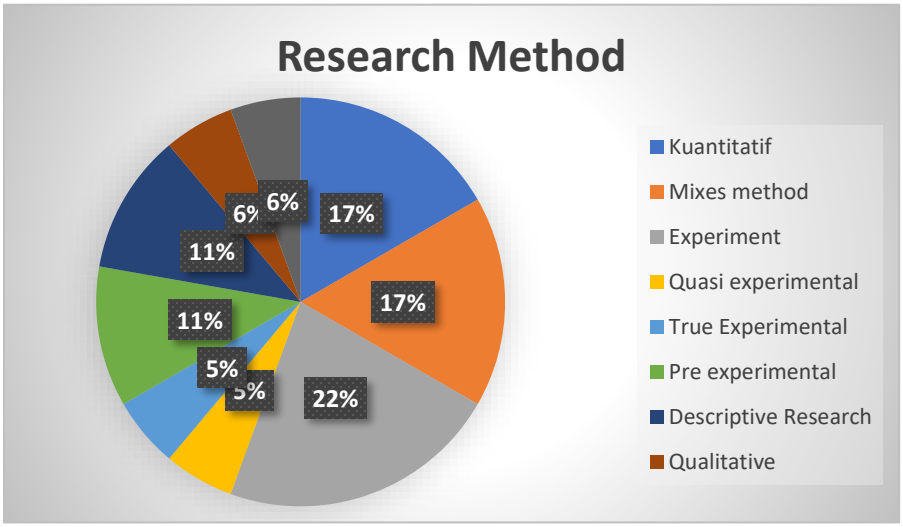

Figure 3. 2 Research Method

2. How the research trend of students' mathematical problem-solving abilities is reviewed from the *adversity quotient* through a problem-based learning model with a STEM approach in 2017-2022.?

Figure 3 shows that research on students' mathematical problem-solving abilities is reviewed from the *adversity quotient* through a problem-based learning model with a STEM approach in 2017-2022. Research on students' mathematical problem-solving abilities is reviewed from the *adversity quotient* through a problem-based learning model with a STEM approach in 2017-2022 junior high school with a percentage. It can be concluded that research on students' mathematical problem solving abilities in terms of *adversity quotient* through problem-based learning models with a STEM approach tends to be carried out at the junior high school education level.

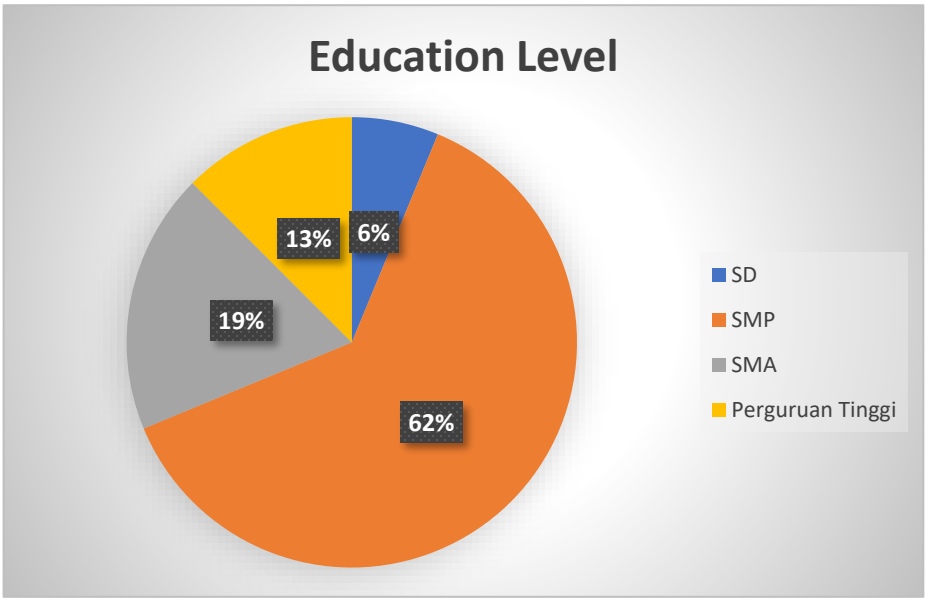

Figure 3. 3 Education Level

4. Conclusion

As a result of conducting a literature review of 17 papers published in 2017-2022, the conclusions of the literature review are as follows. First, after applying the problem-based learning learning model through the STEM approach, it is effective for students' mathematical problem solving. ability. Second, the higher the adversity index, the higher the students' ability to solve math problems. This can be seen in several studies discussed in the discussion section. Third, studies on problem-solving ability from the perspective of Adversity Quotient using the problem-based learning model tend to be centered on middle school diagrams. Based on the conclusion of this study, it is expected that teachers should be able to apply a problem-based learning model as a STEM approach to improve students' mathematical problem-solving ability, and that teachers will also be able to develop adversity index mental intelligence attitude towards students.

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