Systematic Literature Review; Disposition towards Mathematical Problem Solving in Problem-Based Learning with Realistic Mathematical Approach assisted by *Autograph*

Sayyida Adelia Febrianti[a]

[a] *Universitas Negeri Semarang, Kota Semarang 50229, Indonesia*
** Alamat Surel: sayyidayea@students.unnes.ac.id*

Abstract

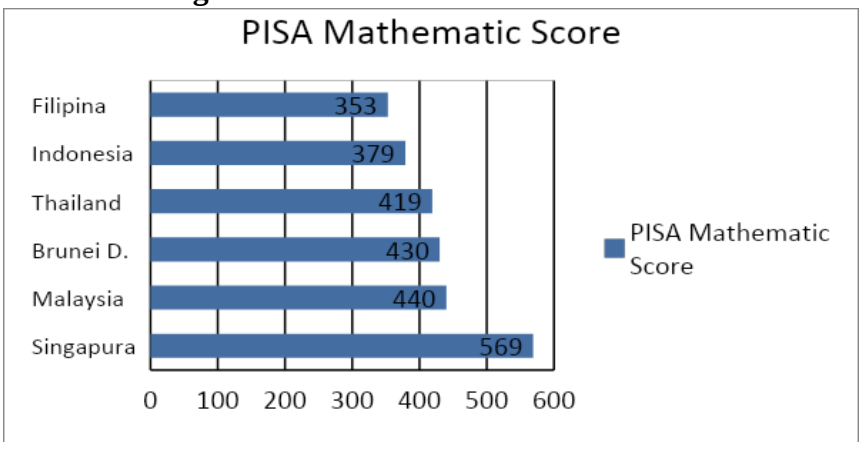
Education continues to innovate to achieve the skills needed in the current era. This study uses the SLR method to examine the objectives, types, previous related research designs, and research trends on the influence of dispositions on students' mathematical problem solving in problem-based learning with a realistic mathematics approach assisted by autographs in the 2017-2023 range. There are 23 national and international articles published obtained from the Google Scholar database. The results of this study indicate that students' mathematical dispositions play a major role in students' mathematical problem solving abilities and problem-based learning with a realistic mathematical approach assisted by Autograph effectively improves students' problem solving abilities.

Keywords:Mathematic
Problem Solving, Disposition, PBL, Realistic Mathematic, Autograph.

1. Introduction

Mathematics learning is organized to meet the demands of the times where science and technology are developing rapidly. Mathematics learning in Indonesia so far has problems in its process. Learning mathematics is actually not just understanding the material and memorizing formulas and then being able to do the questions. The process of learning mathematics that is often encountered is still not able to facilitate students to prepare themselves to face the changing times. In the world of education, there is a test called the PISA test. In Indonesia's 2018 PISA National Report, PISA tests how well students expand analysis based on their knowledge and apply it in unusual situations.(OECD, 2019).

Figure 1. 1 Southeast Asia PISA 2018



Source: Organisation for Economic Co-operation and Development

The scores achieved by Indonesian students indicate that Indonesian students have not yet reached the minimum competency level in mathematics. This test provides an illustration of the extent to which Indonesian students master the skills and knowledge that are important for them to participate fully in society. NCTM sets five standards of mathematical ability that must be realized in learning mathematics, namely problem solving ability, reasoning ability, communication ability, connection ability, and representational ability.(Yunita & Tamur, 2022). The directorate of elementary education teachers in its news reveals that the PISA mathematics process consists of: (1) Being able to formulate problems mathematically; (2) Able to use concepts, facts, procedures, and reasoning in mathematics; (3) Interpret, apply, and evaluate the results of a mathematical process. This process has similarities with the problem-solving ability indicator. Polya states in his book that indicators of problem-solving ability are: (1) Understand the problem and identify what is being asked, analyze the data in the problem, and determine the solubility of the problem; (2) Create a plan that draws on prior knowledge to develop a suitable solution technical framework; (3) Solving the problem using the solution technique that has been chosen, and (4) Checking the correctness of the solution(Widjajanti, 2009). According to the PISA score, the PISA mathematical process, and the Problem Solving Ability indicator, it can be said that the problem solving ability of Indonesian students is still relatively low. Indonesian students lack skills in dealing with situations that require the ability to solve problems using mathematics.(Wuryanto, 2022)

There are several factors that affect students' mathematical problem solving abilities in general, namely consistent practice, self-motivation, self-confidence, the belief that mathematics is useful in everyday life.(Fadillah & Wahyudin, 2022), and appreciation of learning mathematics (Mayratih et al., 2019). Student success in solving problems can also be supported by psychological aspects related to students' attitudes in the learning process (Syarifah et al., 2018).

Internal factors to achieve mathematical problem solving abilities need to be supported by external factors such as the learning model implemented. Problem-Based Learning is one of the learning methods that can be applied to achieve mathematical problem-solving skills(Andesa & Fitriani, 2022). Problem-based learning to improve problem-solving skills will be more effectively supported by a Realistic Mathematics approach because it takes contextual problems. This approach gives freedom for students to describe, interpret and solve problems with the knowledge they have(Septriyana et al., 2019). Learning at this time can not be separated from the name of technology. The right technology can support the process to achieve the desired capabilities. Software is a technology product that is expected to help construct problem-solving abilities.

Based on the description of the background above, the objectives of this study are specified to: (1) Describe the objectives, types, and research designs used; (2) Describe research trends on the influence of dispositions on solving students' mathematical problems in problem-based learning with a realistic mathematical approach assisted by autographs in 2017-2023; (3) Knowing the effect of disposition

on students' mathematical problem solving in problem-based learning with a realistic mathematical approach assisted by autographs

2. Theoretical Review

Disposition is part of the soft-skills and attitudes that must be considered (Depi et al., 2022). With a disposition, it is hoped that students can be responsible for the learning process and are more persistent and diligent in solving problems in the learning process. Students' positive attitudes can be seen from their self-confidence in solving problems, being open to problems, high curiosity, and pleasure towards mathematics (Mayratih et al., 2019).

Problem-based learning emphasizes students to solve real-life problems that are presented by digging up as much information as possible. Problem-based learning has many advantages including involving students in many learning activities so that knowledge is absorbed evenly, this model makes students actively solve problems and requires higher-order thinking skills so that students can experience learning mathematics (Eviyanti et al., 2017). Students need learning where students are involved in problem solving so that they can solve the problems presented. This experience is important for their life (Andesa & Fitriani, 2022)

RME is approach in learning that make students have the opportunity to reinvent mathematical ideas and concepts with the help of adults by exploring various real-life situations and problems (Ulandari et al., 2019). Autograph software is one of the media that can be utilized in studying various materials related to mathematics. This software helps students carry out new experiments, test more problems so that in their experiments students can find, construct, and conclude mathematical principles and finally understand the ability of mathematics itself (Lubis et al., 2020).

3. Method

This study uses the Systematic Literature Review (SLR) method with the aim of identifying, reviewing, evaluating, and interpreting previous research (Triandini et al., 2019). Systematic Literature Review has several processes. Before interpreting which meets the criteria, it is necessary to identify and evaluate according to the type of research and empirical data presented (Trimurtini et al., 2022).

According to (Triandini et al., 2019) the steps taken in the Systematic Literature Review method: First, Research Question (RQ).A Research Question (RQ) is a research question that is created based on the needs of a selected topic.. RQ in this study are:

RQ1. What are the objectives and types of research chosen in research on mathematical problem solving abilities in terms of mathematical dispositions in problem-based learning with a realistic mathematical approach assisted by autographs in the 2017-2023 range?

RQ2. How are research trends influence of dispositions on student's mathematical problem solving in problem-based learning with a realistic mathematics approach assisted by Autograph in 2017-2023?
RQ3. How does disposition, problem-based learning, realistic mathematical approach, and autographs affect students' mathematical problem solving?

Second, Search Process. Search Process is a search process used to obtain relevant sources to answer RQ and other related references. Search Process can be done using a Search Engine. This information was collected from a specific Google Scholar with the keywords "mathematical disposition", "problem-solving ability", "problem-based learning", "realistic mathematical approaches", "autograph", and "mathematical problem-solving". It was pulled from several databases to match the data. "Problem-based learning". "Mathematics Problem Solving Skills", "Realistic Mathematical Approaches to Problem Solving Skills" and "Autograph of Math Problem Solving Skills" will be distributed 2017-2023. Third, Inclusion and Exclusion Criteria. Inclusion and Exclusion Criteria are used to decide whether the data found is suitable for use in SLR research or not.

Table 3. 1 *Inclusion and Exclusion* Criteria

Inclusion	*Exclusion*
National or international articles that are relevant to the study of literature: the influence of dispositions on students' mathematical problem solving in problem-based learning with a realistic mathematics approach assisted by autographs	National or international articles that are irrelevant to literature studies: the influence of dispositions on students' mathematical problem solving in problem-based learning with a realistic mathematics approach assisted by autographs
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 not Indonesian or English

Fourth, Quality Assessment (QA). Quality Assessment is a data evaluation process according to the Inclusion and Exclusion Criteria. QA in this study includes:

QA1. Was the source article published in 2017-2023?
QA2. Are the articles focusing on dispositions, students' mathematical problem solving abilities, PBL, RME, and autographs
QA3. Does the article write down the objectives, types, and research design used in the literature study article: the influence of dispositions on students' mathematical problem solving in problem-based learning with a realistic mathematical approach assisted by autographs.

Fifth: Collect Data. Data collection is the phase of collecting survey data. The data used in this study are primary data. Primary data is information collected through research, interviews, and observations and customized to your needs. This study collected domestic and foreign journals related to the selected topics and titles as primary data. The sixth is data analysis. Collected data were analyzed according to the RQ. Finally, a deviation from the protocol. There was one change in the study. It narrows down the words corresponding to the database's search terms.

4. Discussion

We found 23 articles related to the keywords you used. Subsequently, from 2017 to 2023. Then, the articles were reviewed until the influence of mathematical dispositions in problem-based learning with a realistic mathematical approach assisted by autographs was found on students' mathematical problem solving abilities.

RQ1. What are the objectives and types of research chosen in research mathematical problem solving abilities in terms of mathematical dispositions in problem based learning with realistic mathematical approach assisted by autograph in the 2017-2024 range?

The focus of research in this article is directed to students' mathematical problem solving abilities. Figure 2 below illustrates the number of articles found from 2017-2023 which have relevance to mathematical problem solving abilities in terms of mathematical disposition in problem-based learning with a realistic mathematical approach assisted by autographs in the 2017-2023 range..

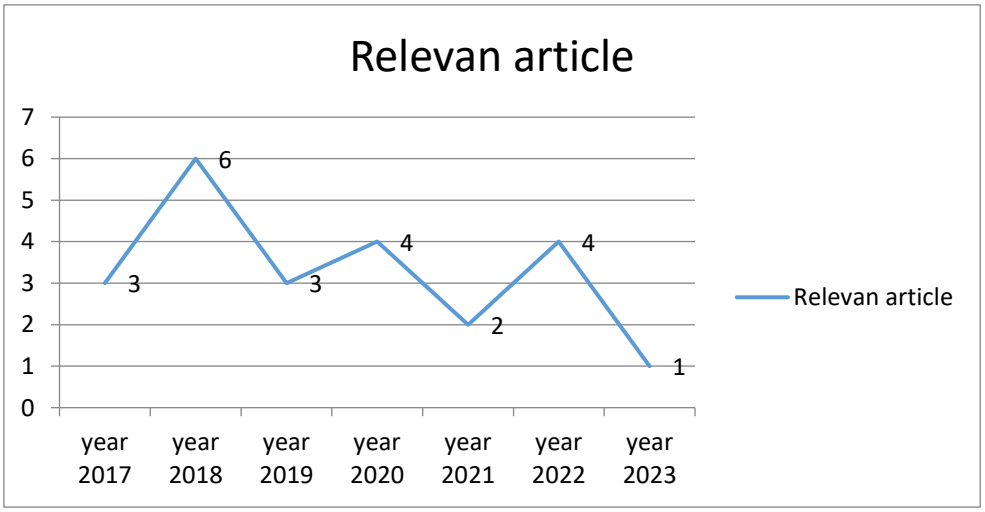


Figure 4. 1 Relevan Article Diagram

The table below describes the number of findings and the research focus of the literature findings each year.

Table 4. 1 Table of Number of findings and research focus

Year	Number of findings and research focus
2017	3 (3) PBL-Mathematical Problem Solving Ability
2018	6 (1) Disposition-Mathematical Problem Solving Ability (2) RME-Mathematical Problem Solving Ability (2) Autograph-Mathematical Problem Solving Ability (1) RME-Autograph-Mathematical Problem Solving Ability
2019	3 (1) Disposition-Mathematical Problem Solving Ability (1) PBL- Mathematical Problem Solving Ability (1) RME- Mathematical Problem Solving Ability
2020	3 (2) RME- Mathematical Problem Solving Ability (2) RME-Autograph-Mathematical Problem Solving Ability
2021	2 (2) Disposition-Mathematical Problem Solving Ability
2022	4 (2) Disposition-Mathematical Problem Solving Ability (2) PBL- Mathematical Problem Solving Ability
2023	1 (1) RME-Autograph-Mathematical Problem Solving Ability

Figure 4. 2 below illustrates the focus/objectives of research on mathematical problem solving abilities in terms of mathematical disposition in problem-based learning with a realistic mathematical approach assisted by autographs in the 2017-2023 range. The focus that has been widely researched is the influence of mathematical disposition on mathematical problem solving abilities with a percentage of 26%.

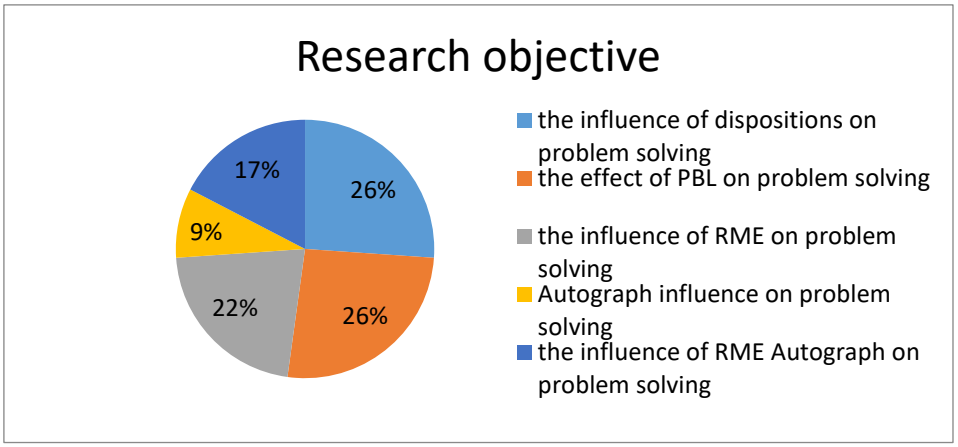


Figure 4. 2 Research Objective Diagram

Next, the impact of problem-based learning on math problem-solving skills was the same, 26%. Moreover, the effect of his RME approach on his ability to solve math problems is 22%. The impact of Autograph on students' math problem-solving skills has been studied, but the research literature is still sparse, so there is an opportunity for deeper research to promote learning media to improve math problem-solving skills.

Of the 23 articles, **Figure 4. 3** below, used in research related to mathematical problem-solving skills in terms of mathematical properties in problem-based learning with a realistic mathematical approach supported by autograph in 2017. We commonly use three types of studies that have been The period is 2023, i.e. quantitative, qualitative research and mixed methods.

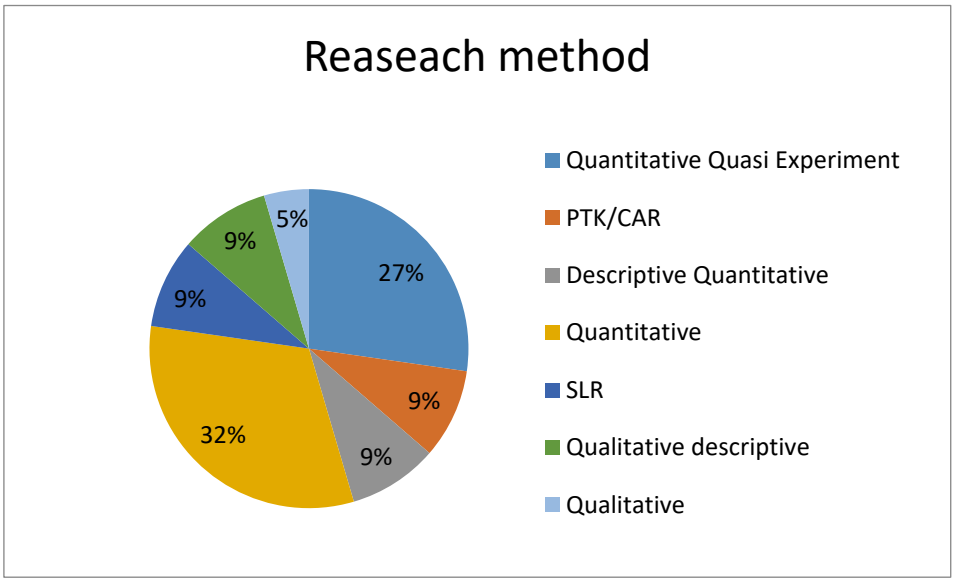


Figure 4. 3 Research Method Diagram

Then from the set of quantitative research found quasi-experimental quantitative, PTK/CAR, descriptive quantitative, and quantitative. The qualitative research set found SLR and qualitative. The research method that is widely used in research focusing on dispositions, students' mathematical problem solving abilities, PBL, and autographs is the quantitative method followed by quasi-experimental quantitative.

RQ2. How are research trends influencing dispositions on solving students' mathematical problems in problem-based learning with a realistic mathematics approach assisted by Autograph in 2017-2023?

During the last six years of research, bibliographic data were acquired and processed with VOSviewer and are shown in the figure below. The same color indicates the same cluster, and the size of the circle indicates the popularity of the keyword. Lines between circles indicate direct relationships between keywords. The larger the circle, the more keywords used in the survey. This indicates that the variable has been extensively studied previously (Trimurtini et al., 2022).

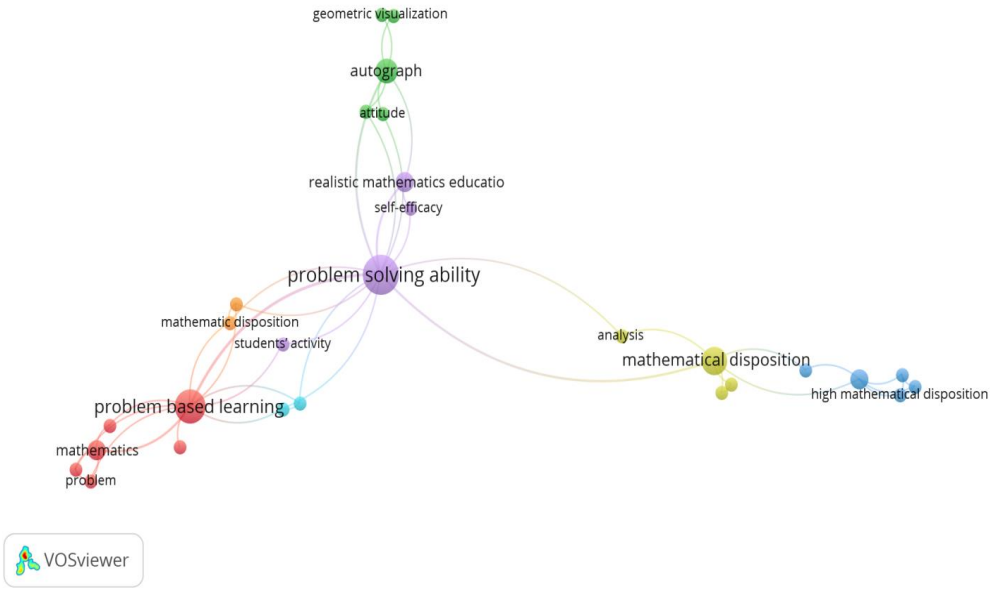


Figure 4. 4 VosViewer based on Keyword

According to the picture above, there are 4 clusters with the largest circle found in the purple cluster on the keyword problem solving ability with keyword problem solving ability. There is a lot of research about problem solving ability with realistic mathematics education. The purple cluster is related to the red cluster with the most popular keywords problem based learning, the yellow cluster has the most popular keywords

mathematical disposition, and the green cluster has the most popular keywords autograph.

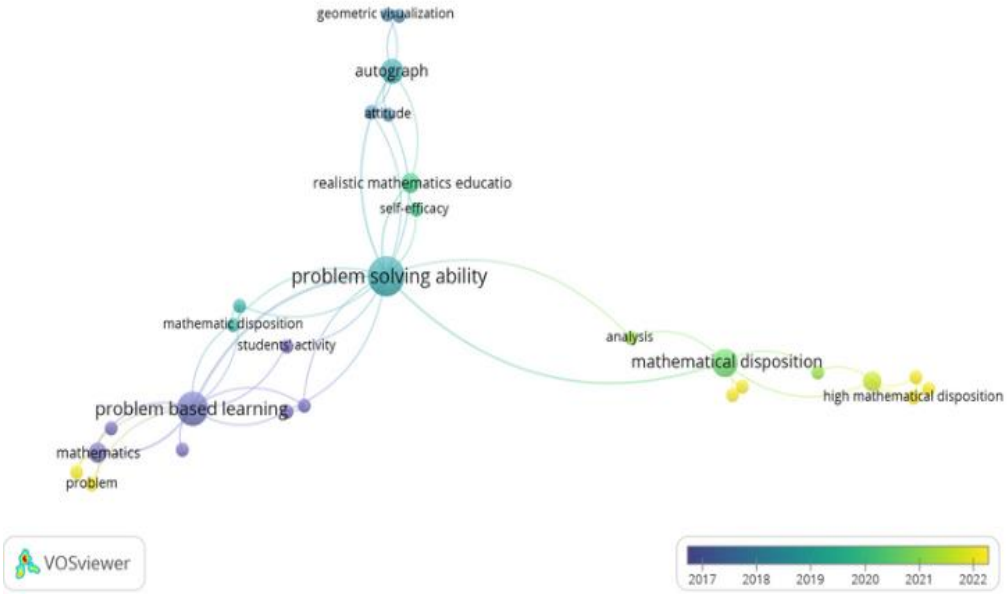


Figure 4. 5 VosViewer based on Year

The VosViewer results above show research trends from year to year. According from the results above, problem based learning is research that has been widely researched from 2017 and what has been widely researched in 2022 and above is students' mathematical dispositions.

RQ3. How does disposition problem-based learning, realistic mathematical approach, and autographs affect students' mathematical problem solving?

According to Puspitasari(2017) Mathematical disposition is one of the factors that determine student success in the learning process, students with good mathematical dispositions can solve mathematical problems well (Mayratih et al., 2019).

One of the reasons for the low ability to solve mathematical problems is the tendency of students to have a less positive view of mathematics, they consider that mathematics is difficult and quite long to complete(Depi et al., 2022). The disposition of mathematics is a positive way of viewing students towards mathematics because with a disposition students have an inherent positive attitude in the form of a tendency to be conscientious, organized, tenacious, persistent, confident, and diligent in behaving that leads to the achievement of learning objectives(Depi et al., 2022). Students' positive attitude towards mathematics is one of the success factors in learning mathematics (Muflihatusubriyah et al., 2021). Mathematical

disposition plays an important role in learning mathematics because with a positive attitude towards mathematics students can generate great enthusiasm to solve problems (Depi et al., 2022). Widyasari dkk (2016) stating that this liking attitude builds a positive attitude contained in the disposition of mathematics and has a good effect on student achievement (Depi et al., 2022). According to Zozah dkk. (2017) Students' mathematical dispositions manifest through the attitudes and behavior of students in choosing problem-solving strategies(Depi et al., 2022).

According to research of Putri Sukma Dewi, et. al. (2019) the mathematical problem-solving abilities of students who take problem-based learning are better than the problem-solving abilities of students who take conventional learning. Problem-based learning also increases the percentage of each indicator of mathematical disposition achieved compared to conventional learning. Students who are taught using the problem-based learning model have better mathematical problem-solving abilities than learning using conventional models. It can be seen from the average test of students who are taught with problem-based learning, which is higher than students who are taught using conventional models. (Amalia et al., 2017).

Problem-based learning involves high student activity. Students become active in understanding problems, conveying ideas, and analyzing when they encounter problems(P. S. Dewi & Septa, 2019). Through solving mathematical problems in problem based learning, students are directed to develop their abilities in constructing knowledge, solving problems in various contexts related to mathematics, applying various strategies in the problem solving process (Simamora et al., 2017). Problem based learning provides opportunities for students to build and gain experience from mathematics itself (Simamora et al., 2017). This experience then trains students to think logically, analytically, systematically, critically, and creatively in dealing with problems (Eviyanti et al., 2017).

Distribution of the analysis of the influence of RME on students' problem-solving abilities in the line material H_o accepted and H_a rejected so it is proven that there is a significant influence between RME and mathematical problem solving abilities (Kosim et al., n.d.). Students' problem-solving abilities increased after using learning materials based on the RME approach and showed that learning materials using the RME approach were things that should be considered in an effort to maximize student mathematics achievement(Ulandari et al., 2019).

The RME approach trains students to be more active and creative in constructing and expressing ideas. The RME approach begins by providing contextual problems, then students are given the opportunity to use their

knowledge to develop a solution strategy so as to increase the ability to identify the adequacy of the elements needed, understand the problem, find variations in problem solving strategies and interpret the results of problem solving.(Septriyana et al., 2019). RME was responded positively by students because of the contextual presentation of problems, students can also use their own strategies based on their knowledge and experience not according to predetermined ways. This is in accordance with the characteristics of RME namely 'students free production. Such learning contributes greatly to the ability to solve mathematical problems(Gee et al., 2018).

The application of ICT(Autograph) meets the criteria of effectiveness and the average value of learning autograph media is higher than learning using geogebra media (M. Dewi & Azmi, 2018). The increase in mathematical problem solving abilities and students' interest in being taught realistic mathematics through autograph learning is higher than students who receive general learning. Learning using a realistic approach assisted by autographs achieves higher indicators of problem solving ability as well as increases the effectiveness of delivering learning material (Puspa & Prasetya, 2023).

5. Conclusion

According to the existing research trends of Disposition to Mathematical Problem Solving in Problem-Based Learning with a Realistic Mathematical Approach assisted by Autographs in the 2017-2023 period, this topic is quite in demand, especially the effect of RME and Disposition on problem-solving abilities, but for the autograph itself it is a very interesting topic. has recently been of interest in research efforts to improve students' mathematical problem solving abilities. Meanwhile, Problem Based Learning itself is a well-known learning model in an effort to improve problem-solving skills so that it is quite common in search engines. Based on research on the Disposition to Mathematical Problem Solving in Problem-Based Learning with a Realistic Mathematical Approach assisted by Autographs in the 2017-2023 year each component effectively increases students' problem-solving abilities according to the statements in the previous discussion.

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