EMTEKA: Jurnal Pendidikan Matematika
Volume 7, No. 1, 2026. 238-250
DOI: https://doi.org/10.24127/emteka.v6i1.10912

e-ISSN 2746-5594
p-ISSN 2746-5608

THE EFFECT OF PBL ON STUDENTS' MATHEMATICAL LITERACY BASED ON KOLB'S LEARNING STYLES

Rendy Tri Cahyadi[1], Heni Pujiastuti[2*], Isna Rafianti[3]

[1*,2,3] Mathematics Education, Universitas Sultan Ageng Tirtayasa, Banten.
** Corresponding author. Jl. Ciwaru Raya –Cipare. 42117, Kota Serang, Indonesia.*

E-mail: 2225210026@untirta.ac.id@univ [1]
henipujiastuti@untirta.ac.id [2*]
isnarafianti@untirta.ac.id [3]

Received January 04, 2026; Received in revised form 05 March 26, 2026; Accepted March 19, 2026

ABSTRACT
This study aims to examine the effect of the PBL model on students' mathematical literacy skills and to describe variations in literacy achievement based on Kolb's learning styles. The study employed a quantitative approach using a quasi-experimental method with a Nonequivalent *Pretest–Posttest* Control Group Design. The sample consisted of 51 eighth-grade students from SMP Kebangsaan, South Tangerang City, divided into an experimental class and a control class. Data were collected using a mathematical literacy test based on the indicators of formulating, employing, interpreting, and reasoning, as well as Kolb's learning style questionnaire. Data analysis involved descriptive and inferential statistics, including prerequisite tests, an independent sample t-test, and N-Gain analysis. The results indicated a significant difference in mathematical literacy skills between students taught using the PBL model and those taught using an expository approach (0,027 < 0.05). Furthermore, the N-Gain analysis revealed that students in the PBL class demonstrated higher improvement in mathematical literacy skills compared to the control class. Descriptive analysis based on learning styles showed variations in literacy achievement across learning style types, although no inferential analysis was conducted. These findings suggest that the PBL model is effective in enhancing students' mathematical literacy skills.
Keywords: Kolb's learning styles; mathematical literacy; PBL.

ABSTRAK
Penelitian ini bertujuan untuk menganalisis pengaruh model PBL terhadap kemampuan literasi matematis siswa SMP serta mendeskripsikan variasi capaian literasi matematis berdasarkan gaya belajar David Kolb. Penelitian menggunakan pendekatan kuantitatif dengan metode eksperimen semu dan desain Nonequivalent Pretest–Posttest Control Group Design. Sampel penelitian terdiri atas 51 siswa kelas VIII SMP Kebangsaan Kota Tangerang Selatan yang terbagi ke dalam kelas eksperimen dan kelas kontrol. Data dikumpulkan melalui tes kemampuan literasi matematis berbasis indikator formulating, employing, interpreting, dan reasoning, serta angket gaya belajar Kolb. Analisis data dilakukan menggunakan statistik deskriptif dan inferensial, meliputi uji prasyarat, uji independent sample t-test, dan analisis N-Gain. Hasil penelitian menunjukkan bahwa terdapat perbedaan signifikan kemampuan literasi matematis antara siswa yang memperoleh pembelajaran PBL dan pembelajaran ekspositori (0,027 < 0,05), serta peningkatan kemampuan literasi matematis siswa pada kelas PBL lebih tinggi dibandingkan kelas kontrol berdasarkan analisis N-Gain. Analisis deskriptif berdasarkan gaya belajar menunjukkan adanya variasi capaian literasi matematis antar tipe gaya belajar, meskipun tidak dianalisis secara inferensial. Temuan ini menunjukkan bahwa PBL efektif digunakan untuk meningkatkan kemampuan literasi matematis siswa SMP.
Kata kunci: gaya belajar David Kolb; literasi matematis; PBL

Introduction

Mathematics has a strategic role in developing logical, analytical, critical, and systematic thinking skills that are essential for addressing the challenges of the 21st century (Pujiastuti et al., 2020). According to Anastasya et al. (2024), mathematics learning is no longer limited to mastering procedures but also emphasizes problem-solving abilities, reasoning skills, and the application of concepts in various contextual situations. The National Council of Teachers of Mathematics (NCTM) emphasizes that the primary goal of mathematics education is to develop individuals who are able to understand, communicate, and use mathematical concepts meaningfully in everyday life (Rahma et al., 2021). Therefore, mathematics learning needs to be directed toward the development of higher-order thinking skills and mathematical literacy that are relevant to global demands.

According to Nuraniyah & Nur (2023), students' mathematical literacy in Indonesia is still relatively low. The results of the Programme for International Student Assessment (PISA) in 2022 indicate that Indonesian students achieved a mathematical literacy score of 366, which is below the international average (OECD, 2023). This low achievement not only reflects limited conceptual understanding but also indicates weaknesses in students' ability to formulate mathematical problems, apply appropriate problem-solving strategies, and interpret results within real-life contexts (Kiawati et al., 2023). This condition suggests that mathematics learning practices in schools have not yet fully supported the optimal development of mathematical literacy.

One factor that is presumed to contribute to the low level of mathematical literacy is the dominance of teacher-centered instruction that emphasizes procedural problem solving (Pujiastuti & Haryadi, 2024). To overcome difficulties in solving real-life problems, the PBL model can be used (Sugiharti et al., 2025). According to Karlina & Sari (2024), teacher-centered learning tends to limit students' opportunities to construct understanding independently and develop critical thinking skills. From a constructivist perspective, Salsabila & Muqowim (2024) state that knowledge should be constructed through active learning experiences and interaction with the learning environment. Therefore, learning models are needed that can encourage students' active engagement in problem-solving processes and reflection on the thinking strategies used.

The PBL model is considered a relevant alternative for developing mathematical literacy skills (Purnama et al., 2023). The PBL model can be effectively applied to students. In this model, students are confronted with various emerging problems, encouraging them to use their thinking skills to find solutions (Darojah et al., 2025). According to Priscilia & Amidi (2023), PBL places contextual problems as the starting point of learning and encourages students to explore, investigate, and engage in discussions to find solutions. Through the stages of problem orientation, organizing learning, investigation, presentation of results, and evaluation of the problem-solving process, students are trained to formulate mathematical problems (formulating), apply concepts and procedures (employing), interpret results (interpreting), and provide logical reasoning (reasoning) (Ornawati et al., 2023). Thus, the characteristics of PBL are conceptually aligned with the indicators of mathematical literacy.

In addition to learning models, students' internal characteristics, such as learning styles, also have the potential to influence success in understanding mathematical concepts (Qomari et al., 2022). According to Furqon et al. (2021), David Kolb's learning style theory explains that individuals have different tendencies in processing learning experiences through the stages of concrete experience, reflective observation, abstract conceptualization, and active experimentation. These differences result in divergent, assimilative, convergent, and accommodative learning styles, which may affect students' strategies in solving mathematical problems.

In the context of mathematical literacy, Amelia et al. (2024) state that convergent and accommodative learning styles tend to support active engagement in concept application and contextual problem solving, whereas divergent and assimilative learning styles place greater emphasis on reflection and conceptual understanding. Therefore, understanding variations in learning styles is important in designing mathematics instruction that is adaptive and responsive to students' needs.

Studies conducted by Oktaviana & Haryadi (2020) and Musa'ad et al. (2023), show that the implementation of PBL has a positive effect on improving mathematical problem-solving skills and learning outcomes. However, these studies primarily focus on the effects of learning models without considering differences in students' learning characteristics. In fact, variations in learning styles have the potential to influence the effectiveness of PBL implementation in developing mathematical literacy (Gunawan et al., 2021).

Based on these conditions, this study offers novelty by examining the effect of the PBL model on students' mathematical literacy skills while also describing variations in mathematical literacy achievement based on David Kolb's learning styles. This study is expected to contribute to the development of more adaptive mathematics learning strategies and to strengthen efforts to improve students' mathematical literacy at the junior secondary school level.

Research Methods

This study employed a quantitative approach with a quasi-experimental research design using the Nonequivalent Pretest–Posttest Control Group Design. The study involved two classes selected through purposive sampling, namely class VIII A as the experimental group receiving instruction using the PBL model and class VIII B as the control group receiving expository instruction. The research sample consisted of 51 students. The equivalence of the initial abilities of both groups was examined through a comparison of the mean pretest scores prior to the implementation of the treatment in Table 1.

Table 1. Research Design

Group	*Pretest*	Treatment	*Posttest*
Eksperimen	O_1	X	O_2
Kontrol	O_3	-	O_4

Description:

O_1 = Pretest score of the experimental group

O_2 = Posttest score of the experimental group

O_3 = Pretest score of the control group

e-ISSN 2746-5594
p-ISSN 2746-5608

O_4 = Posttest score of the control group
X = Treatment (PBL model)

The study was conducted on the topic of Systems of Linear Equations in Two Variables (SPLDV) over three meetings, with each meeting lasting 2 × 40 minutes. Instruction in the experimental class was implemented according to the stages of PBL, which include problem orientation, organizing learning activities, investigation, presentation of results, and analysis and evaluation of the problem-solving process, while the control class received expository instruction. Both classes were taught by the same teacher to minimize the influence of extraneous variables.

The research instruments consisted of a mathematical literacy test in the form of four essay questions with a maximum score of 100, developed based on mathematical literacy indicators derived from the PISA framework, namely formulating, employing, interpreting, and reasoning, adapted from (Ornawati et al., 2023). The empirical validity of the test items was examined using the product–moment correlation, while reliability was calculated using Cronbach's Alpha, yielding a coefficient of 0.9087. In addition, Kolb's learning style questionnaire was used to identify students' learning style tendencies, including divergent, assimilative, convergent, and accommodative styles.

Data analysis was conducted using descriptive and inferential statistics with the assistance of SPSS. The prerequisite tests included normality testing using the Shapiro–Wilk test and homogeneity testing using Levene's test. Hypothesis testing was performed using an independent sample t-test on posttest scores, while learning improvement was analyzed using normalized gain (N-Gain). Descriptive analysis was used to describe students' mathematical literacy achievement based on learning styles.

Results and Discussion

Result

This study aims to analyze the effect of implementing the PBL model on junior high school students' mathematical literacy skills based on David Kolb's learning styles. To achieve this objective, a series of data analyses were conducted, including Pretest, Posttest, and N-Gain analyses in both the experimental and control classes. Data analysis was carried out using descriptive and inferential statistics to examine the equivalence of initial abilities, differences in learning outcomes, and improvements in students' mathematical literacy skills.

Pretest Data Analysis

Descriptive Statistics

The pretest was administered to both classes before the learning treatment to determine students' initial mathematical literacy skills. The descriptive statistics of the pretest results are presented in Table 2.

Table 2. Descriptive Statistics of Pretest Data

Class	N	X_{min}	X_{max}	Mean	SD
Experimental Pretest	25	7	57	35,4	16,26
Control Pretest	26	7	50	31,04	14,01

e-ISSN 2746-5594
p-ISSN 2746-5608

Based on Table 2, the mean pretest score of the experimental class was 35.40, while that of the control class was 31.04. The difference between the mean scores was relatively small, indicating that the students' initial mathematical literacy abilities in both classes were at a nearly comparable level.

Inferential Statistics

Normality Test

The normality test was conducted using the Shapiro–Wilk test to ensure the distribution of pretest data. The results of the normality test are presented in Table 3.

Table 3. Pretest Normality Test Results

Class	**Saphiro-Wilk**		**Conclusion**
	Statistic	**Sig.**	
Exsperimental	0,889	0,062	Normally distributed
Control	0,903	0,064	Normally distributed

Based on Table 3, the significance values of the pretest data in both classes were greater than 0.05; therefore, H_0 was accepted. Thus, the pretest data for both the experimental and control classes were normally distributed.

Homogeneity Test

The homogeneity test was conducted to determine the equality of variances of the pretest data. The results are presented in Table 4.

Table 4. Pretest Homogeneity Test Results

Data	***Lavene Statistic***	**Sig.**	**Conclusion**
Pretest	0,904	0,346	Homogeneous

The significance value shown in Table 4 was 0.346 (> 0.05); therefore, H_0 was accepted. This indicates that the variance of the pretest data in both classes was homogeneous.

T-Test

After meeting the assumptions of normality and homogeneity, an independent sample t-test was conducted to examine the equivalence of initial abilities. The pretest t-test results are presented in Table 5.

Table 5. Pretest Equivalence Test Results

Data	***t***	**df**	**Sig. (2-tailed)**	**Conclusion**
Pretest	1,027	49	0,309	No significant difference

Based on Table 5, the significance value was 0.309 (> 0.05); therefore, H_0 was accepted. This indicates that there was no significant difference in students' initial mathematical literacy abilities between the experimental and control classes.

Posttest Data Analysis

Descriptive Statistics

e-ISSN 2746-5594
p-ISSN 2746-5608

The posttest was administered after the learning treatment to determine students' final mathematical literacy skills. The descriptive statistics of the posttest results are presented in Table 6.

Table 6. Descriptive Statistics of Posttest Data

Kelas	**N**	X_{min}	X_{max}	**Mean**	**SD**
Experimental Posttest	25	57	100	78,68	11,46
Control Posttest	26	43	100	69,73	16,13

Based on Table 6, the mean posttest score of the experimental class was higher than that of the control class. The standard deviation of the experimental class was also smaller, indicating a more homogeneous distribution of scores after the implementation of the PBL model.

Inferential Statistics

Normality Test

The results of the posttest normality test are presented in Table 7.

Table 7. Posttest Normality Test Results

Class	**Saphiro-Wilk**		**Conclusion**
	Statistic	**Sig.**	
Exsperimental	0,921	0,055	Normally distributed
Control	0,949	0,219	Normally distributed

Based on Table 7, the significance values of the posttest data in both classes were greater than 0.05, indicating that the data were normally distributed.

Homogeneity Test

The posttest homogeneity test results are presented in Table 8.

Table 8. Posttest Homogeneity Test Results

Data	***Lavene Statistic***	**Sig.**	**Conclusion**
Posttest	2,442	0,125	Homogeneous

Based on Table 8, the significance value was 0.125 (> 0.05), indicating that the variance of the posttest data was homogeneous. Therefore, parametric analysis could be conducted.

T-Test

An independent sample t-test was conducted to determine whether the difference in mean posttest scores between the two classes was statistically significant. The results are presented in Table 9.

Table 9. Posttest T-Test Results

Data	***t***	**df**	**Sig. (2-tailed)**	**Conclusion**
Posttest	2,275	49	0,027	Significant difference

Based on Table 9, the significance value was 0.027 (< 0.05); therefore, H_0 was rejected. This indicates a significant difference in mathematical literacy skills

EMTEKA: Jurnal Pendidikan Matematika
Volume 7, No. 1, 2026. 238-250
DOI: https://doi.org/10.24127/emteka.v6i1.10912
e-ISSN 2746-5594
p-ISSN 2746-5608

between students taught using the PBL model and those taught using the expository model.

N-Gain Data Analysis
Descriptive Statistics

N-Gain analysis was conducted to determine the improvement in students' mathematical literacy skills. The descriptive statistics of the N-Gain results are presented in Table 10.

Table 10. Descriptive Statistics of N-Gain Data

Class	**N**	X_{min}	X_{max}	**Mean**	**SD**
Experimental N-Gain	25	45	100	68	12,36
Control N-Gain	26	34	100	58	17,04

Based on Table 10, the mean N-Gain score of the experimental class was higher than that of the control class, indicating greater improvement in mathematical literacy skills among students who received instruction using the PBL model.

Inferential Statistics
Normality Test

The normality test results for N-Gain data are presented in Table 11.

Table 11. N-Gain Normality Test Results

Class	**Saphiro-Wilk**		**Conclusion**
	Statistic	**Sig.**	
Experimental	0,921	0,735	Normally Distributed
Control	0,949	0,255	Normally Distributed

Based on Table 11, the significance values of the N-Gain data for both classes were greater than 0.05, indicating that the data were normally distributed.

Homogeneity Test

The homogeneity test results for N-Gain data are presented in Table 12.

Table 12. N-Gain Homogeneity Test Results

Data	***Lavene Statistic***	**Sig.**	**Conclusion**
N-Gain	2,836	0,099	Homogeneous

Based on Table 12, the significance value was 0.099 (> 0.05), indicating that the variance of the N-Gain data was homogeneous. Therefore, parametric analysis could be conducted.

T-Test

The independent sample t-test results for N-Gain data are presented in Table 13.

Table 13. N-Gain T-Test Results

Data	***t***	**df**	**Sig. (2-tailed)**	**Conclusion**
N-Gain	2,359	49	0,022	Significant difference

EMTEKA: Jurnal Pendidikan Matematika e-ISSN 2746-5594
Volume 7, No. 1, 2026. 238-250 p-ISSN 2746-5608
DOI: https://doi.org/10.24127/emteka.v6i1.10912

Based on Table 13, the significance value was 0.022 (< 0.05); therefore, H_0 was rejected. This indicates that the improvement in mathematical literacy skills of students who received instruction using the PBL model was significantly higher than that of students who received expository instruction.

Descriptive Analysis Based on Learning Styles

This study also conducted a descriptive analysis of students' mathematical literacy skills based on David Kolb's learning styles, namely divergent, assimilative, convergent, and accommodative. This analysis aimed to provide an overview of variations in mathematical literacy achievement across different learning style categories. The descriptive statistics based on learning styles are presented in Table 14.

Table 14. Descriptive Statistics Based on Learning Styles

Learning Style	N	X_{min}	X_{max}	Mean	SD
Divergent	14	50	93	71,86	12,50
Assimilastive	14	43	86	70,93	13,40
Convergent	13	43	100	72,62	19,59
Acommodative	10	71	93	83,70	7,77

Based on Table 14, the highest mean mathematical literacy score was observed among students with an accommodative learning style, while the lowest mean score was found among students with an assimilative learning style. In addition, the standard deviation values indicate differences in score variability across learning style groups.

To further clarify the comparison of mean mathematical literacy scores between the experimental and control classes based on learning styles, the data are presented in graphical form in Figure 1.

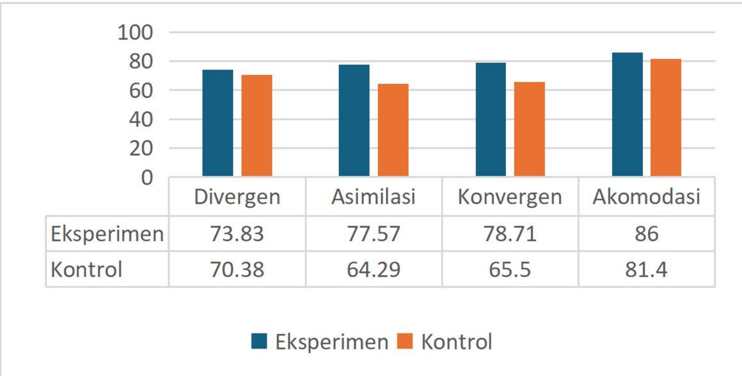

Figure 1. Graph of Average Post-Test Scores by Learning Style

Based on Figure 1, the mean scores of the experimental class are higher than those of the control class across all learning style categories. The largest mean difference appears in the accommodative learning style, while relatively smaller differences are observed in the assimilative and divergent learning styles. However, this analysis is descriptive in nature and is not intended to test differences statistically.

EMTEKA: Jurnal Pendidikan Matematika e-ISSN 2746-5594
Volume 7, No. 1, 2026. 238-250 p-ISSN 2746-5608
DOI: https://doi.org/10.24127/emteka.v6i1.10912

Discussion

The results of this study indicate that the implementation of the PBL model has a positive impact on junior high school students' mathematical literacy skills. This finding is supported by the results of the independent sample t-test on posttest data, which revealed a significant difference between the experimental and control classes. In addition, the pretest equivalence test confirmed that both classes had comparable initial mathematical literacy abilities prior to the implementation of the learning intervention. Therefore, the differences observed in posttest outcomes and the subsequent improvement in students' abilities can be attributed to the differences in the learning models applied.

The improvement in mathematical literacy skills among students who learned through the PBL model can be explained by the problem-centered learning mechanism inherent in PBL. In this model, students do not passively receive information but are actively involved in identifying, analyzing, and solving contextual problems (Putri et al., 2025). This process encourages students to connect mathematical concepts with real-life situations, thereby strengthening conceptual understanding and reasoning skills (Pratidina & Nindiasari, 2023). In line with Akras et al. (2025), interaction through group discussions facilitates the exchange of ideas and reflective thinking, which contributes to the development of interpreting and reasoning abilities. Thus, PBL not only enhances learning outcomes but also promotes deeper mathematical thinking processes.

This improvement is further supported by the structured stages of the PBL model, which include problem orientation, organizing student learning, guiding individual and group investigations, developing and presenting results, and analyzing and evaluating the problem-solving process (Rambe et al., 2022). During the problem orientation stage, students are trained to formulate problems into mathematical representations. The investigation stage encourages students to employ mathematical concepts and procedures, while the presentation and evaluation stages allow students to interpret and reflect on the solutions obtained. This sequence of activities demonstrates that all indicators of mathematical literacy can be systematically facilitated through the implementation of PBL.

The findings of this study are consistent with constructivist theory, which emphasizes that knowledge is constructed through students' active engagement in the learning process (Kurnila et al., 2022). From this perspective, students are not merely recipients of information but actively construct knowledge through meaningful learning experiences. These findings also support previous research by Nurwahida et al. (2023), which demonstrated that PBL is effective in improving higher-order thinking skills and mathematical literacy. However, this study not only confirms these findings but also provides additional emphasis through the analysis of learning improvement. While studies such as Akras et al. (2025), focused primarily on differences in final outcomes, the present study shows that PBL also leads to more optimal improvement in students' abilities. Thus, this research strengthens and complements previous studies in the context of developing mathematical literacy.

In addition to the learning model, the analysis also revealed variations in mathematical literacy skills based on David Kolb's learning styles. Descriptively, students with convergent and accommodative learning styles demonstrated higher levels of mathematical literacy compared to those with assimilative and divergent learning styles. This finding indicates that learning style characteristics influence how students process information and solve mathematical problems (Aliudin, 2021). Consistent with Kurniawati et al. (2020), students with accommodative learning styles tend to adapt more easily to PBL because they learn through direct experience and active exploration, while students with convergent learning styles excel in applying concepts in practical situations.

Conversely, students with assimilative and divergent learning styles tend to focus more on observation and reflection, requiring more time to integrate concepts before applying them (Kurnia et al., 2023). Nevertheless, all learning style groups still demonstrated improvement after participating in PBL-based instruction. However, these differences are descriptive in nature and were not tested inferentially; therefore, no statistical conclusions can be drawn regarding the effect of learning styles on mathematical literacy skills.

The findings of this study suggest that PBL is not only effective in increasing the average level of mathematical literacy but also has the potential to create a more equitable distribution of abilities through the active involvement of all students in the learning process. This indicates that PBL is flexible and capable of accommodating diverse student learning characteristics, even though students may achieve different levels of performance.

One of the strengths of this study lies in the use of improvement analysis, which allows for a more comprehensive measurement of students' learning development, as well as the integration of learning style analysis that provides additional insights into variations in mathematical literacy achievement. However, this study also has limitations, including a relatively small sample size and the use of a quasi-experimental design without randomization. Therefore, the generalization of the findings should be approached with caution.

Overall, this study contributes to strengthening empirical evidence regarding the effectiveness of PBL in improving students' mathematical literacy skills and provides additional perspectives on variations in achievement based on learning styles. These findings are expected to serve as a foundation for the development of more adaptive, contextual, and higher-order thinking-oriented mathematics learning strategies.

Conclusion and Suggestion

Based on the results of this study, it can be concluded that the implementation of the PBL model results in higher students' mathematical literacy skills compared to expository learning. This is indicated by the significant differences in posttest outcomes as well as more optimal improvement in students' abilities based on N-Gain analysis. These findings demonstrate that PBL is effective in developing students' abilities to formulate, apply, interpret, and reason mathematical concepts within real-world problem contexts. In addition, descriptive analysis reveals variations in mathematical literacy achievement based on David Kolb's learning styles, although these differences were not examined inferentially.

EMTEKA: Jurnal Pendidikan Matematika e-ISSN 2746-5594
Volume 7, No. 1, 2026. 238-250 p-ISSN 2746-5608
DOI: https://doi.org/10.24127/emteka.v6i1.10912

This study has important implications for mathematics teachers to implement PBL as an alternative instructional approach that promotes active student engagement and fosters more meaningful mathematical literacy development. Teachers are also encouraged to consider the diversity of students' learning characteristics when designing learning activities. Future research may extend this study by involving larger samples, employing stronger experimental designs, and applying more advanced statistical analyses to examine differences in mathematical literacy skills across learning styles in greater depth.

Reference

Akras, A., Pujiastuti, H., & Rafianti, I. (2025). Pengaruh Problem Based Learning Terhadap Kemampuan Literasi Matematis Siswa SMP Ditinjau dari Gaya Belajar. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *09*(2), 527–538. https://doi.org/10.31004/cendekia.v9i2.3937

Aliudin, F. A. (2021). *Literasi Matematika Siswa Sekolah Menengah Pertama ditinjau Dari Gaya Belajar Menurut David Kolb* [Universitas Islam Negeri Maulana Malik Ibrahim Malang]. http://etheses.uin-malang.ac.id/30566/1/17190032.pdf

Amelia, E., Pujiastuti, H., & Nindiasari, H. (2024). Kemampuan Literasi Matematis Siswa Smp Dalam Menyelesaikan Soal Aritmatika Sosial Ditinjau Dari Gaya Belajar David Kolb. *Jurnal Lebesgue : Jurnal Ilmiah Pendidikan Matematika, Matematika Dan Statistika*, *5*(1), 278–288. https://doi.org/10.46306/lb.v5i1.557

Anastasya, C., Pujiastuti, H., & Setiani, Y. (2024). Kemampuan Literasi Matematis Siswa Ditinjau Dari Gaya Belajar David Kolb. *J-PiMat: Jurnal Pendidikan Matematika*, *6*(1), 1075–1086. https://doi.org/10.31967/jpimat.v6i1.3975

Darojah, A. U. H., Vahlia, I., & Anwar, R. B. (2025). Pengembangan LKPD Berbasis Model Pembelajaran Problem Based Learning (PBL) Terintegrasi Nilai-Nilai Islam. *Jurnal Pendidikan Matematika Universitas Lampung*, *13*(1), 41-53.. https://doi.org/10.23960/mtk/v13i1.pp41-53

Furqon, S., Siswanah, E., & Tsani, D. F. (2021). Kemampuan Literasi Matematika Peserta Didik Kelas IX berdasarkan Gaya Belajar menurut David Kolb. *Edumatica : Jurnal Pendidikan Matematika*, *11*(01), 12–27. https://doi.org/10.22437/edumatica.v11i01.11438

Gunawan, Chasanah, A. N., Hendrastuti, Z. R., & Prihatiningrum, W. (2021). Analisis Kemampuan HOTS Siswa pada Materi Trigonometri Ditinjau dari Gaya Belajar David Kolb. *UNION: Jurnal Ilmiah Pendidikan Matematika*, *9*(2), 173–187. https://doi.org/10.30738/union.v9i2.9473

Karlina, S., & Sari, R. M. M. (2024). Studi Literatur Tentang Peranan Model Problem Based Learning (PBL) Dalam Meningkatkan Kemampuan. *Jurnal Theorems (The Original Reasearch Of Mathematics)*, *8*(2), 451–460. http://ejournal.unma.ac.id/index.php/th

Kiawati, E. S., Junedi, B., & Tabrani, M. B. (2023). Penerapan Model Pembelajaran Berbasis Masalah untuk Meningkatkan Kemampuan Literasi Matematis Siswa. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *7*(3), 2465–2474. https://doi.org/10.31004/cendekia.v7i3.2213

Kurnia, O., Ratnaningsih, N., & Nataliasari, I. (2023). Analisis Kesalahan Peserta

Didik Menurut Newman Dalam Menyelesaikan Soal Kemampuan Spasial Pada Materi Bangun Ruang Sisi Datar Ditinjau Dari Gaya Belajar David Kolb. *Jurnal Kongruen*, *2*(4), 202–207. https://doi.org/10.31949/kongruen.v2i4.10964

Kurniawati, W., Supandi, S., & Aini, A. N. (2020). Efektivitas Model Pembelajaran Problem Based Learning (PBL) dan Model Pembelajaran Pair Check Terhadap Kemampuan Berpikir Kritis Matematis Siswa Kelas VII. *Imajiner: Jurnal Matematika Dan Pendidikan Matematika*, *2*(5), 428–438. https://doi.org/10.26877/imajiner.v2i5.6665

Kurnila, V. S., Badus, M., Jeramat, E., & Ningsi, G. P. (2022). Peningkatan kemampuan literasi matematika melalui pendekatan problem based learning bermuatan penilaian portofolio. *EULER: Jurnal Ilmiah Matematika, Sains Dan Teknologi*, *10*(1), 88–97. https://doi.org/10.34312/euler.v10i1.13963

Musa'ad, F., Trisnawati, N. F., Rusani, I., Sundari, & Setyo, A. A. (2023). Pengaruh Model Problem Based Learning Untuk Meningkatkan Kemampuan Literasi Matematika Pada Materi Penyajian Data. *AXIOM : Jurnal Pendidikan Dan Matematika*, *12*(2), 218–225. https://doi.org/10.30821/axiom.v12i2.17966

Nuraniyah, I. N., & Nur, I. R. D. (2023). Analisis Literasi Matematis Siswa Dalam Menyelesaikan Soal Pisa Konten Change And Relationship. *JES-MAT: Jurnal Edukasi Dan Sains Matematika*, *9*(2), 137–148. https://doi.org/10.51574/kognitif.v4i1.1211

Nurwahida, Muliana M, A., & Murtafiah. (2023). Pengaruh Problem Based Learning (PBL) Terhadap Kemampuan Literasi Matematika Ditinjau Dari Gaya Belajar Peserta Didik Kelas X Mipa SMA Negeri 1 Majene. *Saintifik*, *9*(2), 284–290. https://doi.org/10.31605/saintifik.v9i2.445

OECD. (2023). *PISA 2022 Results (Volume I)*. OECD. https://doi.org/10.1787/53f23881-en

Oktaviana, D., & Haryadi, R. (2020). Pengaruh Model Pembelajaran Problem Based Learning (PBL) Terhadap Kemampuan Pemecahan Masalah Mahasiswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *9*(4), 1076–1085. https://doi.org/10.24127/ajpm.v9i4.3069

Ornawati, V., Hendrastuti, Z. R., & Franita, Y. (2023). Pengaruh Model Pembelajaran Problem Based Learning Terhadap Kemampuan Literasi Matematis Ditinjau Dari Gaya Belajar Siswa SMP. *Delta: Jurnal Ilmiah Pendidikan Matematika*, *11*(1), 45–56. https://doi.org/http://dx.doi.org/10.31941/delta.v11i1.2438

Pratidina, D. A., & Nindiasari, H. (2023). Pembelajaran problem based learning (PBL) dengan kerangka kerja TPaCK: kemampuan pemecahan masalah matematis siswa SMA. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *6*(5), 1841–1850. https://doi.org/10.22460/jpmi.v6i5.15834

Priscilia, M., & Amidi, P. (2023). Systematic Literature Review: Kemampuan Literasi Matematika pada Problem Based Learning ditinjau dari Kemandirian Belajar Siswa. *Prosiding Seminar Nasional Matematika*, *7*, 119–128. https://proceeding.unnes.ac.id/prisma

Pujiastuti, H., & Haryadi, R. (2024). The Effectiveness of Using Augmented Reality on the Geometry The Effectiveness of Using the Geometry Thinking Ability of Augmented Junior High Reality School on Students Thinking Ability of Junior High School Students. *Procedia Computer Science*, *234*, 1738–1745. https://doi.org/10.1016/j.procs.2024.03.180

Pujiastuti, H., Suvati, D. A., Haryadi, R., & Marethi, I. (2020). Development of mathmodule based on local wisdom and 21st century skills : linear equation system. *Journal of Physics: Conf. Series*, *1480*. https://doi.org/10.1088/1742-6596/1480/1/012052

Purnama, M. I., Fisher, D., Subaryo, & Anggiana, A. D. (2023). Kemampuan Literasi Matematis Peserta Didik SMP Melalui Model Problem Based Learning dengan Teknik MURDER. *SYMMETRY: Pasundan Journal of Research in Mathematics Learning and Education*, *08*(1), 146–156. https://doi.org/10.23969/symmetry.v8i1.8252

Putri, S. A., Ihsanudin, & Santosa, C. A. H. F. (2025). The Effect Of Problem Based Learningmodel Assisted By E-Lkpd Based Onwizer.Me Website On Mathematical Problem Solving Ability. *EMTEKA: Jurnal Pendidikan Matematika*, *6*(2), 651–664. https://doi.org/https://doi.org/10.24127/emteka.v6i1.8894

Qomari, M. N., Lestari, S. A., & Fauziyah, N. (2022). Learning Trejectory pada Pembelajaran Berdiferensiasi Materi Keliling Bangun Datar Berdasarkan Perbedaan Gaya Belajar. *DIDAKTIKA : Jurnal Pemikiran Pendidikan*, *28*(2(1)), 29–41. https://doi.org/10.30587/didaktika.v28i2(1).4399

Rahma, Angriani, A. D., Nur, F., Suharti, & Tahir, M. Y. (2021). Keefektifan Strategi Pembelajaran Problem Based Learning Terhadap Hasil Belajar Matematika Siswa. *Jurnal Ilmiah Soulmath : Jurnal Edukasi Pendidikan Matematika*, *9*(2), 153–164. https://doi.org/10.25139/smj.v9i2.3784

Rambe, A. H., Adinda, J. S., Siregar, H., Ritonga, N. Z., & Novita. (2022). Efektivitas Model Pembelajaran Problem Based Learning pada Siswa Kelas 5 Sekolah Dasar. *Jurnal Pendidikan Dan Konseling (JPDK)*, *4*(4), 423–428. https://doi.org/10.31004/jpdk.v4i4.5251

Salsabila, Y. R., & Muqowim. (2024). Korelasi Antara Teori Belajar Konstruktivisme Lev Vygotsky Dengan Model Pembelajaran Problem Based Learning (PBL). *LEARNING : Jurnal Inovasi Penelitian Pendidikan Dan Pembelajaran*, *4*(3), 813–827. https://doi.org/10.51878/learning.v4i3.3185

Sugiharti, A., Vahlia, I., & Rahmawati, D. (2025). Pengembangan Aplikasi Android Berbasis Problem Based Learning Berorientasi Kebudayaan Lokal Materi Baris Dan Deret Aritmatika. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *14*(2), 409-423. http://dx.doi.org/10.24127/ajpm.v14i2.10963