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DEVELOPMENT OF INTERACTIVE PBL-BASED E-LKPD TO ENHANCE MATHEMATICAL LITERACY ON ARITHMETIC SEQUENCES AND SERIES

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ABSTRACT

This study developed an interactive electronic student worksheet (E-LKPD) based on Problem-Based Learning (PBL) to enhance Grade X students' mathematical literacy on arithmetic sequences and series and evaluated its validity, practicality, and effectiveness. The study employed research and development using the ADDIE model. Three material experts and three media experts assessed product validity, two mathematics teachers and 36 students assessed practicality, and 36 students completed mathematical-literacy pretests and posttests. Material validity covered content eligibility, presentation, and language, whereas media validity covered visual design, technical quality, and alignment with learning. Practicality was examined through teacher ratings of learning design, visual communication, and benefits and student ratings of cognitive, affective, and conative responses. The product achieved material- and media-validity scores of 98% and 93%, respectively. Teacher and student practicality scores were 90% (very practical) and 79% (practical). The mean mathematical-literacy score increased from 30.58 to 78.36, with an N-Gain of 0.69 (moderate) and a significant paired-samples t-test result ($p < .001$). Therefore, the interactive PBL-based E-LKPD is valid, practical, and effective for supporting mathematical literacy on arithmetic sequences and series.

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1. INTRODUCTION

Mathematics learning in the 21st century no longer emphasizes only the mastery of concepts and computational procedures, but also students' ability to use mathematics to understand, solve, and make decisions regarding various problems in everyday life. This ability is known as mathematical literacy, which refers to an individual's capacity to formulate, employ, and interpret mathematics in various real-life contexts (OECD, 2023). Mathematical literacy has become an essential competence because it enables students to connect mathematical concepts with real situations, think logically, and solve problems effectively (Rismen et al., 2022).

However, students' mathematical literacy in Indonesia remains relatively low. The results of the Programme for International Student Assessment (PISA) indicate that most Indonesian students still experience difficulties in understanding contextual problems, constructing mathematical models, and interpreting the results of problem-solving processes (OECD, 2023). Similar difficulties are also found in the topic of arithmetic sequences and series. Based on preliminary observations and interviews with Grade X senior high school mathematics teachers, students still struggle to identify known and asked information, relate the concepts of sequences and series to contextual situations, and determine appropriate problem-solving strategies. Most students tend to memorize formulas without understanding the underlying conceptual meaning. This condition indicates that the learning process has not fully facilitated the development of students' mathematical literacy.

One factor that may contribute to this condition is the use of conventional teaching materials. Student worksheets and textbooks used in schools generally emphasize procedural exercises rather than contextual problem-solving activities. As a result, students have limited opportunities to develop critical thinking, reasoning, and mathematical literacy skills. (Chandra et al., 2021) showed that interactive e-LKPD can reorganize worksheet activities into a more active and digitally supported learning format. In a similar direction, (Octaviana et al., 2022) found that e-LKPD can strengthen student engagement and collaborative learning activities. These findings indicate that conventional worksheets need to be transformed into interactive digital materials that provide students with more opportunities to explore contextual problems.

The development of educational technology provides opportunities to design more innovative digital teaching materials, one of which is the Electronic Student Worksheet or e-LKPD. An e-LKPD is a digital teaching material that integrates learning content, learning activities, and assessment in an electronic format accessible through computers or mobile devices (Chandra et al., 2021). The use of e-LKPD allows learning materials to be presented more attractively through the integration of text, images, animations, videos, and other interactive features. Mulyasari et al. (2022) demonstrated that PBL-based e-LKPD can be used to measure and support students' mathematical literacy, while Purnama and Suparman (2020) reported that PBL-based e-LKPD has potential to improve students' mathematical literacy skills. Nevertheless, previous e-LKPD studies have not specifically developed an interactive product for mathematical literacy on arithmetic sequences and series.

In addition to innovative teaching materials, a learning model that encourages students to actively construct knowledge through problem-solving activities is also required. One relevant model is Problem-Based Learning (PBL). PBL places contextual problems as the starting point of learning, encouraging students to conduct investigations, think critically, and find solutions both independently and collaboratively. The stages of

PBL include problem orientation, student organization, investigation, development and presentation of work, as well as analysis and evaluation of the problem-solving process. (Effendi et al., 2021) showed that mathematics worksheets based on PBL can support elementary students' learning processes. (Firdaus et al., 2017) further reported that PBL contributes to students' mathematical literacy more effectively than direct instruction, and (Rahima et al., 2025) confirmed through a systematic literature review that PBL interventions have a positive effect on mathematical literacy. These findings support the selection of PBL as the learning foundation in the developed e-LKPD.

Based on the preceding discussion, previous studies have demonstrated the effectiveness of e-LKPD and PBL in mathematics learning. (Aprianah et al., 2026) developed interactive PBL-based e-LKPD for vocational school students, whereas (Husna et al., 2022) focused on PBL-based e-LKPD to improve mathematical problem-solving ability. (Sari et al., 2025) developed interactive PBL-based e-LKPD for trigonometry problem-solving, while (Setyawan & Suparman, 2023) and (Siregar & Suparman, 2022) examined PBL-based e-LKPD in relation to problem-solving and mathematical communication abilities. However, these studies have not specifically integrated interactive e-LKPD, PBL syntax, and mathematical literacy indicators into a single learning product for arithmetic sequences and series. Therefore, the novelty of this study lies in the development of an interactive Problem-Based Learning-based e-LKPD integrated with mathematical literacy activities on arithmetic sequences and series for Grade X senior high school students.

Based on the identified problems and research gap, this study proposes the following research questions: (1) What is the validity level of the interactive Problem-Based Learning-based e-LKPD for mathematical literacy on the topic of arithmetic sequences and series? (2) What is the practicality level of the developed e-LKPD in the learning process? and (3) What is the effectiveness level of the e-LKPD in supporting students' mathematics learning? Therefore, this study aims to develop and examine the validity, practicality, and effectiveness of an interactive Problem-Based Learning-based e-LKPD for mathematical literacy on the topic of arithmetic sequences and series. The findings of this study are expected to contribute to the development of innovative digital teaching materials and support the improvement of mathematics learning quality in schools.

2. METHOD

This study employed research and development (R&D) to produce an interactive E-LKPD and to evaluate the quality of the developed product based on validity, practicality, and effectiveness. The product was an interactive E-LKPD based on Problem-Based Learning and mathematical literacy for arithmetic sequences and series for Grade X senior high school students.

The study was conducted at SMA Negeri 1 Jatisari during the second semester of the 2025/2026 academic year. The research participants consisted of six validators selected purposively, namely three material experts and three media experts, two senior high school mathematics teachers as practicality respondents, and 36 students from Class XB as respondents for practicality and effectiveness testing. The material experts had competence in mathematics education, whereas the media experts had competence in educational technology and digital learning media development.

The development procedure followed the ADDIE model consisting of Analysis, Design, Development, Implementation, and Evaluation (Branch, 2009). In the analysis

stage, the researchers identified learning needs and problems encountered by students in arithmetic sequences and series through observation, teacher interviews, curriculum analysis, and student-characteristic analysis.

In the design stage, the researchers prepared an interactive E-LKPD design that integrated PBL syntax and mathematical literacy indicators. The activities included preparing the concept map, the PBL-based learning flow, the interface design, the storyboard, and the research instruments. The instruments included expert-validation sheets, teacher and student response questionnaires, and mathematical-literacy tests in the form of pretest and posttest items.

In the development stage, the design was realized as an interactive E-LKPD using the Classkick platform. Classkick has been used as a digital learning medium that supports interactive classroom activities (Go, 2023). The product was then validated by material and media experts. Material validation covered content eligibility, language, presentation, suitability with PBL syntax, and mathematical literacy indicators. Media validation covered display, navigation, interactivity, and ease of use. Suggestions from validators were used as the basis for product revision before classroom implementation.

In the implementation stage, the revised product was used in mathematics learning in Class XB of SMA Negeri 1 Jatisari. The trial was conducted on arithmetic sequences and series. Practicality data were collected through teacher and student response questionnaires after the use of the E-LKPD, whereas effectiveness data were collected through mathematical-literacy pretest and posttest scores.

In the evaluation stage, formative and summative evaluations were conducted throughout the development process. Formative evaluation was carried out through product revision based on expert validation and classroom trial results. Summative evaluation was conducted to determine the overall quality of the product based on validity, practicality, and effectiveness.

Data were collected through observation, interviews, questionnaires, and tests. Observation and interviews were used in the needs-analysis stage to identify learning problems. Questionnaires were used to obtain validity and practicality data, while tests were used to measure the effectiveness of the E-LKPD in enhancing students' mathematical literacy.

The research instruments consisted of expert-validation sheets, teacher response questionnaires, student response questionnaires, and mathematical-literacy tests. Before use, the instruments were validated for content by experts to ensure the alignment between indicators and research objectives.

The data were analyzed qualitatively and quantitatively. Qualitative data from interviews, comments, and suggestions from validators, teachers, and students were analyzed descriptively as the basis for product revision. Quantitative data were used to determine the validity, practicality, and effectiveness of the developed E-LKPD.

Validity and practicality percentages were calculated using the following formula:

Percentage = (obtained score / maximum possible score) x 100%

Table 1. Product Validity Criteria

Percentage (%)	Validity or Practicality category
85% - 100%	Very Valid/Practical
70% - 84%	Valid/Practical
50% - 69%	Moderately Valid/Practical
< 50%	Not Valid/Practical

Source: Researcher's categorization based on validation percentage scores

3. RESULTS AND DISCUSSION

3.1. Results

This development research produced an interactive e-LKPD based on Problem-Based Learning (PBL) designed to enhance students' mathematical literacy in the topic of arithmetic sequences and series. The product quality was evaluated in terms of validity, practicality, and effectiveness using the ADDIE model framework.

Analysis

The needs analysis obtained through interviews with Grade X mathematics teachers at SMA Negeri 1 Jatisari revealed that students still experience difficulties in understanding contextual problems, modeling real-life situations into mathematical representations, and interpreting solution results. These difficulties are particularly evident in the topic of arithmetic sequences and series, which requires the ability to connect mathematical concepts with everyday contexts. Teachers also reported that the teaching materials used are still dominated by textbooks and conventional worksheets that mainly consist of routine exercises, thus not optimally supporting the development of critical thinking skills and mathematical literacy.

The analysis of students' characteristics indicated that Grade X students are at the formal operational stage, meaning they are cognitively capable of logical, abstract, and systematic thinking. However, interview results showed that some students still struggle to identify known and asked information in word problems and to select appropriate concepts for problem-solving. In addition, students demonstrated higher interest in digital-based learning media compared to printed teaching materials.

The curriculum analysis showed that SMA Negeri 1 Jatisari implements the Merdeka Curriculum, which emphasizes student-centered learning. The topic of arithmetic sequences and series was selected because it has strong relevance to various contextual problems such as savings, installment payments, and growth patterns. Therefore, it is suitable for training students' ability to formulate, apply, and interpret mathematics in different real-life situations.

Design

Based on the needs analysis, an interactive e-LKPD was designed by integrating the Problem-Based Learning syntax with mathematical literacy indicators. At this stage, a flowchart, storyboard, and learning activity structure were developed, consisting of problem orientation, problem formulation, investigation, concept application, result presentation, solution interpretation, and evaluation of the problem-solving process. In addition, research instruments were also developed, including expert validation sheets, teacher and student response questionnaires, and mathematical literacy tests in the form of pretest and posttest.

Development

The e-LKPD product was developed using the Classkick platform, which provides interactive features allowing students to access learning materials, complete activities, and submit responses directly (Go, 2023). Prior to implementation, the product was validated by subject matter and media experts.

The results of material expert validation are presented in Table 3. The content feasibility aspect obtained a score of 98%, the presentation aspect 98%, and the language aspect 100%, with an overall average of 98%, categorized as highly valid. These results

indicate that the developed content is aligned with learning outcomes, mathematical literacy indicators, PBL syntax, and uses language that is easily understood by students.

The results of media expert validation are presented in Table 4. The design and visual appearance aspect obtained a score of 89%, the technical quality aspect 95%, and the instructional suitability aspect 95%, with an overall average of 93%, categorized as highly valid. This indicates that the e-LKPD has an attractive design, user-friendly navigation, and supports the implementation of PBL-based and mathematical literacy-oriented learning.

Revisions were made based on expert feedback, including simplifying contextual problem narratives to improve student comprehension and improving background and text color combinations to enhance readability. These validation results confirm that the developed e-LKPD is suitable for classroom implementation.

Implementation

The revised product was implemented with 36 students of class XB at SMA Negeri 1 Jatisari. Practicality was measured using teacher and student response questionnaires.

Teacher responses indicated an average practicality score of 90%, categorized as highly practical. The instructional design aspect obtained 94%, visual communication 84%, and usefulness 92%. These findings suggest that teachers considered the e-LKPD easy to use, aligned with learning objectives, and beneficial for supporting mathematics instruction.

Student responses showed an average practicality score of 79%, categorized as practical. The cognitive aspect obtained 78%, affective 77%, and conative 81%. These results indicate that students were able to understand the content well, showed interest in the learning activities, and were motivated to actively participate in the learning process.

Product effectiveness was measured by comparing pretest and posttest scores of mathematical literacy ability. The results showed that the mean pretest score of 30.58 increased to 78.36 in the posttest, with an average gain of 47.78 points. The N-Gain value of 0.69 was categorized as moderate, indicating an improvement in mathematical literacy after using the e-LKPD.

The paired sample t-test results showed $t(35) = 19.24$ with a significance value of $p < 0.001$. This indicates a statistically significant difference between pretest and posttest scores. Therefore, the developed PBL-based interactive e-LKPD is effective in improving students' mathematical literacy in arithmetic sequences and series.

Evaluation

The evaluation stage was conducted comprehensively based on validity, practicality, and effectiveness results. The findings indicate that the e-LKPD meets the criteria of being highly valid, practical, and effective. Therefore, it is considered feasible to be used as a supporting teaching material in mathematics learning on arithmetic sequences and series without requiring substantial revisions.

3.2. Discussion

This study developed an interactive e-LKPD based on Problem-Based Learning (PBL) designed to enhance students' mathematical literacy in the topic of arithmetic sequences and series. The development process employed the ADDIE model, which consists of analysis, design, development, implementation, and evaluation stages (Branch, 2009). The findings indicate that the developed product meets the criteria of

validity, practicality, and effectiveness, and is therefore suitable for use in mathematics learning.

The validation results showed that the e-LKPD obtained a material validity score of 98% and a media validity score of 93%, both categorized as highly valid. The high material validity score indicates that the content, PBL syntax, mathematical literacy indicators, presentation, and language use are aligned with the intended learning objectives. Meanwhile, the high media validity score reflects that the design, navigation, interactivity, and instructional suitability meet the standards of high-quality learning media. The high validity result is consistent with (Chandra et al., 2021), who emphasized expert validation in interactive e-LKPD development, and Sari et al. (2025), who reported that interactive PBL-based e-LKPD requires alignment among content, media design, and learning objectives. Thus, the validation results confirm that the developed e-LKPD fulfills both content validity and construct validity.

These findings are consistent with Chandra et al. (2021), who developed an interactive e-LKPD on set material, and (Sari et al., 2025), who developed an interactive PBL-based e-LKPD for trigonometry problem-solving. However, the present study differs because it explicitly integrates Problem-Based Learning syntax and mathematical literacy indicators into each learning activity within the topic of arithmetic sequences and series. This integration enables students not only to learn mathematical concepts but also to practice formulating problems, applying concepts, and interpreting solutions in accordance with the mathematical literacy framework proposed by OECD (2023).

The practicality of the product is indicated by teacher responses of 90% (highly practical) and student responses of 79% (practical). These results demonstrate that the e-LKPD is easy to use in the learning process for both teachers and students. The high practicality score in the instructional design aspect suggests that the structured PBL stages help teachers manage learning more systematically. In addition, the use of the Classkick platform allows students to access materials and complete learning activities more flexibly.

Nevertheless, student practicality scores were lower than those of teachers, indicating that some students still require adaptation to digital learning media and active problem-solving activities. This condition is reasonable, as most students were previously accustomed to conventional printed materials and routine exercise-based learning. Therefore, the implementation of PBL-based e-LKPD requires a transition period for students to become more independent and actively engaged in learning.

These findings align with (Sidabutar & Siregar, 2025), who showed that e-LKPD based on an active learning model can support students' mathematical reasoning. The present study extends these findings by demonstrating that the integration of contextual problems, structured PBL guidance, and interactive Classkick features can improve the practicality of mathematics learning materials from both teacher and student perspectives.

The effectiveness of the e-LKPD is shown by an increase in students' mathematical literacy scores from a pretest mean of 30.58 to a posttest mean of 78.36, with an N-Gain value of 0.69 (moderate category). Furthermore, the paired sample t-test revealed a statistically significant difference between pretest and posttest scores. These results indicate that the use of the interactive PBL-based e-LKPD positively contributes to students' mathematical literacy development.

This improvement can be explained through the characteristics of the PBL model embedded in the e-LKPD. In the problem orientation stage, students are trained to identify and formulate contextual problems (formulating). In the investigation and concept

application stages, students employ mathematical concepts and procedures to derive solutions (employing). Subsequently, in the presentation and evaluation stages, students explain and interpret the obtained solutions (interpreting). Thus, each PBL stage directly facilitates the three core processes of mathematical literacy as defined by OECD (2023).

These findings support (Octaviana et al., 2022), who reported that e-LKPD can enhance student engagement and collaborative skills in learning activities. They are also in line with (Mulyasari et al., 2022), who used PBL-based e-LKPD to support mathematical literacy. However, this study provides a more specific contribution by focusing on mathematical literacy improvement through the integration of formulating, employing, and interpreting indicators into each learning activity on arithmetic sequences and series. Consequently, the observed improvement is not limited to general learning outcomes but also extends to students' ability to apply mathematics in solving contextual problems.

The main novelty of this study lies in the integration of three core components: Problem-Based Learning syntax, interactive activities using the Classkick platform, and mathematical literacy processes within a single learning product for arithmetic sequences and series. Unlike previous studies that generally focused separately on digital e-LKPD development or PBL implementation, this study integrates mathematical literacy indicators into each learning stage, thereby providing students with a more contextual, active, and meaningful learning experience.

In addition to theoretical contributions, the findings also have practical implications for mathematics teachers. The developed e-LKPD can serve as an alternative digital teaching material supporting the implementation of the Merdeka Curriculum, which emphasizes student-centered learning. The use of contextual problems and interactive activities enables teachers to more effectively develop students' critical thinking, problem-solving skills, and mathematical literacy compared to traditional procedural learning approaches.

However, this study has several limitations. The trial was conducted in a single class without a comparison group, so the effectiveness of the product cannot be directly compared with other instructional media. In addition, the use of the e-LKPD depends on the availability of digital devices and adequate internet access. Therefore, future research is recommended to involve larger samples, apply experimental designs with control groups, and examine the long-term impact of e-LKPD on students' retention and transfer of mathematical literacy skills.

4. CONCLUSION

This study successfully developed an interactive e-LKPD based on Problem-Based Learning (PBL) to enhance students' mathematical literacy in the topic of arithmetic sequences and series using the ADDIE development model. The developed product met the criteria of being highly valid, practical, and effective for use in mathematics learning. The findings indicate that the integration of Problem-Based Learning syntax with mathematical literacy processes supports students in formulating, employing, and interpreting mathematical concepts within various contextual situations.

The novelty of this study lies in the integration of mathematical literacy processes (formulating, employing, and interpreting) into each stage of the interactive PBL-based e-LKPD. Therefore, the developed product can serve as an alternative digital teaching material that supports student-centered learning and enhances mathematical literacy skills in senior high school mathematics education.

However, this study is limited to a single-class trial without a comparison group. Therefore, future research is recommended to involve larger samples across multiple schools and to employ experimental research designs in order to examine the effectiveness and applicability of the product in a more comprehensive manner.

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REFERENCES

Aprianah, B., Susila, H. R., & Pebriantika, L. (2026). Development of interactive e-LKPD based on problem-based learning for grade X of vocational school. *Tekno-Pedagogi: Jurnal Teknologi Pendidikan*, *16*(2).

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

Chandra, F. N., Rahaju, & Yuwono, T. (2021). Pengembangan e-LKPD interaktif materi himpunan. *Jurnal Ilmiah Pendidikan Matematika*, *8*(1), 90–101.

Effendi, R., Herpratiwi, & Sutiarso, S. (2021). Development of mathematics worksheets based on problem-based learning at elementary school. *Jurnal Basicedu*, *5*(2), 920–929.

Firdaus, F. M., Wahyudin, & Herman, T. (2017). Improving primary students' mathematical literacy through problem-based learning and direct instruction. *Educational Research and Reviews*, *12*(4), 212–219. https://doi.org/10.5897/ERR2016.3072

Go, Y. (2023). Pemanfaatan aplikasi Classkick sebagai media pembelajaran bahasa mandarin. *Jurnal Sinestesia*, *13*(1), 175–186.

Husna, N. H., Marzal, J., & Yantoro. (2022). Development of problem-based learning-based e-LKPD to improve students' mathematical problem-solving ability. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(3), 2085–2095. https://doi.org/10.24127/ajpm.v11i3.4914

Mulyasari, D. W., Gunarhadi, & Roemintoyo. (2022). e-LKPD based on problem-based learning (PBL) approach to measure mathematics literacy ability of elementary students. *International Journal of Elementary Education*, *6*(3), 393–402. https://doi.org/10.23887/ijee.v6i3.47532

Octaviana, F., Wahyuni, D., & Supeno. (2022). Development of e-LKPD to improve junior high school students' collaborative skills in science learning. *Edukatif: Jurnal Ilmu Pendidikan*, *4*(2), 2345–2353. https://doi.org/10.31004/edukatif.v4i2.2332

OECD. (2023). *PISA 2022 results (Volume I and II): Country notes: Indonesia*. OECD Publishing. https://www.oecd.org/en/publications/pisa-2022-results-volume-i-and-ii-country-notes_ed6fbcc5-en/indonesia_c2e1ae0e-en.html

Rahima, R., Majid, A. F., Nursalam, & Angriani, A. D. (2025). Mathematical literacy through problem-based learning: A systematic literature review of intervention effectiveness. *Hipotenusa Journal of Research Mathematics Education*, *8*(2), 156–170.

Rismen, S., Putri, W., & Jufri, L. H. (2022). Kemampuan literasi matematika ditinjau dari gaya belajar. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *6*(1), 348–364.

Sari, N. K. A. I., Suharta, I. G. P., & Parwati, N. N. (2025). Development of interactive e-LKPD based on PBL to improve mathematical problem-solving skills in trigonometry material tenth grade high school students. *JKTP: Jurnal Kajian Teknologi Pendidikan*, *8*(1), 1–13. https://doi.org/10.17977/um038v8i12025p001

Setyawan, N. D., & Suparman. (2023). Pengembangan e-LKPD berbasis PBL terintegrasi kemampuan pemecahan masalah matematika peserta didik. *Jurnal Pendidikan Matematika RAFA*, *8*(2), 35–48.

Sidabutar, S. F. J., & Siregar, N. (2025). Development of discovery learning-based e-LKPD to improve students' mathematical reasoning abilities. *Eksakta: Journal of Mathematics and Natural Sciences Research and Learning*, *10*(1), 32–41.

Siregar, U. H., & Suparman. (2022). Pengembangan e-LKPD berbasis PBL dalam meningkatkan kemampuan komunikasi matematis. *JNPM (Jurnal Nasional Pendidikan Matematika)*, *6*(4), 672–689. https://doi.org/10.33603/jnpm.v6i4.7153