Jurnal Kependidikan:
Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran
https://e-journal.undikma.ac.id/index.php/jurnalkependidikan/index

Vol. 12, No. 3 : September 2026
E-ISSN: 2442-7667
pp. 1163-1173
Email: jklppm@undikma.ac.id

Development of Financial Literacy-Integrated Problem-Based Learning Worksheets for Enhancing Students' Mathematical Problem-Solving Skills

Afifa Thurifqoh, Sri Hastuti Noer*, Agung Putra Wijaya
Master of Mathematics Education, Faculty of Teacher Training and Education,
Universitas Lampung, Indonesia.
*Corresponding Author. Email: hastuti_noer@yahoo.com

Abstract: This study aims to develop and evaluate financial literacy-integrated Problem-Based Learning (PBL) worksheets to foster students' mathematical problem-solving skills. The product was developed using the ADDIE framework within a Research and Development (R&D) method, encompassing the stages of analysis, design, development, implementation, and evaluation. The field trial involved 61 eleventh-grade students, comprising 31 students in the experimental group and 30 in the control group, selected through cluster random sampling using a pretest–posttest control group design. Data were collected through expert validation, practicality questionnaires, and mathematical problem-solving tests. The data were analyzed using Aiken's V to quantify expert judgments, item validity and reliability analyses to evaluate the mathematical problem-solving test, percentage analysis to assess practicality, normalized gain (N-gain) to measure improvements in mathematical problem-solving skills, and an independent-samples t-test to examine differences in improvement between the experimental and control groups. Expert judgments yielded Aiken's V coefficients ranging from 0.84 to 0.93, indicating strong agreement among the experts regarding the relevance of the assessed components. The mathematical problem-solving test demonstrated acceptable item validity and good internal consistency, with a Cronbach's alpha coefficient of 0.853. The developed worksheets demonstrated a high level of practicality, based on teacher and student response rates of 89% and 87.6%, respectively. The experimental group achieved a higher mean N-gain score (0.625) than the control group (0.516), with a statistically significant difference in improvement (one-tailed $p = 0.011$). These findings indicate that the developed financial literacy-integrated PBL worksheets meet established quality criteria, support classroom implementation, and foster students' mathematical problem-solving skills through authentic financial contexts.

Article History
Received: 09-07-2026
Revised: 12-08-2026
Accepted: 31-08-2026
Published: 20-09-2026

Key Words:
Financial Literacy; Mathematical Problem-Solving; Problem-Based Learning; Student Worksheets.

How to Cite: Thurifqoh, A., Sri Hastuti Noer, & Agung Putra Wijaya. (2026). Development of Financial Literacy-Integrated Problem-Based Learning Worksheets for Enhancing Students' Mathematical Problem-Solving Skills. *Jurnal Kependidikan : Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran, Dan Pembelajaran*, *12*(3), 1163-1173. https://doi.org/10.33394/jk.v12i3.22267

https://doi.org/10.33394/jk.v12i3.22267

Introduction

Mathematical problem-solving ability is an essential competency in mathematics education because it requires students to integrate conceptual understanding, logical reasoning, and appropriate solution strategies in real-world situations. It is closely related to mathematical literacy, which involves applying and interpreting mathematics across real-life contexts (OECD, 2023). However, Indonesian students continue to perform below the OECD average, particularly in tasks requiring mathematical reasoning and problem solving (OECD, 2023). This highlights the need for learning approaches that provide students with meaningful opportunities to engage in contextual mathematical problems.

At the same time, the growing digital economy has increased students' exposure to financial activities, including digital payments, investment, and *buy now, pay later* services.

Vol. 12, No. 3 : September 2026
E-ISSN: 2442-7667
pp. 1163-1173
Email: jklppm@undikma.ac.id

Financial literacy involves the knowledge, skills, attitudes, and behaviors needed to make informed financial decisions (OECD, 2024). Because financial situations require students to interpret quantitative information and make decisions based on mathematical reasoning, they can provide meaningful contexts for developing mathematical problem-solving ability (Lusardi & Mitchell, 2023).

The relationship between financial literacy and mathematical problem-solving ability is evident in real-world financial situations, which require students to interpret quantitative information, identify relevant variables, compare alternatives, and evaluate the consequences of different decisions. These processes align with mathematical problem solving and require students to apply mathematical concepts beyond routine procedures. PBL is well suited to financial learning because it places students in authentic, less-structured situations that require them to interpret information and construct solution strategies rather than rely on predetermined procedures. Integrating financial literacy into PBL therefore creates meaningful contexts for students to apply mathematical reasoning to financial decisions (Yew & Goh, 2016; Siagian et al., 2023; Sagita et al., 2022).

Observations in the study context showed that mathematics learning still relied heavily on procedural instruction and routine exercises, with limited opportunities to address contextual and non-routine problems. As a result, students had difficulties identifying relevant information, choosing appropriate strategies, and judging the reasonableness of their solutions. The worksheets used in the classroom also focused mainly on standard exercises rather than authentic financial situations, highlighting the need for learning resources that connect mathematical concepts with real-world contexts and meaningful problem-solving activities.

Previous studies have demonstrated the potential of PBL-based learning resources to improve students' mathematical problem-solving ability. Agustinsa et al. (2023) found that PBL using contextual worksheets improved the mathematical problem-solving ability of junior high school students, while Bay et al. (2024) reported similar benefits from interactive PBL-based worksheets. However, these studies focused on PBL and contextual or interactive worksheets without specifically integrating financial literacy into the learning activities. Although previous studies have highlighted the relevance of financial literacy to mathematics learning and real-life financial decision-making (Sagita et al., 2022; Zaimovic et al., 2023), its systematic integration into PBL-based student worksheets for senior high school financial mathematics remains limited.

To address this gap, this study developed PBL-based student worksheets that systematically integrate financial literacy throughout the learning process. The worksheets incorporate authentic financial problems into each PBL phase and provide structured activities that guide students to analyze information, formulate and apply mathematical strategies, and evaluate their solutions. Accordingly, this study aimed to develop and evaluate the validity, practicality, and effectiveness of the worksheets in enhancing students' mathematical problem-solving ability.

Research Method

Mathematical problem-solving ability is an essential competency in mathematics education because it requires students to integrate conceptual understanding, logical reasoning, and appropriate solution strategies in real-world situations. It is closely related to mathematical literacy, which involves applying and interpreting mathematics across real-life contexts (OECD, 2023). However, Indonesian students continue to perform below the OECD average, particularly in tasks requiring mathematical reasoning and problem solving (OECD,

Vol. 12, No. 3 : September 2026
E-ISSN: 2442-7667
pp. 1163-1173
Email: jklppm@undikma.ac.id

2023). This highlights the need for learning approaches that provide students with meaningful opportunities to engage in contextual mathematical problems.

At the same time, the growing digital economy has increased students' exposure to financial activities, including digital payments, investment, and *buy now, pay later* services. Financial literacy involves the knowledge, skills, attitudes, and behaviors needed to make informed financial decisions (OECD, 2024). Because financial situations require students to interpret quantitative information and make decisions based on mathematical reasoning, they can provide meaningful contexts for developing mathematical problem-solving ability (Lusardi & Mitchell, 2023).

The relationship between financial literacy and mathematical problem-solving ability is evident in real-world financial situations, which require students to interpret quantitative information, identify relevant variables, compare alternatives, and evaluate the consequences of different decisions. These processes align with mathematical problem solving and require students to apply mathematical concepts beyond routine procedures. PBL is well suited to financial learning because it places students in authentic, less-structured situations that require them to interpret information and construct solution strategies rather than rely on predetermined procedures. Integrating financial literacy into PBL therefore creates meaningful contexts for students to apply mathematical reasoning to financial decisions (Yew & Goh, 2016; Siagian et al., 2023; Sagita et al., 2022).

Observations in the study context showed that mathematics learning still relied heavily on procedural instruction and routine exercises, with limited opportunities to address contextual and non-routine problems. As a result, students had difficulties identifying relevant information, choosing appropriate strategies, and judging the reasonableness of their solutions. The worksheets used in the classroom also focused mainly on standard exercises rather than authentic financial situations, highlighting the need for learning resources that connect mathematical concepts with real-world contexts and meaningful problem-solving activities.

Previous studies have demonstrated the potential of PBL-based learning resources to improve students' mathematical problem-solving ability. Agustinsa et al. (2023) found that PBL using contextual worksheets improved the mathematical problem-solving ability of junior high school students, while Bay et al. (2024) reported similar benefits from interactive PBL-based worksheets. However, these studies focused on PBL and contextual or interactive worksheets without specifically integrating financial literacy into the learning activities. Although previous studies have highlighted the relevance of financial literacy to mathematics learning and real-life financial decision-making (Sagita et al., 2022; Zaimovic et al., 2023), its systematic integration into PBL-based student worksheets for senior high school financial mathematics remains limited.

To address this gap, this study developed PBL-based student worksheets that systematically integrate financial literacy throughout the learning process. The worksheets incorporate authentic financial problems into each PBL phase and provide structured activities that guide students to analyze information, formulate and apply mathematical strategies, and evaluate their solutions. Accordingly, this study aimed to develop and evaluate the validity, practicality, and effectiveness of the worksheets in enhancing students' mathematical problem-solving ability.

Results and Discussion

A student worksheet for financial mathematics that is based on problem-based learning (PBL) and incorporates financial literacy was created as a consequence of this study. The

Jurnal Kependidikan:
Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran
https://e-journal.undikma.ac.id/index.php/jurnalkependidikan/index
Vol. 12, No. 3 : September 2026
E-ISSN: 2442-7667
pp. 1163-1173
Email: jklppm@undikma.ac.id

steps of the ADDIE model analysis, design, development, implementation, and evaluation were followed in the development process. Formative evaluation was conducted throughout each stage to refine the product before proceeding to the next phase. The results and discussion are presented according to these development stages.

1) Analyze : Learning Needs and Product Rationale

The analysis stage identified the learning needs, curriculum requirements, and student characteristics relevant to the development of the worksheet. The curriculum analysis indicated that financial mathematics requires students not only to understand concepts such as compound interest and annuities but also to apply them to contextual financial problems (Kemendikbudristek, 2022). Classroom observations and interviews further showed that mathematics learning was still largely procedural, while existing worksheets provided limited opportunities for students to investigate authentic problems and develop systematic solution strategies.

These findings indicated a need for learning materials that connect mathematical concepts with meaningful real-world contexts. Therefore, the developed worksheet integrated financial contexts such as savings, investment, credit, and digital lending into PBL activities. Rather than presenting financial situations as isolated applications of mathematical formulas, the worksheet required students to interpret information, formulate strategies, evaluate alternatives, and consider the consequences of their solutions. This approach provided a basis for connecting financial literacy with mathematical problem solving through authentic and decision-oriented learning experiences.

2) Design: Integration of PBL, Financial Literacy, and Problem Solving

The worksheet design incorporated financial literacy into mathematics learning through the Problem-Based Learning (PBL) framework. Learning activities centered on simple and compound interest and presented authentic financial situations in which students applied mathematical concepts to make meaningful financial decisions. The worksheet comprised learning objectives, activity instructions, contextual problems, investigation tasks, group discussions, reflection activities, and assessments. These activities were organized to support four stages of mathematical problem solving: understanding the problem, formulating a strategy, carrying out the plan, and reflecting on the solution.

Figure 1. Overview of problem orientation, group organization, and investigation activities.

Jurnal Kependidikan:
Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran
https://e-journal.undikma.ac.id/index.php/jurnalkependidikan/index
Vol. 12, No. 3 : September 2026
E-ISSN: 2442-7667
pp. 1163-1173
Email: jklppm@undikma.ac.id

As shown in Figure 1, the worksheet presents an authentic financial problem and guides students through problem orientation, group organization, and investigation. Students identify relevant information, analyze the financial context, explore possible solution strategies, and construct mathematical models to address the problem. Through this process, financial contexts serve not merely as examples for applying mathematical formulas but as authentic problems without predetermined solution procedures, requiring students to interpret information, reason mathematically, select appropriate strategies, and make decisions based on the results. This structure connects mathematical problem solving with financial literacy by requiring students to apply mathematical reasoning to realistic financial situations.

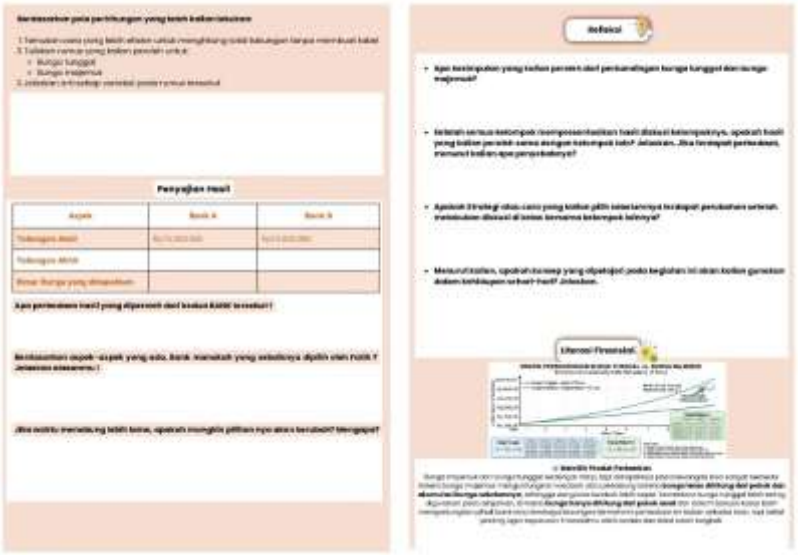

Figure 2. Overview of presentation of results, reflection, and financial literacy reinforcement activities.

As illustrated in Figure 2, students present and discuss the results of their investigations and explain the mathematical reasoning underlying their solutions. The subsequent reflection activities require students to evaluate their problem-solving processes and consider the implications of different financial decisions involving simple and compound interest. The worksheet therefore extends mathematical problem solving beyond obtaining a numerical answer by encouraging students to justify their reasoning, compare alternatives, and reflect on the appropriateness of their decisions. These activities integrate mathematical reasoning with financial literacy and support students in applying mathematical concepts to responsible financial decision-making.

3) Development: Validation and Product Refinement

The development stage transformed the initial design into a prototype and focused on establishing the quality of the developed worksheet and research instruments. The worksheet was evaluated by three experts in terms of content, presentation, language, and graphical design, with particular attention to its alignment with the learning objectives, Problem-Based Learning (PBL) process, and integration of financial literacy. The research instruments were also reviewed to ensure their suitability for measuring students' mathematical problem-solving ability.

Table 3. Validation results of the developed worksheet and research instruments.

Component	Aiken's V	Category
Material	0.85	Very Valid
Media	0.84	Very Valid
Test Instrument	0.93	Very Valid

Vol. 12, No. 3 : September 2026
E-ISSN: 2442-7667
pp. 1163-1173
Email: jklppm@undikma.ac.id

As presented in Table 3, the expert judgments yielded Aiken's V coefficients of 0.85 for the material component, 0.84 for the media component, and 0.93 for the mathematical problem-solving test. All coefficients fell within the very valid category, indicating strong agreement among the experts regarding the relevance and suitability of the assessed components. These results indicate that the developed worksheet and research instrument met the established content validity criteria.

Expert feedback informed several refinements to the worksheet, particularly in the wording of contextual problems, activity instructions, layout, and visual illustrations representing financial literacy contexts. These revisions improved the clarity, coherence, and contextual relevance of the worksheet and strengthened its alignment with the intended learning objectives and PBL process. The mathematical problem-solving test consisted of three open-ended items designed to assess four problem-solving stages: understanding the problem, formulating a strategy, implementing the plan, and reflecting on the solution. The items were empirically tested with 24 twelfth-grade students who were not included in the field implementation to examine their psychometric quality, including item validity, reliability, difficulty level, and discrimination.

Table 4. Item analysis results of the mathematical problem-solving test.

Aspect	Result	Category
Item Validity	All item valid	Accepted
Reliability (Cronbach's Alpha)	0.853	Good
Difficulty Level	Moderate	Appropriate
Discrimination Index	Fair-Good	Appropriate

As shown in Table 4, all three test items met the item-validity criteria and were therefore retained for the field implementation. The test demonstrated good internal consistency, with a Cronbach's alpha coefficient of 0.853. The items also showed moderate difficulty and fair-to-good discrimination, indicating their suitability for measuring differences in students' mathematical problem-solving ability. Overall, the validation and item analysis results confirmed that the developed worksheet and mathematical problem-solving test met the established quality criteria and were suitable for subsequent implementation. The validated worksheet was therefore used in the implementation stage to examine its practicality and effectiveness.

4) Implementation: Practicality and Effectiveness

The implementation stage consisted of a small-group trial and a field implementation. The small-group trial involved six students representing high, moderate, and low academic achievement and was conducted to assess the practicality of the developed worksheet. Following the trial, feedback from the students and mathematics teacher was used to refine the worksheet before its implementation in the field.

Table 5. Practicality results of the developed worksheet.

Respondent	Percentage	Category
Mathematics teacher	89%	Very Practical
Students	87.6%	Very Practical

As presented in Table 5, the developed worksheet achieved a *very practical* category based on both teacher and student responses. The teacher's response indicated that the worksheet was easy to use, well organized, and supportive of the PBL process, while students responded positively to the contextual financial problems, visual presentation, and learning activities. These findings indicate that the worksheet was practical for classroom use and provided a suitable learning environment for engaging students with contextual mathematical problems.

The revised worksheet was subsequently administered in a pretest–posttest control group design. Students in the experimental class learned using the PBL-based worksheet integrating financial literacy, while those in the control class used the conventional worksheet routinely employed at the school. Worksheet effectiveness was assessed by examining changes in students' mathematical problem-solving performance from pretest to posttest using normalized gain (N-gain) scores.

Table 6. Students' mathematical problem-solving ability

Class	Pretest Mean	Posttest Mean	N-Gain
Experimental	32	73.08	0.625
Control	32	66.25	0.516

As shown in Table 6, the two classes had an identical mean pretest score of 32, indicating comparable initial performance in mathematical problem solving. After the intervention, the experimental class recorded a higher mean posttest score than the control class (73.08 vs. 66.25). The experimental class also showed a higher mean N-gain of 0.625, compared with 0.516 in the control class, suggesting greater improvement in mathematical problem-solving performance following the use of the developed worksheet.

Prior to comparing the two groups, the N-gain data were examined for normality using the Shapiro–Wilk test and for variance homogeneity using Levene's test. Both groups showed normally distributed N-gain scores ($p > 0.05$), while the homogeneity test produced $p = 0.396$, indicating that the variance assumption was satisfied for the independent-samples *t*-test. The one-tailed independent-samples *t*-test resulted in a significance value of 0.011 ($p < 0.05$), indicating a significant difference in improvement between the two classes.

Table 7. Results of statistical analysis

Statistical Test	Result	Decision
Normality Test (N-Gain)	Exp = 0.615 Ctrl = 0.535	Normal
Homogeneity Test (N-Gain)	Sig = 0.396	Homogeneous
Independent Samples t-test (N-Gain)	Sig. (1-tailed) = 0.011	H_0 Rejected
Normality test (Posttest - Experimental)	Sig. = 0.062	Normal
Proportion Test	Z = 0.786	H_0 Accepted

In addition to the comparison of improvement, the proportion of students achieving the predetermined mastery criterion was examined in the experimental class. Twenty of the 30 students (67%) achieved the minimum mastery criterion. Although this proportion exceeded the target proportion of 60% descriptively, the one-sample proportion test yielded $Z = 0.786$, which did not provide sufficient evidence to conclude that the proportion was significantly greater than the predetermined target at the 0.05 significance level. Overall, the implementation results demonstrate that the developed worksheet was highly practical and produced a significantly greater improvement in students' mathematical problem-solving ability than the conventional worksheet.

5) Evaluation

Formative evaluation was conducted throughout the development process to refine the worksheet based on feedback and findings at each stage. The analysis informed the selection of authentic financial contexts, while expert feedback and instrument analysis guided revisions to the worksheet's content, presentation, language, and visual design. The small-group trial further informed revisions to improve usability before field implementation. Overall, the evaluation process resulted in a worksheet aligned with the identified learning needs and designed to integrate PBL, financial literacy, and mathematical problem solving.

Vol. 12, No. 3 : September 2026
E-ISSN: 2442-7667
pp. 1163-1173
Email: jklppm@undikma.ac.id

Discussion

The findings indicate that the developed student worksheet was valid, highly practical, and effective in supporting students' mathematical problem-solving ability. The significantly greater improvement observed in the experimental class suggests that integrating financial literacy into PBL-based mathematics learning can provide meaningful contexts for students to apply mathematical reasoning. Rather than treating financial literacy as additional content, the worksheet embedded authentic financial situations within the problem-solving process, requiring students to interpret quantitative information, identify relevant variables, formulate solution strategies, and evaluate the implications of their solutions. This finding is consistent with Sawatzki and Sullivan (2018), who demonstrated that challenging mathematical problems situated in real-world financial contexts can engage students in applying and interpreting mathematics.

The effectiveness of the worksheet may also be attributed to the characteristics of PBL, which places students in authentic problems without predetermined solution procedures. In the developed worksheet, students were required to identify relevant information, develop mathematical strategies, construct solutions, discuss their reasoning, and reflect on the appropriateness of their results. These activities provide opportunities for students to move beyond routine procedural practice toward mathematical reasoning and problem solving. This interpretation is consistent with previous research indicating that PBL can support mathematical problem-solving ability by engaging students in active problem solving, collaborative inquiry, and higher-order thinking (Chrisdiyanto & Hamdi, 2023; Siagian et al., 2023; Wahyuni et al., 2023). The findings are also supported by broader evidence from systematic reviews and meta-analyses showing positive effects of PBL on students' mathematical problem-solving performance.

The financial context further strengthens this learning process because financial situations naturally require quantitative interpretation and decision-making. In the developed worksheet, contexts involving savings, investment, compound interest, and credit required students not only to obtain numerical solutions but also to interpret those solutions in relation to alternative financial decisions. Research examining the interaction between mathematical and financial literacy similarly indicates that financial contexts can support both conceptual and process skills and can be meaningfully integrated into mathematics learning (Ghazali et al., 2022). This finding reinforces the view that financial literacy can function not merely as instructional content but also as an authentic context through which students develop mathematical reasoning and problem-solving skills.

A key contribution of this study is the integration of authentic financial situations, PBL activities, and mathematical problem solving within a single worksheet. Earlier studies have demonstrated the value of PBL-based worksheets in mathematics learning (Agustinsa et al., 2023; Bay et al., 2024), while financial literacy research has highlighted the importance of preparing students to make informed financial decisions (Lusardi & Mitchell, 2023). The present study brings these perspectives together by using financial situations as the basis for mathematical reasoning, problem solving, and decision making. Thus, the developed worksheet goes beyond using financial examples as supplementary material by making financial problems an integral part of students' mathematical learning experiences.

The findings also offer implications for mathematics education. Financial literacy-integrated PBL worksheets can help teachers relate mathematical concepts to situations that students may encounter in everyday life, while encouraging problem-solving and responsible decision making. However, the findings should be considered within the context of this study, which was conducted at a single senior high school with a limited number of participants and

Vol. 12, No. 3 : September 2026
E-ISSN: 2442-7667
pp. 1163-1173
Email: jklppm@undikma.ac.id

focused on financial mathematics. Further research involving broader school contexts, larger samples, and other mathematical topics is needed to examine the applicability of this approach across different settings.

Conclusion

The study resulted in a financial literacy-integrated PBL worksheet for senior high school mathematics that met the required validity and practicality standards. Expert assessment yielded Aiken's V coefficients of 0.84–0.93, while teacher and student responses reached 89% and 87.6%, respectively. The experimental class also showed greater improvement in mathematical problem-solving performance, with a mean N-gain of 0.625 compared with 0.516 in the control class, and the difference was statistically significant (one-tailed $p = 0.011$). Although 67% of students in the experimental class achieved the predetermined mastery criterion, the proportion was not significantly above the target proportion. Overall, the findings suggest that integrating financial literacy into PBL-based mathematics learning can provide authentic contexts for developing mathematical problem-solving skills and connecting mathematical reasoning with real-world financial decisions. The resulting worksheet can therefore serve as an alternative resource for contextual mathematics instruction.

Recommendation

Practical and Pedagogical Recommendations

The developed student worksheet can be used as an alternative instructional resource for mathematics teachers seeking to integrate financial literacy into contextual mathematics learning. Teachers are encouraged to adapt the authentic financial contexts and PBL activities to students' learning needs and local financial situations. Curriculum developers and educational policymakers may also consider incorporating financial contexts into mathematics learning materials to strengthen the connection between mathematical problem solving and real-world financial decision-making.

Future Research Agenda

Future research should examine the implementation of the developed worksheet across different educational levels, school contexts, and student characteristics to assess its generalizability. Further studies may also investigate the integration of financial literacy with other mathematical topics and explore the use of interactive or digital learning technologies to extend the accessibility and adaptability of PBL-based financial mathematics learning.

References

Agustinsa, R., Anjasari, V., & Yensy, N. A. (2023). The effect of Problem-Based Learning models using contextual worksheets on middle school students' mathematical problem-solving ability. *Edumatica: Jurnal Pendidikan Matematika, 13*(1), 48–56. https://doi.org/10.22437/edumatica.v13i01.24387

Aiken, L. R. (1980). Content validity and reliability of single items or questionnaires. *Educational and Psychological Measurement, 40*(4), 955–959. https://doi.org/10.1177/001316448004000419

Aiken, L. R. (1985). Three coefficients for analyzing the reliability and validity of ratings. *Educational and Psychological Measurement, 45*(1), 131–142. https://doi.org/10.1177/0013164485451012

Anazifa, R. D., & Djukri. (2017). Project-based learning and problem-based learning: Are they effective to improve students' thinking skills? *Jurnal Pendidikan IPA Indonesia,*

6(2), 346–355. https://doi.org/10.15294/jpii.v6i2.11100

Bay, R. L., Kurniati, N., Lu'luilmaknun, U., & Azmi, S. (2024). Efektivitas model Problem Based Learning (PBL) berbantuan lembar kerja peserta didik interaktif untuk meningkatkan kemampuan pemecahan masalah matematika siswa kelas VII SMPN 23 Mataram tahun ajaran 2023/2024. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *9*(2). https://doi.org/10.23969/jp.v9i2.13997

Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Springer.

Chrisdiyanto, E., & Hamdi, S. (2023). Efektivitas Problem Based Learning dan Problem Solving terhadap kemampuan berpikir kritis dan kemandirian belajar matematika. *Jurnal Riset Pendidikan Matematika, 10*(2), 165–174. https://doi.org/10.21831/jrpm.v10i2.65754

Foley, G. D., Budhathoki, D., Thapa, A. B., & Aryal, H. P. (2023). Instructor perspectives on quantitative reasoning for critical citizenship. *ZDM–Mathematics Education, 55*, 1009–1020. https://doi.org/10.1007/s11858-023-01520-4

Hasanah, A., Marasabessy, R., & Samsudin. (2025). Improving middle school students' mathematical literacy through problem-based learning: Considering early mathematical abilities. *Indonesian Journal of Science and Mathematics Education, 9*(1). https://doi.org/10.24042/ijsme.v9i1.23541

Hastings, J. S., Madrian, B. C., & Skimmyhorn, W. L. (2013). Financial literacy, financial education, and economic outcomes. *Annual Review of Economics, 5*, 347–373. https://doi.org/10.1146/annurev-economics-082312-125807

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review, 16*(3), 235–266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Kaiser, T., & Menkhoff, L. (2020). Financial education in schools: A meta-analysis of experimental studies. *Economics of Education Review, 78*, 101930. https://doi.org/10.1016/j.econedurev.2019.101930

Lidiana, V., & Sukestiyarno, Y. L. (2023). Development of entrepreneurship-based mathematical e-module and its learning with Problem-Based Learning to improve students' mathematical problem-solving ability. *Unnes Journal of Mathematics Education, 12*(1), 93–102. https://doi.org/10.15294/ujme.v12i1.62911

Lührmann, M., Serra-Garcia, M., & Winter, J. (2018). The impact of financial education on adolescents' intertemporal choices. *American Economic Journal: Economic Policy, 10*(3), 309–332. https://doi.org/10.1257/pol.20170012

Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature, 52*(1), 5–44. https://doi.org/10.1257/jel.52.1.5

Lusardi, A., & Mitchell, O. S. (2023). The importance of financial literacy: Opening a new field. *Journal of Economic Perspectives, 37*(4), 137–154. https://doi.org/10.1257/jep.37.4.137

Mitrayana, M., & Juandi, D. (2023). A systematic literature review of problem-based learning in mathematics education. *Journal on Mathematics Education, 14*(2), 315–336. https://doi.org/10.22342/jme.v14i2.22809

Organisation for Economic Co-operation and Development. (2023). *PISA 2022 assessment and analytical framework*. OECD Publishing. https://doi.org/10.1787/dfe0bf9c-en

Organisation for Economic Co-operation and Development. (2024). *PISA 2022 results (Volume IV): How financially smart are students?* OECD Publishing. https://doi.org/10.1787/5a849c2a-en

Vol. 12, No. 3 : September 2026
E-ISSN: 2442-7667
pp. 1163-1173
Email: jklppm@undikma.ac.id

Pólya, G. (1973). *How to solve it: A new aspect of mathematical method* (2nd ed.). Princeton University Press.

Sagita, L., Putri, R. I. I., Zulkardi, & Prahmana, R. C. I. (2022). Promising research studies between mathematics literacy and financial literacy through project-based learning. *Journal on Mathematics Education, 13*(4), 753–772. https://doi.org/10.22342/jme.v13i4.19057

Salsabila, S., & Asih, E. C. M. (2024). The effect of Problem-Based Learning models on students' mathematical problem-solving ability: A meta-analysis. *Jurnal Pendidikan MIPA, 25*(2), 864–877. https://doi.org/10.23960/jpmipa/v25i2.pp864-877

Sawatzki, C., & Sullivan, P. (2018). Shopping for shoes: Teaching students to apply and interpret mathematics in the real world. *International Journal of Science and Mathematics Education, 16*(7), 1355–1373. https://doi.org/10.1007/s10763-017-9833-3

Shapiro, S. S., & Wilk, M. B. (1965). An analysis of variance test for normality (complete samples). *Biometrika, 52*(3–4), 591–611. https://doi.org/10.1093/biomet/52.3-4.591

Siagian, Q., Darhim, D., Juandi, D., & Khairunnisa. (2023). The effect of Problem-Based Learning on improving students' mathematical ability: Meta-analysis. *Jurnal Cendekia: Jurnal Pendidikan Matematika, 7*(3), 2252–2264. https://doi.org/10.31004/cendekia.v7i3.2166

Suparman, S., & Juandi, D. (2022). Upgrading mathematical problem-solving abilities through problem-based learning: A meta-analysis study in some countries. *AIP Conference Proceedings, 2575*, 080017. https://doi.org/10.1063/5.0107757

Wahyuni, T., Syutaridho, S., & Efriani, A. (2023). The effect of implementing the Problem-Based Learning model on students' problem-solving abilities in middle school. *Edumatica: Jurnal Pendidikan Matematika, 13*(3), 247–257. https://doi.org/10.22437/edumatica.v13i03.28953

Wangsa, A., Retnawati, H., Wijaya, A., Iman, A. N., & Umasugi, S. M. (2023). Financial literacy ability in solving mathematical problems: Case study of Bugisnese gender differences. *Jurnal Kependidikan, 9*(1), 296–304. https://doi.org/10.33394/jk.v9i1.7191

Yew, E. H. J., & Goh, K. (2016). Problem-based learning: An overview of its process and impact on learning. *Health Professions Education, 2*(2), 75–79. https://doi.org/10.1016/j.hpe.2016.01.004

Zaimovic, A., Torlakovic, A., Arnaut-Berilo, A., Zaimovic, T., Dedovic, L., & Nuhic Meskovic, M. (2023). Mapping financial literacy: A systematic literature review of determinants and recent trends. *Sustainability, 15*(12), Article 9358. https://doi.org/10.3390/su15129358

