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Systematic Literature Review: Students' Mathematical Literacy Ability Through the Problem Based Learning Model

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Abstract: This research aims to examine several literatures related to the Problem Based Learning learning model on mathematical literacy abilities. The research method used in this research is the SLR method. Journal searches were carried out using the keywords PBL learning model and mathematical literacy skills published in the 2019-2023 period obtained with the help of the Publish or Perish application. The results of this research show that: 1) the problem-based learning model can improve students' mathematical literacy skills; 2) research related to the PBL learning model on students' mathematical literacy abilities in the 2019-2023 period tends to be mostly carried out in 2021, at junior high school level, and is a type of quantitative research.

Keywords: mathematical literacy skills, problem-based learning, systematic literature review

Introduction

The main aspect that influences the progress of a country is education. The definition of education based on Law no. 20 of 2003, regarding the "National Education System" namely "education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble morals, and skills needed by himself, society, nation and state". So, the existence of education becomes an important asset to educate students' intellectual and emotional intelligence in facing the future in accordance with the national education goals stated in the 1945 Constitution. Based on the opinion expressed by Bolstad, (2020) the focus of current education programs is optimizing students' abilities and insights so that able to adapt and handle all the problems that occur in society due to the flow of globalization and progress of the times.

The Indonesian government continues to optimize and develop the education system so that educational goals can be achieved and social life can be created side by side with technology and fast communication and easy access to information. Progress in the field of technology cannot be separated from the impact of developments in mathematical science. So mathematics is one of the main factors influencing technological development. Therefore, students are required to study mathematics so that students are ready to face all forms of changing times.

In this era, mathematics plays an important role in life. This condition requires the application of learning models in the form of observation, question and answer, practice, reasoning, testing, analysis, and making instruments to make them more meaningful (Kemdikbud, 2015). Current mathematics learning should not only be focused on making students good at calculating and finding answers, which indirectly only consist of activities in implementing pre-existing concepts, but students must be able to analyze, identify and discover concepts. So, to achieve this goal optimal mathematical literacy is needed.

The definition of mathematical literacy is based on Ojese's opinion in (Kusumawardani, Wardono, & Kartono, 2018), namely skills in identifying and applying basic mathematical knowledge to everyday problems to find solutions. The existence of mathematical literacy makes it easier for individuals to make the right decisions through the application of mathematical functions in everyday life. The scope of mathematical literacy relates to skills in solving problems mathematically and effectively, elaborating ideas, providing arguments, and analyzing cases. The function and role of mathematical literacy is broadly described implicitly in the objectives of mathematics learning.

However, facts in the field reveal that the level of mathematical literacy is still in the low category. Based on the results of the 2015 PISA test, of the six levels of mathematical ability, students only occupy the first level with a mean score of 375. This score is far from the international mean score of 500 with standard level 3. This condition makes Indonesia occupy the 3rd position. 69 of 76 countries. The main factor that causes students' mathematical literacy levels to be at level 1, far from the standard, is the lack of familiarization that students receive to complete case studies that require reasoning,

creativity, arguments, and the ability to contextually connect mathematical models such as PISA questions.

Steps that can be taken to address the problem of low mathematical literacy are by implementing a learning model that is oriented towards increasing literacy. According to literature studies, the appropriate type of learning model is the problem-based learning model.

According to Yusri (2018), in the problem-based learning model the learning system is based on case studies that take problems in the surrounding environment where these problems can encourage students to learn facts or mathematical concepts that will be studied. Then Octavia, (2020:21) emphasized that in the problem-based learning model, students are required to investigate real case studies. The characteristics of problem-based learning model learning are that education acts as a facilitator when students experience difficulties in solving the problems given and students are required to identify these problems individually according to their understanding. This learning model can help students deal with broader problems.

According to the previous background explanation, the researcher has an interest in conducting research with the aim of identifying and analyzing the results of previous research which discusses the implementation of the problem-based learning model to increase students' mathematical literacy.

Methodology

The data analysis method implemented by researchers is SLR (Systematic Literature Review), namely a literature review technique that involves interpretation, assessment and identification of findings from previous research to find answers to research questions that have been previously determined (Kitchenham & Charters, 2007).

Writing Systematic Literature Review (SLR) journals/articles requires paying attention to existing procedures, as explained by Triandini et al., 2019, including:

1. *Research Questions* (Research question)

   This stage is related to preparing questions that are tailored to the research topic. In this research there are 3 research questions (RQ) as follows: (RQ1) "What is the description of the relationship between the Problem Based Learning learning model and increasing students' mathematical literacy skills?"; (RQ2) "What are the research trends in the 2019-2023 period regarding the Problem Based Learning learning model on students' mathematical literacy abilities?"
2. *Search Process* (Search Process)

   Activities carried out to answer research questions by utilizing references that are relevant to the research topic are called search processes. Then the steps taken by researchers to make it easier to find relevant literature studies were using the

Publish or Perish application so they could access the Crossref and Google Scholar databases. Then the keywords used are "Problem Based Learning learning model and mathematical literacy skills", where the articles searched and collected are articles published or published in the period 2019 to 2023.

3. *Inclusion Criteria* (Inclusion Criteria)

   This process is related to the identification and selection of data that is suitable for involvement in SLR research. There are two characteristics implemented in data selection, namely exclusion and inclusion criteria, as represented in Table 1.

Table 1. Inclusion Criteria

Criteria	Type
Literature is a national or international journal that discusses the Problem Based Learning learning model and students' mathematical literacy abilities	Inclusion
Literature published in the 2019-2023 period	Inclusion
Literature uses Indonesian or English	Inclusion
Garuda, Scopus, Sinta, or Google Scholar indexed literature	Inclusion

4. *Quality Assessment* (Quality Assessment)

   This stage is related to the process of evaluating data from SLR research results by asking questions to assess the level of quality, where questions related to quality assessment include:

   QA 1. "Does the journal explain the Problem Based Learning model and students' mathematical literacy skills?"
   QA 2. "Is the journal published in the 2019-2023 period?"
   QA 3. "Does the literature use Indonesian or English?"
   QA 4. "Is the literature indexed by Garuda, Scopus, Sinta, or Google Scholar?"

   For each QA that has been determined, an assessment can be carried out with the provisions Yes (Y) on statements that are in accordance with the QA and No (T) on statements that are not in accordance with the QA.

5. *Data Collection* (Data collection)

   The type of data source implemented in research is secondary data sources obtained from two application methods, namely, 1) documentation method, in the form of uploading previous research data that has been obtained to delay software and 2) library study method to find previous research that is relevant to the research topic.

6. *Data Analysis* (Data analysis)

This stage is related to the analysis of previously collected data. The results of this analysis will show and answer the Research Question that was set in step 1.

7. *Deviation from Protocol* (Report Deviation).
   This stage is related to refining and adjusting word matches to search keywords in the database.

Result and Discussion

Search Process Results and Inclusion Criteria

When carrying out the search process using Publish or Perish using the keyword "Problem Based Learning learning model and mathematical literacy skills" 500 journals and articles were obtained. Then the researchers filtered based on the year of publication, namely 2019-2023 and articles had to meet the exclusion and inclusion criteria. So from this filtering we obtained 12 national and international journals and articles indexed by Garuda, Scopus, Sinta and Google Scholar. Data from the 12 articles are presented in Table 2.

Table 2. Classification of Selected Literature

No	Writer	Journal Name	Types of research	Level	Index
1	Kafiar et al, (2021)	Tambusai Education Journal	Quantitative	JUNIOR HIGH SCHOOL	Sinta 6
2	Farhan et al, (2021)	*Journal of Medicine: Journal of Mathematics Education IKIP Veteran Semarang*	Quantitative	elementary school	Sinta 3
3	Tabun et al, (2020)	Edumatica: Journal of Mathematics Education	Quantitative	JUNIOR HIGH SCHOOL	Sinta 3
4	Mulyasari et al, (2022)	*International Journal of Elementary Education*	Quantitative	elementary school	Sinta 2
5	Ekaputri & Simanjorang, (2022)	*Interdisciplinary Social Studies*	Quantitative	JUNIOR HIGH SCHOOL	Q4
6	Muharomah & Setiawan, (2020)	UNION: Journal of Mathematics Education	Quantitative	JUNIOR HIGH SCHOOL	Sinta 4

No	Writer	Journal Name	Types of research	Level	Index
7	Nurlaela & Imami, (2022)	Education and Culture Scientific Journal	Quantitative	JUNIOR HIGH SCHOOL	Sinta 5
8	Nasrulloh & Nurlia, (2021)	EduMa: Mathematics Education Learning and Teaching	Quantitative	JUNIOR HIGH SCHOOL	Sinta 3
9	Sriwahyuni et al, (2019)	Journal of Didactical Mathematics	Quantitative	JUNIOR HIGH SCHOOL	Sinta 4
10	Amalia & Nuriadin, (2023)	MATHLINE: Journal of Mathematics and Mathematics Education	Qualitative	SENIOR HIGH SCHOOL	Sinta 3
11	Fauziyah et al, (2021)	*Turkish Journal of Computer and Mathematics Education*	*Mixed Method*	SENIOR HIGH SCHOOL	Q4
12	Kiawati et al, (2023)	Scholar's Journal: Journal of Mathematics Education	Quantitative	JUNIOR HIGH SCHOOL	Sinta 4

Quality Assessment Results (Quality Assessment)

The next stage after selecting inclusion from 12 pieces of literature is assessing the quality of the literature study, where the assessment categories have been described in the previous sub-chapter. Then the results of the data quality assessment are presented in Table 3.

Table 3. Quality Assessment Results (Quality Assessment)

No	Author Name and Year	Title	QA1	QA2	QA3	QA4	Results
1	Kafiar et al, (2021)	"Effectiveness of the Problem Based Learning Model on Mathematical Literacy Abilities Based on Higher Order Thinking Skills (HOTS) at YPK 2 Urmbosidori Middle School, Supiori Regency, Papua Province"	Y	Y	Y	Y	Accepted

No	Author Name and Year	Title	QA1	QA2	QA3	QA4	Results
2	Farhan et al, (2021)	"Problem Based Learning on Literacy Mathematics: Experimental Study in Elementary School"	Y	Y	Y	Y	Accepted
3	Tabun et al, (2020)	"Students' Mathematical Literacy Ability in Problem Based Learning (PBL) Model Learning"	Y	Y	Y	Y	Accepted
4	Mulyasari et al, (2022)	"E-LKPD Based on Problem Based Learning (PBL) Approach to Measure Mathematics Literacy Ability of Elementary Students"	Y	Y	Y	Y	Accepted
5	Ekaputri & Simanjorang, (2022)	"The Effect of Problem Based Learning Model on Students' Mathematical Literacy"	Y	Y	Y	Y	Accepted
6	Muharomah & Setiawan, (2020)	"Application of the Problem Based Learning Model to Improve the Mathematical Literacy Abilities of Middle School Students"	Y	Y	Y	Y	Accepted
7	Nurlaela & Imami, (2022)	"Increasing Students' Mathematical Literacy Abilities through the Implementation of the Problem Based Learning Model in Class VII SMPIT Insan Harapan"	Y	Y	Y	Y	Accepted
8	Nasrulloh & Nurlia, (2021)	"The Effect of the Implementation of Problem Based Learning Models on the Mathematical Literacy Ability of Grade 7 Student's"	Y	Y	Y	Y	Accepted
9	Sriwahyuni et al, (2019)	"Application of the Problem Based Learning Model to Improve the Mathematical	Y	Y	Y	Y	Accepted

No	Author Name and Year	Title	QA1	QA2	QA3	QA4	Results
		Literacy Abilities of Middle School Students"					
10	Amalia & Nuriadin, (2023)	"Analysis of Students' Mathematical Literacy Ability on Sequences and Series Material through the Application of Problem Based Learning"	Y	Y	Y	Y	Accepted
11	Fauziyah et al, (2021)	"Using Problem Based Learning through Blended Learning Based on JUMPISA Problem against Students Mathematical Literacy"	Y	Y	Y	Y	Accepted
12	Kiawati et al, (2023)	"Application of the Problem Based Learning Model to Improve Students' Mathematical Literacy Abilities"	Y	Y	Y	Y	Accepted

Data Analysis Results (Data Analysis)

The results of previous research regarding "mathematical literacy skills and the Problem Based Learning learning model" became a literature study in this research, and the data presented has been summarized and reviewed. Based on the results of the analysis of 12 pieces of literature, information was obtained that the Problem Based Learning learning model was able to increase students' mathematical literacy. Then the data from 12 pieces of literature are presented in Table 4.

Table 4. Literature Research Results Showing Students' Mathematical Literacy Ability through the Problem Based Learning Model

No	Writer	Research result
1	Kafiar et al, (2021)	Implementing the Problem Based Learning learning model can significantly improve students' mathematical literacy skills as demonstrated by students' proficiency in solving HOTS questions in the form of functions and relations.
2	Farhan et al, (2021)	The control group students' mathematical literacy abilities were lower than those in the experimental group who received the Problem Based Learning learning model.

No	Writer	Research result
3	Tabun et al, (2020)	The gain value obtained by students who received the PBL learning model was 0.8. This means that students' mathematical literacy skills were found to increase after receiving the PBL learning model.
4	Mulyasari et al, (2022)	According to observation results, students' mathematical literacy level is relatively low because most students are not used to completing problem-based case studies. So, the solution to optimize students' mathematical abilities is to develop a Problem Based Learning model assisted by e-LKPD.
5	Ekaputri & Simanjorang, (2022)	The results of research in the journal entitled "The Effect of Problem Based Learning Model on Students' Mathematical Literacy" showed an increase in students' mathematical literacy after implementing Problem Based Learning.
6	Muharomah & Setiawan, (2020)	Based on the results of the post-test and pre-test scores of students who received learning using conventional methods for students who received the Problem Based Learning learning model, it was found that students' mathematical literacy abilities were higher in students who received the Problem Based Learning model of learning.
7	Nurlaela & Imami, (2022)	According to the results of the student's pre-test before learning using the Problem Based Learning model, it was worth 52.50. However, after receiving learning with Problem Based Learning, a post-test score of 74.00 was obtained. This means that students' mathematical literacy has increased after receiving the Problem Based Learning learning model.
8	Nasrulloh & Nurlia, (2021)	According to the results of the paired sample t-test, it was found that grade 7 students' mathematical literacy had increased after receiving learning using the Problem Based Learning method.
9	Sriwahyuni et al, (2019)	According to data from the results of the Independent Sample T-Test and N-gain, it was concluded that students' mathematical literacy abilities were superior if they received the Problem Based Learning learning model compared to the conventional learning model.
10	Amalia & Nuriadin, (2023)	Implementing the Problem Based Learning learning model to explain series and series is able to develop students'

No	Writer	Research result
		mathematical literacy because students are given statements or questions based on existing cases.
11	Fauziyah et al, (2021)	Students' mathematical literacy abilities are significantly influenced by the Problem Based Learning learning model.
12	Kiawati et al, (2023)	Based on the research results, the conclusions obtained are, 1) the conventional learning model produces students' literacy skills at a "low" level, while the Problem Based Learning learning model produces students' mathematical literacy abilities in the "medium" category; 2) the Problem Based Learning learning model produces mathematical literacy skills that are superior to conventional learning models.

(RQ1) What is the description of the relationship between the Problem Based Learning model and increasing students' mathematical literacy skills?

An individual's skills in terms of interpreting, applying and formulating problems that occur in society into mathematical equations involving communication, reasoning and concept analysis to find the right solution are called mathematical literacy skills (Noviarsyh Dasaprawoira et al, 2019). This ability is needed by every individual, especially students, to make it easier to find appropriate, effective and constructive solutions to problems (EFP Sari, 2015). So a lot of previous research has discussed the Problem Based Learning learning model to optimize students' mathematical literacy.

Based on Table 4, all research related to "problem-based learning models on mathematical literacy skills in the period 2019-2023" shows an increase in students' mathematical literacy after receiving Problem Based Learning (Mulyasari et al, 2022), (Ekaputri & Simanjorang, 2022), (Nurlaela & Imami, 2022), (Nasrulloh & Nurlia, 2021), and (Amalia & Nuriadin, 2023). This statement is in line with research results (Kafiar et al, 2021) and (Fauziyah et al, 2021) which found that there was a significant increase in students' mathematical literacy which was influenced by Problem Based Learning. Then (Farhan et al, 2021), (Tabun et al, 2020), (Muharomah & Setiawan, 2020), (Sriwahyuni et al, 2019), and (Kiawati et al, 2023) added that there was superior student mathematical literacy with Problem Based Learning learning model compared to conventional models.

*Problem Based Learning*It is classified as a learning method that can significantly increase students' mathematical literacy. Learning steps in problem-based learning can help students achieve mathematical literacy indicators. In research by (Ekaputri & Simanjorang, 2022) it is explained that: 1) The first step in PBL learning is for the teacher to introduce the problem to the students. In this initial step, students are asked to identify information and

convert it into mathematical form. In this step, students can identify problems related to mathematical literacy indicators, namely using their knowledge to solve real and everyday problems; 2) The second step is for the teacher to organize students so that learning is student-centered. This statement is in line with research results (Kafiar et al, 2021) which found that PBL was able to provide significant improvements because the learning process was student-oriented, where students were involved in direct practice in finding solutions to problems that occurred in the surrounding environment based on HOTS questions. When solving these problems, students are allowed to discuss or work independently to correlate and reason about the solution strategy. In this step students can formulate problems that are linked to mathematical literacy indicators, namely understanding and solving problems with formulas; 3) The third step is that the teacher guides individual and group investigations. This step is related to mathematical literacy indicators related to understanding the material offered, developing independence and reasoning, and honing problem-solving abilities; 4) The fourth step is for students to develop and display their work. This step is related to indicators of mathematical literacy, namely articulating mathematical arguments and ideas, discussing problem solving, asking questions, and exchanging knowledge to deepen concepts; 5) the fifth step is analysis and evaluation of problem solving procedures. This step is related to indicators of mathematical literacy, namely regarding students' understanding to identify and evaluate errors and determine the answer that best suits the problem.

Conventional learning methods do not have a significant impact on students' mathematical literacy, but the Problem Based Learning learning model is the opposite, namely it can increase students' mathematical literacy significantly. Based on the research results (Tabun et al, 2020), researchers treated the experimental group by applying the Problem Based Learning model through non-routine familiarization by providing PISA level 3 based case studies to students. Then, from this habituation, students' mathematical literacy abilities have increased compared to conventional learning models. This proves that the PBL model can provide stimulus to students in finding solutions to contextual and real problems. This statement is in line with the research results of Istiandaru, Wardono, and Mulyono (2014), namely that a learning model that combines real-world case studies can motivate students to continue learning, which ultimately has an impact on increasing students' mathematical literacy.

So, based on the statements above, the conclusion that can be drawn is that students' mathematical literacy abilities have increased after receiving the Problem Based Learning learning model. The PBL learning type means that students are given the opportunity to complete case studies through reasoning, analysis, testing and formulating concepts to find solutions. This statement is in line with information reported by PISA 2012, which states

that mathematical literacy is an individual's skill in interpreting, implementing and making mathematical formulations in various contexts. Apart from that, the results of this research are in line with the findings of (Sari & Khiyarunnisa, 2017), namely that there is a correlation between mathematical literacy and the PBL (Problem Based Learning) learning model.

(RQ2) What are the research trends in the 2019-2023 period regarding the Problem Based Learning learning model on students' mathematical literacy abilities?

In this study, there were 13 articles included in this yearp analysis obtained from a literature search. Judging from the year of publication of the article regarding the problem-based learning (PBL) learning model and students' mathematical literacy skills, the year 2019-2023 was selected. In 2021, the most articles were found, namely 4 articles. Meanwhile, the least in this research analysis in 2019 was 1 article. This data can be seen in Figure 1 which shows the number of articles and year of publication regarding the problem-based learning (PBL) learning model on students' mathematical literacy abilities.

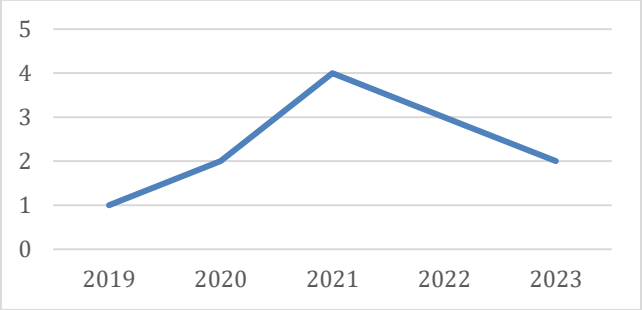

Figure 1. Classification Based on Publication Year

The problem-based learning (PBL) model is applied at various levels of education in Indonesia with the hope of being able to improve students' mathematical literacy skills in learning mathematics in Indonesia. The number of articles at each level is presented in Figure 2. In the last 5 years from 2019-2023, it is known that the application of the problem-based learning (PBL) learning model to students' mathematical literacy skills was dominated by the SMP/MTs education level with 8 articles. Furthermore, at the SD/MI and SMA/MA levels there are 2 articles each.

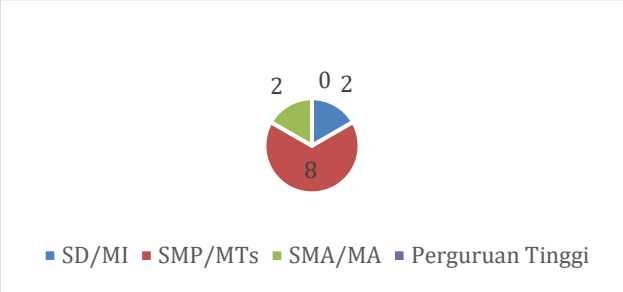

Figure 2. Classification Based on Educational Level

Meanwhile, if we look at the type of research used in research regarding problem-based learning models and students' mathematical literacy abilities in the 2019-2023 period, it is dominated by quantitative research with 10 articles. For qualitative and mixed method research in the period 2019-2023, there is 1 article each. The number of articles based on the type of research is presented in Figure 3.

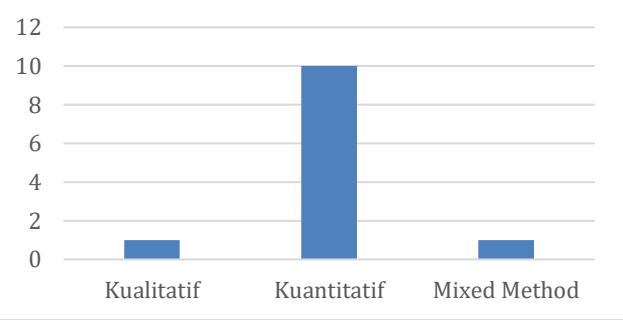

Figure 3. Classification Based on Research Type

So, it can be concluded that the research trend related to the Poblem Based Learning learning model on mathematical literacy skills in the period 2019-2023, if seen from the year of publication, is dominated by 2021, namely 4 articles, if seen from the level of education, it is dominated by junior high school/ MTs, namely 8 articles, and if you look at the type of research, it is dominated by quantitative research with 10 articles.

Conclusion

There are 12 research articles that use the Problem Based Learning learning model as a treatment for students which aims to improve students' mathematical literacy skills in the 2019-2023 period. Based on the results and discussion presented above, it can be concluded that most publications will occur in 2021 using quantitative research types which are dominated by the SMP/MTs level. In general, the results of these studies show that the PBL learning model has an influence in increasing students' mathematical literacy skills when compared to other learning models, for example conventional learning models. This is because the learning process that uses a learning model is more student-centered and

provides opportunities for students to solve real problems involving everyday life problems.

References

Amalia, K., & Nuriadin, I. (2023). Analysis of Students' Mathematical Literacy Ability on Sequences and Series Material Through the Application of Problem Based Learning. Mathline : Journal of Mathematics and Mathematics Education, 8(3), 1057–1076. https://doi.org/10.31943/mathline.v8i3.478

Budi Waluya, S., Mariani, S., Kunci, K., & Mathematics, L. (nd). MATHEMATICAL LITERACY OF JUNIOR HIGH SCHOOL STUDENTS IN REALISTIC PROBLEM BASED LEARNING EDMODO SCHOOLOGY. https://journal.unnes.ac.id/sju/index.php/prisma/

Ekaputri, H., & Simanjorang, MM (nd). THE EFFECT OF PROBLEM-BASED LEARNING MODEL ON STUDENTS' MATHEMATICAL LITERACY. https://iss.internationaljournallabs.com/index.php/iss

Ely Fauziyah, M., & Fatekurohman, M. (2021). Using Problem Based Learning through Blended Learning Based on JUMPISA Problem towards Students Mathematical Literacy. In Turkish Journal of Computer and Mathematics Education (Vol. 12, Issue 14).

Farhan, M., Satianingsih, R., & Yustitia, V. (2021). Problem Based Learning on Literacy Mathematics: Experimental Study in Elementary School. Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang, 5(1), 118. https://doi.org/10.31331/medivesveteran.v5i1.1492

Kafiar, E., Weyai, SAM, Hurint, MT, Teacher Training, ST, Ilmu, D., & Biak, P. (nd). Effectiveness of the Problem Based Learning Model on Mathematical Literacy Ability Based on Higher Order Thinking Skill (HOTS) at YPK 2 Urmboridori Middle School, Supiori Regency, Papua Province.

Kiawati, ES, Junedi, B., & Tabrani, MB (2023). Application of the Problem Based Learning Model to Improve Students' Mathematical Literacy Abilities. Scholar's Journal: Journal of Mathematics Education, 7(3), 2465–2474. https://doi.org/10.31004/cendekia.v7i3.2213

Kurnila, VS, Badus, M., Jeramat, E., & Ningsi, GP (2022). Improving Mathematical Literacy Skills Through a Problem Based Learning Approach Containing Portfolio Assessment. Euler: Scientific Journal of Mathematics, Science and Technology, 10(1), 88–97. https://doi.org/10.34312/euler.v10i1.13963

Madyaratri, DY, & Wardono and Priyono, A. (2019). Students' Mathematical Literacy Ability in Problem Based Learning with a Review of Learning Styles. PRISM. Proceedings of the National Mathematics Seminar, 2, 648–658. https://journal.unnes.ac.id/sju/index.php/prisma/

Mathematics, J., Mathematics, DP, Ul Husna, A., & Kurniasih, MD (2023). MATHLINE INFLUENCE OF THE LIVEWORKSHEET ASSISTED PROBLEM-BASED LEARNING MODEL ON STUDENTS' MATHEMATICAL LITERACY ABILITY. 8, 503–520. https://doi.org/10.31943/mathline.v8i2.419

Muharomah, NN, Setiawan, DE, Raya, JP, Cianjur, K., & Barat, J. (2020). Application of the Problem Based Learning Model to Improve the Mathematical Literacy Abilities of Middle School Students. In UNION: Journal of Mathematics Education (Vol. 8).

Nasrulloh, MF, & Nurlia, Z. (2021). The Effect of the Implementation of Problem-Based Learning Models on the Mathematical Literacy Ability of Grade 7^th Student's. Eduma : Mathematics Education Learning and Teaching, 10(2), 117. https://doi.org/10.24235/eduma.v10i2.8564

Nurlaela, E., & Imami, AI (2022). Improving Students' Mathematical Literacy Abilities Through the Implementation of the Problem Based Learning Model in Class VII SMPIT Insan Harapan. Dikdaya Scientific Journal, 12(1), 33. https://doi.org/10.33087/dikdaya.v12i1.270

Siswandari, H., Lintang Setyani, Y., Nurdianti, D., Asikin, M., & Ardiansyah, AS (nd). Study of the Problem Based Learning Model with a STEM Nuance on Mathematical Literacy Ability Towards PISA 2022.

Sriwahyuni, A., Rahmatudin, J., & Hidayat, R. (2019). APPLICATION OF A PROBLEM BASED LEARNING MODEL TO IMPROVE JUNIOR HIGH SCHOOL STUDENTS' MATHEMATIC LITERACY ABILITIES. Journal of Didactical Mathematics, 1(2), 1. http://jurnal.unma.ac.id/index.php/dm

Suwarno, M., & Ardani, RA (2022). Students' Mathematical Literacy Ability Based on PISA Level 4. Square : Journal of Mathematics and Mathematics Education, 4(2), 107–115. https://doi.org/10.21580/square.2022.4.2.12401

Syawahid, M., & Putrawangsa, S. (2017). Junior high school students' mathematical literacy abilities are viewed from learning styles. Beta: Tadris Journal of Mathematics, 10(2), 222–240. https://doi.org/10.20414/betajtm.v10i2.121

Tabun, HM, Taneo, PNL, Daniel, F., Studi, P., Mathematics, P., & Soe, S. (nd). Students' Mathematical Literacy Ability in Problem Based Learning (PBL) Model Learning.

Trianawaty Anwar, N., Budi Waluya, S., Postgraduate Unnes, K., & Kelud, J. (2018). Unnes Journal of Mathematics Education Research Abilities of Mathematical Literacy Based on Self-Confidence in Problem Based Learning with DAPIC Problem-Solving Process. UJMER, 7(2), 152–160. http://journal.unnes.ac.id/sju/index.php/ujmer

Wahyu Mulyasari, D. (2022). E-LKPD based on Problem Based Learning (PBL) Approach to Measure Mathematics Literacy Ability of Elementary Students. International Journal of Elementary Education, 6(3), 393–402. https://doi.org/10.23887/ijee.v6i3.47532