The Effect of The PBL Model Using Eco Fraction Media on Numeric Literacy and Problem Solving Skills in Fraction Material of Grade IV Students

Yuni Rahmawati[1], Didik Sugeng Pambudi[2], Susanto[3]

[1,2,3]Universitas Jember

ABSTRACT: This research seeks to examine the significant impact of applying the Problem Based Learning (PBL) model supported by Eco Fraction media on elementary school students' numeracy literacy and problem-solving abilities in fraction topics. This research engaged 56 fourth-grade students from classes IV A and IV B at SDN Citrodiwangsan 02. The sample was selected through cluster random sampling, and the study adopted a quantitative quasi experimental approach using a non equivalent control group design. Data were collected using validated instruments measuring numeracy literacy and mathematical problem-solving abilities. The results of the independent samples t-test showed a significance level below 0.001 ($p < 0.05$), demonstrating a statistically meaningful difference between the experimental and control groups. The results indicate that students in the experimental group attained superior average posttest scores in numeracy literacy, with a mean of 75.36, compared to 60.54 in the control group. Likewise, the experimental group showed higher achievement in mathematical problem-solving skills, obtaining an average score of 78.07, whereas the control group recorded a mean score of 62.96. These results demonstrate that integrating the Problem-Based Learning (PBL) approach with concrete instructional media derived from recycled materials, such as Eco Fraction, effectively supports students in transforming abstract mathematical concepts into meaningful understanding, while enhancing critical thinking, mathematical reasoning, and contextual problem-solving skills in alignment with the cognitive development level of elementary school learners.

KEYWORDS: Eco Fraction, Fractions, Numeracy Literacy, Problem Based Learning, Problem Solving.

INTRODUCTION

Mathematics education at the elementary level serves as a crucial foundation for fostering students' abilities in logical reasoning, analytical thinking, and systematic problem-solving as essential competencies for the 21st century. Within this context, numeracy literacy emerges as a central learning outcome, encompassing students' capacity to comprehend, apply, and interpret mathematical concepts across diverse real-life situations. Nevertheless, evidence from international assessments, including the Programme for International Student Assessment (PISA), reveals that the numeracy literacy of Indonesian students remains at a relatively low level, particularly in addressing contextual problems that demand higher-order reasoning skills (OECD, 2023; Stacey, 2015).

This low numeracy literacy is inextricably linked to students' difficulties in understanding basic mathematical concepts, including fractions, which are abstract concepts that require representational skills, proportional reasoning, and an understanding of the relationship between parts and wholes. Previous research has shown that elementary school students often experience misconceptions about the operation and application of fractions because learning tends to be procedurally oriented and does not connect concepts to real-world situations (Nurjanah & Suryadi, 2021). This situation impacts students' low ability to solve problem-based problems.

In addition to numeracy literacy, mathematical problem-solving skills are also an essential competency that needs to be developed from elementary school. These skills include the ability to understand problems, plan solution strategies, implement plans, and evaluate the resulting solutions. However, mathematics learning practices in elementary schools are still dominated by conventional methods that position students as passive recipients of information, thus limiting opportunities for systematic problem-solving skills practice (Polya, 2004; Hmelo-Silver, 2013).

The Problem Based Learning (PBL) model is an effective learning approach to improve students' numeracy literacy and problem-solving abilities by making contextual problems the basis of the learning process. This model facilitates active student engagement in knowledge construction, collaborative discussion, and systematic solution development, which has been empirically proven to strengthen conceptual understanding, critical thinking, and mathematical problem-solving competencies (Hmelo-Silver et al., 2007; Yew & Goh, 2016).

The effective application of problem based learning in fraction instruction requires the support of concrete instructional media that can connect abstract mathematical ideas with students' everyday experiences. eco fraction, a hands-on learning medium developed from recycled sawdust, enables learners to interact directly with visual representations of fractions, thereby facilitating deeper conceptual understanding. Previous studies have demonstrated that the integration of concrete media in mathematics instruction enhances students' comprehension and active participation in learning (Bruner, 1966; Mawarni & Amanda, 2023). Accordingly, this study seeks to examine the impact of implementing the problem based learning model assisted by eco fraction media on elementary school students' numeracy literacy and fraction problem solving abilities.

LITERATURE REVIEW

Mathematics learning in elementary school is an important foundation for developing students' logical, systematic, and critical thinking skills. This learning fosters students' understanding of concepts, reasoning, communication, and structured problem-solving (Kusumawati et al., 2023). Fractions are one topic that requires a deep conceptual understanding, given their distinct characteristics from integers and the difficulty they often present in representing and interpreting numerical values. This requires learning that focuses not only on mastering procedures but also on students' ability to understand and use mathematical concepts meaningfully. Consistent with the adoption of the independent curriculum, mathematics instruction is oriented toward enhancing numeracy literacy as a fundamental competence that equips students with the ability to comprehend, apply, and interpret numerical information and mathematical symbols within daily life situations.

The Ministry of Education, Culture, Research, and Technology (2022) provides a clear explanation of the national concept of numeracy literacy. which states that numeracy literacy is the ability to effectively apply the concepts of numbers, operations, measurements, and data to solve everyday problems. Numeracy literacy is not merely a matter of calculating skills or memorizing procedures, but also includes analytical thinking skills in data-driven decision-making. However, the results of international studies such as PISA show that the numeracy literacy skills of Indonesian students are still relatively low, which is reinforced by the large number of students who have not achieved the minimum competency in the Minimum Competency Assessment (AKM). Therefore, learning innovations are needed that can bridge abstract mathematical concepts with students' concrete experiences. The following indicators of mathematical literacy are adapted from PISA:

Table 1. which serves as the basis for assessing students' numeracy literacy skills in this research.

Indicators of Mathematical Literacy	Sub-Indicators of Mathematical Literacy
Formulating problems mathematically	Simplifying real-world problems into known and unknown components.
	Clearly expressing problems in the form of mathematical statements.
Employing mathematical concepts, facts, procedures, and reasoning	Developing appropriate problem-solving strategies using mathematical facts, concepts, and reasoning.
	Solving problems accurately using mathematical procedures.
Interpreting, concluding, and reflecting on mathematical results	Interpreting and concluding the results of problem solving in relation to realworld contexts.
	Explaining how the solution and results were obtained.

Source: Adapted from OECD as cited in Putra & Vebrian (2019, pp. 8–10)

Problem-solving skills are at the heart of mathematics learning, requiring students to think systematically through structured steps. Based on Polya's theory (1973), the problem-solving process consists of four sequential stages, namely comprehending the problem, formulating a solution plan, executing the planned strategy, and evaluating the obtained results. These skills are closely related to numeracy literacy because students need a good understanding of numerical information to choose the right solution

strategy for contextual problems. In reality, many students remain fixated on routine procedures and struggle when faced with word problems or problems that require critical thinking, particularly those involving fractions, which involve complex concepts such as proportions and parts of a whole.

The *Problem-Based Learning* (PBL) approach is a learner-centered method that promotes deep understanding by involving students in solving authentic, real-life problems. This model facilitates in-depth understanding by involving learners in structured inquiry, collaborative discussion, and reflective activities that support independent and cooperative problem solving. The learning process in PBL is systematically organized through several stages, including problem orientation, learning organization, guided investigation, presentation of solutions, and evaluation of the problem-solving process (Trianto, 2017). Empirical evidence from Wulandari et al. (2023) demonstrates that the application of PBL in elementary schools significantly enhances students' creative thinking abilities in mathematics, as students are able to generate original ideas and propose innovative solutions. Therefore, PBL contributes not only to the improvement of conceptual comprehension but also to the development of creativity, particularly when integrated with appropriate instructional media such as eco fraction tools.

Figure 1. Eco Fraction Media

Eco Fraction Media, a concrete teaching aid made from recycled sawdust, serves to visualize the concept of fractions interactively and manipulatively. The use of concrete media supports Bruner's Concrete–Pictorial–Abstract (CPA) principle, which facilitates students' construction of knowledge through direct experience before moving on to the abstract stage.

Several previous studies reinforce the importance of using this combination of models and media. Research by Nurhayati et al. (2021) and Widyaningsih and Surya (2017) demonstrated that fraction boards are highly effective in helping students understand fraction concepts concretely and increasing their engagement in learning. Furthermore, recent research by Sari et al. (2024) demonstrated the significant influence of the fraction board-assisted PBL model on improving students' numeracy skills. The integration of the PBL model and Eco-Fraction media is expected to not only improve cognitive learning outcomes but also foster self-confidence and persistence in facing future mathematical challenges

METHODS

This research employed a quantitative approach using a quasi-experimental method with a non-equivalent control group design. The population comprised all fourth-grade students at SDN Citrodiwangsan 02 Lumajang, with 28 students in each class (IV A and IV B), selected via cluster random sampling. Based on normality and homogeneity analyses of the odd-semester mathematics PTS scores for the 2025/2026 academic year, class IV A was assigned as the experimental group, receiving instruction through the Problem-Based Learning (PBL) model supported by Eco Fraction media, whereas class IV B functioned as the control group and followed conventional teaching methods.

This study employed validated assessment instruments, consisting of a numeracy literacy test developed based on PISA indicators and a mathematical problem-solving test structured according to Polya's problem-solving stages. The research process commenced with a pretest to assess students' baseline competencies, followed by the implementation of the instructional treatment conducted across three learning sessions. During the intervention, the experimental group participated in Problem Based Learning (PBL) activities supported by eco fraction manipulatives derived from recycled wood materials to facilitate conceptual understanding of fractions. Upon completion of the intervention, a posttest was administered to both the experimental and control groups to obtain final data. The data obtained were analyzed through inferential statistical methods, comprising the Shapiro–Wilk test for normality, Levene's test for variance homogeneity, and the independent samples t-test, using SPSS version 27 to assess the impact of the instructional method on the observed variables.

RESULT

This study investigated the impact of the Problem Based Learning (PBL) approach, assisted by Eco Fraction media, on fourth-grade students' numeracy literacy and mathematical problem-solving abilities during fraction lessons at SDN Citrodiwangsan 02. The study was initiated with a pretest to identify students' initial competencies, followed by the execution of instructional activities in both the experimental and control groups across three instructional sessions with equivalent time allocation and identical learning content. The instructional materials covered fundamental fraction concepts, comparison and ordering of fractions, equivalent fractions, and the application of fractions through contextual word problems. The research procedure concluded with the administration of a posttest to evaluate learning outcomes, while the detailed schedule of the instructional implementation is presented in the subsequent table:

Table 2. Learning Implementation Schedule

No.	Day, date	Time		Activity
		Experimental Class	Control Class	
1	Monday, October 20, 2025	07.30 – 08.40	08.50 – 10.00	Pretest
2	Tuesday, October 21,2025	07.00 – 08.10	08.20 - 09.30	Learning 1
3	Friday, October 24, 2025	07.00 – 08.10	08.20 - 09.30	Learning 2
4	Monday, October 27, 2025	07.30 – 08.40	08.50 – 10.00	Learning 3
5	Tuesday, October 28, 2025	07.30 – 08.40	08.50 – 10.00	Posttest

The implementation of learning in the experimental class applies the PBL model with 5 syntaxes assisted by Eco Fraction media with the assistance of the fourth grade teacher as an observer to ensure the suitability of the implementation with the research design which begins with the presentation of contextual problems related to the use of fractions in everyday life. The problems are presented through videos and texts in group worksheets whose solutions use Eco Fraction media as a concrete and interactive tool.

Figure 2. PBL syntax assisted by eco fraction media (experimental class)

During the core activities, students work in small groups to identify problems, discuss ideas, and determine solution strategies with teacher guidance. Eco-Fraction media is used to visualize the concept of fractions, enabling students to understand how to determine the value of fractions, compare fractions, and solve context-based problems.

In the investigation phase, students conduct simple experiments using Eco-Fraction media and record observations for group discussion. This phase aims to develop analytical thinking skills and connect mathematical concepts to real-life situations.

Each group then presents the results of their discussions, and the teacher provides feedback to improve conceptual understanding. The final phase concludes with a group reflection to formulate learning conclusions and evaluate student understanding of the material.

Figure 3. Learning activities in the control class (teacher center)

In control class, instruction was conducted using traditional teaching methods, teacher-centered model through theoretical explanations, examples, and individual practice without the aid of Eco-Fraction media or problem-based activities. Learning emphasized solution procedures rather than conceptual understanding.

At the conclusion of the instructional sessions in both the experimental and control classes, a posttest was administered to evaluate students' gains in numeracy literacy and mathematical problem-solving abilities. The pretest and posttest results were analyzed to evaluate the effect of implementing Problem Based Learning (PBL) model with eco fraction media on students' numeracy literacy and mathematical problem solving abilities.
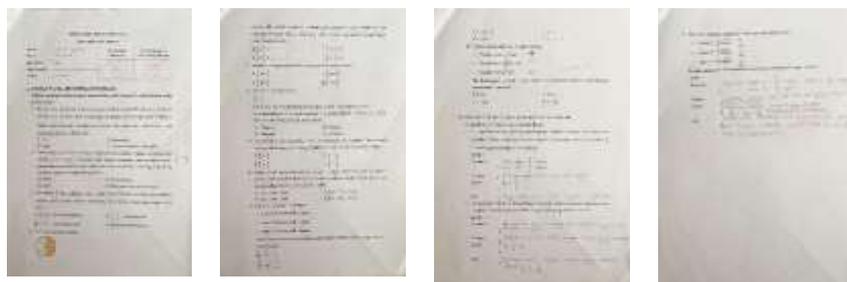

Figure 4. Example of Posttest Results for Numeracy Literacy and Problem Solving Skills for Experimental Class
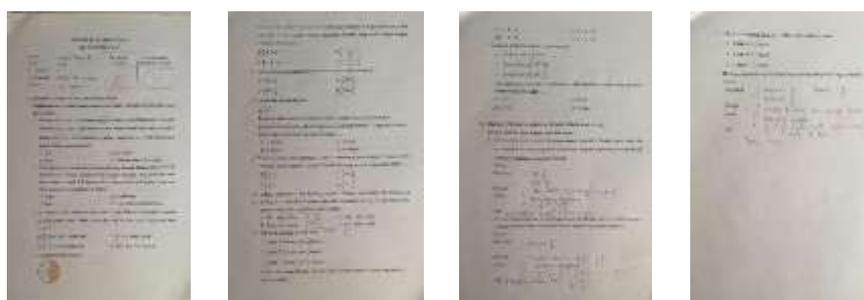

Figure 5. Example of Posttest Results for Numeracy Literacy and Problem Solving Skills for Control Class

The descriptive analysis revealed that numeracy literacy skills increased in both the experimental and control groups after the learning process. However, the experimental group, which received instruction through the Problem Based Learning (PBL) model supported by Eco Fraction media, exhibited a notably higher improvement than the control group. The detailed results of the SPSS version 27 analysis are provided in the following table:

Table 3. Description of Numeracy Literacy Ability Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Control Pretest	28	20	70	48.57	12.084
Control Posttest	28	40	80	60.54	11.890
Experimental Pretest	28	30	80	50.71	12.745
Experimental Posttest	28	40	100	75.36	13.467
Valid N (listwise)	28				

Quantitatively, the average posttest result of numeracy literacy of experimental class students was higher at 75.36 compared to the control class at 60.54. This finding indicates that student involvement in problem-based learning supported by eco-fraction media is able to help students formulate problems mathematically, use the concept of facts, procedures, and mathematical reasoning, and interpret, conclude, and reflect on mathematical results according to literacy indicators. The achievements of students who have met these indicators in each class can be seen in the following table:

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Table 4. Student Achievement in Numeracy Literacy Indicators

Mathematical Literacy Ability Indicator	Experimental Class			Control Class		
	fulfilled	not yet fulfilled	number of students	fulfilled	not yet fulfilled	number of students
Formulating problems mathematically (Test instruments 1-3)	26	2	28	16	12	28
Using mathematical concepts, facts, procedures, and reasoning (Test instruments 4-7)	23	5	28	11	17	28
Interpreting, concluding, and reflecting on mathematical results (Test instrument numbers 8-10)	22	6	28	19	9	28

Based on the results presented in the numeracy literacy indicator achievement table, students in the experimental group demonstrated higher levels of achievement across all assessed indicators compared to those in the control group. This improvement suggests that the application of the Problem Based Learning (PBL) model supported by Eco Fraction media effectively facilitates students' ability to comprehend, process, and apply mathematical concepts within contextual learning situations. Meanwhile, students in the control class who followed conventional learning tended to show lower achievement, especially in indicators that require reasoning and interpretation of numerical problems. In line with the achievement of numeracy literacy, the improvement in student learning outcomes is also reflected in the problem solving skills developed during the learning process.

Descriptive analysis of students' problem-solving abilities showed a consistent pattern of improvement, where the experimental group obtained a significantly higher average posttest score of 78.07, compared to the control group which achieved 62.96. This finding indicates that Problem Based Learning (PBL) based learning supported by Eco-Fraction media is able to improve students' abilities in understanding problems, designing solution strategies, implementing solution steps systematically, and re-checking the results of answers according to Polya's problem solving stages. The detailed results of the SPSS version 27 analysis are provided in the following table:

Table 5. Statistical Description of Problem Solving Skills

	N	Minimum	Maximum	Mean	Std. Deviation
Control Pretest	28	17	70	43.54	10.373
Control Posttest	28	33	90	62.96	12.773
Experimental Pretest	28	33	57	46.89	5.890
Experimental Posttest	28	63	97	78.07	8.160
Valid N (listwise)	28				

EFFECT ANALYSIS RESULTS (INFERENTIAL TEST) ANALYSIS OF THE INFLUENCE OF THE PBL MODEL ASSISTED BY ECO FRACTION MEDIA ON STUDENTS' NUMERACY LITERACY SKILLS ON FRACTION MATERIAL IN GRADE IV ELEMENTARY SCHOOL

The next step before testing the hypothesis on students' numeracy literacy skills was a normality test to determine the characteristics of the data distribution. This test aimed to determine whether the pretest and posttest data in the experimental and control classes were normally distributed. The normality test was conducted using SPSS version 27 software, and the results of the statistical analysis are presented in the following table:

Table 6 Results of the Normality Test of Numeracy Literacy Data

	Class	Shapiro-Wilk		
		Statistic	Df	Sig.
Numeracy Literacy	Control Pretest	0.930	28	0.060
	Control Posttest	0.928	28	0.054
	Experimental Pretest	0.936	28	0.087
	Experimental Posttest	0.928	28	0.056

The Shapiro–Wilk test results show that the significance values for numeracy literacy scores in both the experimental and control groups are greater than 0.05, indicating that the data meet the assumption of normality. This confirmation of normal distribution establishes a valid basis for conducting the subsequent homogeneity test, which serves as a prerequisite for further inferential statistical analysis.

The homogeneity test was conducted to verify the equivalence of variance between the experimental and control groups under both pre-treatment and post treatment conditions. This analysis employed Levene's test with a significance level of 0.05. Based on the results generated through data processing using SPSS version 27, information regarding variance homogeneity was obtained and is subsequently presented in the following table:

Table 7. Results of the Homogeneity Test of Numeracy Literacy Variance

		Levene Statistic	df1	df2	Sig.
Numeracy Literacy	Based on Mean	0.861	1	54	0.358
	Based on Median	0.982	1	54	0.326
	Based on Median and with adjusted df	0.982	1	53.993	0.326
	Based on trimmed mean	0.846	1	54	0.362

The results of the homogeneity test using Levene's test indicate that the data variances across groups are homogeneous, as evidenced by a significance value greater than 0.05; therefore, the data satisfy the assumptions required to perform an Independent Samples t-test. The statistical analysis results obtained using SPSS version 27 are presented in the following table:

Table 8. Results of the Independent Sample T-test for Numeracy Literacy.

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
									Lower	Upper	
Numeracy Literacy	Equal variances assumed	.861	.358	-4.366	54	<0,001	-14.821	3.395	-21.628	-8.015	
	Equal variances not assumed			-4.366	53.184	<0,001	-14.821	3.395	-21.630	-8.013	

The results of the independent sample t-test analysis indicate that the significance value (Sig. 2-tailed) is below the threshold of 0.05, signifying a statistically significant difference in numeracy literacy levels between students in the experimental group and those in the control group. This finding demonstrates that the instructional treatment led to meaningful variations in numeracy literacy outcomes across groups. Therefore, the implementation of the Problem-Based Learning *(*PBL) model supported by eco fraction media is statistically proven to have a positive effect on improving students' numeracy literacy.

ANALYSIS OF THE INFLUENCE OF THE PBL MODEL ASSISTED BY ECO FRACTION MEDIA ON STUDENTS' PROBLEM-SOLVING SKILLS IN FRACTION MATERIAL IN GRADE IV ELEMENTARY SCHOOL

The study investigated the impact of the *Problem-Based Learning* (PBL) model, facilitated by Eco Fraction media, on fourth-grade students' problem-solving abilities in fraction topics through hypothesis testing, beginning with a normality assessment. This assessment aimed to verify whether the pretest and posttest scores for both experimental and control groups followed a normal

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distribution, which is a necessary condition for conducting subsequent statistical analyses. The outcomes of the normality test, processed using SPSS version 27, are summarized in the table below:

Table 9. Results of the Normality Test of Problem Solving Skills Data.

	Class	Shapiro-Wilk		
		Statistic	Df	Sig.
Problem Solving Skills	Control Pretest	0.943	28	0.129
	Control Posttest	0.981	28	0.881
	Experimental Pretest	0.937	28	0.095
	Experimental Posttest	0.936	28	0.088

The Shapiro–Wilk normality test results show that the significance values for problem-solving skills in both the experimental and control groups are greater than 0.05, indicating that the data follow a normal distribution. This confirmation of normality ensures the appropriateness of conducting further analyses using parametric statistical methods. Consequently, the next step involves performing a homogeneity test to assess whether the variances between groups are equal, with the outcomes analyzed using SPSS version 27 and summarized in the subsequent table:

Table 10. Results of the Homogeneity Test of Variance of Problem Solving Skills.

		Levene Statistic	df1	df2	Sig.
Problem Solving Skills	Based on Mean	3.390	1	54	0.071
	Based on Median	3.370	1	54	0.072
	Based on Median and with adjusted df	3.370	1	46.250	0.73
	Based on trimmed mean	3.382	1	54	0.071

The results of the homogeneity test using Levene's in the table above show a significance value greater than 0.05, indicating that the data variance between groups is homogeneous. This finding confirms that the research data meets the homogeneity assumption required to conduct the Independent Samples t-test. The results of the statistical analysis using SPSS 27 are shown in the table below:

Table 11. Results of the Independent Sample T-test of Problem Solving Skills

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lo-wer	Up-per
Problem Solving Skills	Equal variances assumed	3.390	.071	-5.274	54	<0.001	-15.107	2.864	-20.850	-9.364
	Equal variances not assumed			-5.274	45.893	<0.001	-15.107	2.864	-20.873	-9.341

The analysis results in the table above using the Independent Sample t-test show a significance value (Sig. 2-tailed) below 0.05, which means there is a significant difference in problem-solving skills between students in the experimental and control groups. Thus, the application of the Problem Based Learning (PBL) model supported by Eco Fraction media has been proven to have a positive influence on improving students' mathematical problem-solving competencies.

DISCUSSION

This research shows that the application of the Problem-Based Learning (PBL) model combined with eco fraction media significantly improves the numeracy literacy and mathematical problem-solving abilities of fourth-grade students on fraction material. This conclusion is supported by the observed differences in post-test mean scores between the experimental and control groups, with the Independent Sample t-test indicating a significance value of less than 0.05. Consequently, instructional strategies that integrate PBL with concrete learning media are more effective than traditional approaches focused on lectures and procedural exercises.

The improvement of numeracy literacy among students in the experimental class is reflected not only in test results but also in their high level of active engagement throughout the learning process. The implementation of the *Problem-Based Learning* (PBL) syntax habituates students to examine contextual problems, participate in discussions, conduct exploration, and systematically communicate their findings. These learning activities encourage students to relate mathematical concepts to real life situations, so that the understanding gained becomes more meaningful and sustainable (Trianto, 2017; Savery, 2015). Consequently, numeracy literacy develops as students become capable of interpreting, applying, and evaluating mathematical concepts logically and critically within everyday contexts.

The effectiveness of the PBL model was further strengthened by the use of Eco Fraction media, which functioned as a concrete visual representation for understanding fraction concepts. This media facilitated students' construction of part–whole relationships through manipulative activities, thereby reducing the abstract nature of fractions. These findings are consistent with the Concrete–Pictorial–Abstract (CPA) principle proposed by Bruner (1966) and with previous studies reporting that concrete media enhance conceptual understanding and numeracy literacy among elementary school students (Widodo, 2021; Mawarni & Amanda, 2023).

In terms of problem-solving skills, students in the experimental group showed higher abilities in applying Polya's problem solving framework, which includes understanding the problem, developing a solution plan, implementing the chosen strategy, and evaluating the results. This structured and collaborative approach enhances students' critical thinking and mathematical reasoning skills (Hmelo-Silver, 2004; Barrows, 2002). Additionally, participation in group discussions promotes social interaction that reinforces conceptual understanding, consistent with Vygotsky's (1978) theory of the zone of proximal development.

Eventually, the results of this research confirm that the application of the Problem Based Learning (PBL) model supported by Eco Fraction media is very effective in improving numeracy literacy and problem-solving skills in fraction material for fourth grade elementary school students. The integration of contextual problems, investigative activities, and concrete learning media provides meaningful learning experiences that align with the demands of strengthening numeracy within the curriculum.
Therefore, this instructional model is recommended as an innovative alternative strategy for mathematics instruction, particularly in fraction topics that often pose challenges for students.

CONCLUSION

The findings of this study indicate that implementing the Problem-Based Learning (PBL) model with Eco Fraction media significantly enhances fourth-grade students' numeracy literacy and mathematical problem-solving skills in fraction topics. This conclusion is supported by the notable difference in average posttest scores between the experimental and control groups, with statistical analysis showing a significance level below 0.05. Problem-based learning supported by concrete media effectively helps students develop meaningful understanding of fractions, apply systematic problem-solving strategies, and enhance critical and communicative thinking skills. Therefore, the PBL model assisted by Eco Fraction media is recommended for sustainable implementation in elementary mathematics instruction, supported by effective classroom management, optimal facilitation of discussions, and the provision of innovative learning resources and teacher professional development. Future research is suggested to extend the scope across different educational levels and contexts and to examine additional variables such as learning motivation, creativity, and mathematical communication skills in order to strengthen empirical evidence and contribute further to the field of mathematics education.

REFERENCES

1. Barrows, H. S. (2002). Problem-based learning applied to medical education. Southern Illinois University Press.
2. Bruner, J. S. (1966). *Toward a theory of instruction*. Harvard University Press.
3. Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? Educational Psychology Review, 16(3), 235–266.
4. Kemendikbudristek. (2022). Guide to Developing Numeracy Learning in Elementary Schools. Jakarta: Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.
5. Kusumawati, D., Ramadhani, A., & Permatasari, M. (2023). Analysis of Elementary School Students' Mathematical ProblemSolving Ability Through the PBL Model. Journal of Elementary School Pedagogy, 11(1), 45-53.
6. Mawarni, A., & Amanda, D. (2023). The Effectiveness of Concrete Media on Numeracy Literacy Skills. Journal of Mathematics Education Scholars
7. Nurhayati, N., Suparman, S., & Wahyuni, W. (2021). The use of fraction board media to improve elementary school students' understanding of fraction concepts. Indonesian Journal of Mathematics Education, 6(1).
8. Organisation for Economic Co-operation and Development. (2019). *PISA 2018 results (Volume I): What students know and can do*. OECD Publishing. https://doi.org/10.1787/5f07c754-en
9. Organisation for Economic Co-operation and Development. (2023). *PISA 2022 assessment and analytical framework: Mathematics, reading, science and creative thinking*. OECD Publishing. https://doi.org/10.1787/9b007fdc-en
10. Polya, G. (1973). *How to Solve It: A New Aspect of Mathematical Method*. Princeton University Press.
11. Sari, M., Dwi, R., & Hendra, P. (2024). Analysis of mathematical problem-solving stages based on Polya's model. *Jurnal Riset Pendidikan Matematika, 11*(1), 30–38.
12. Savery, J. R. (2015). Overview of problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of ProblemBased Learning, 1*(1), 9–20.
13. Trianto. (2017). *Innovative learning models for constructivist-oriented instruction*. Prestasi Pustaka.
14. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press. Widodo, H. (2021). Concrete manipulative media to improve elementary school students' understanding of fraction concepts. *Jurnal Numerasi*.
15. Widyaningsih, N., & Surya, E. (2017). The use of fraction board media in problem-based learning to improve student engagement and understanding of fraction concepts in Grade IV. *Jurnal Pendidikan Matematika, 1*(1), 10–18.
16. Wulandari, S., Misdalina, M., & Tanzimah, T. (2023). The Influence of the Problem Based Learning Model on Students' Creative Thinking Abilities in Understanding Learning