

Development of West Java Tourism-Based Numeracy Teaching Materials to Foster Critical Thinking in Elementary School Students

**Eka Firmansyah^{1*}, Achmad Mudrikah², dan Siti Nurhayati³, Feri Husada Susanto⁴,
Melinda Putri Mubarika⁵ and Jasem Al-Tamar⁶**

^{1*,2,4,5} Universitas Pasundan, Bandung, Indonesia

³Universitas Pendidikan Indonesia, Bandung, Indonesia

⁶Kuwait University

**Corresponding author*

Email: eka_firmansyah@unpas.ac.id^{1*}, ferihusadasusanto@gmail.com²,
sitinurhayati0603@upi.edu³, melinda.datarnuwijaya@gmail.com⁵
jasem.altammar@ku.edu.kw⁶

Article Information

Received February 19th, 2026

Revised July 07th, 2026

Accepted July 13th, 2026

Diterima 19 Feb 2026

Direvisi 07 Juli 2026

Disetujui 13 Juli 2026

Keywords:

Contextual Teaching Materials;
Numeracy; Critical Thinking;
Elementary School; West Java
Tourism

Kata kunci:

Kemampuan Berpikir Kritis
Matematis, Adversity Quotient,
Wright Map.

ABSTRACT

This study aimed to develop and evaluate West Java tourism-based numeracy teaching materials designed to foster critical thinking among elementary school students. The study employed a Research and Development approach using the ADDIE model, comprising analysis, design, development, implementation, and evaluation. Needs analysis involved curriculum review, interviews, and questionnaires administered in three elementary schools. The product was developed for fourth- and fifth-grade students and consisted of a numeracy module, student worksheets, and a teacher guide integrating measurement, estimation, arithmetic operations, and simple data analysis with authentic contexts from Kawah Putih, Tangkuban Perahu, and Pangandaran Beach. Product validity was assessed by three experts in mathematics education, curriculum, and elementary education, while practicality was examined through teacher and student response questionnaires. A limited field trial involving 75 students used pre-test and post-test tasks to assess numeracy and critical thinking, supported by classroom observations. The expert validation yielded an overall mean score of 3.55 on a four-point scale, indicating that the materials were very valid. Teacher and student responses ranged from 85% to 90%, placing the materials in the very practical category. Post-test performance increased by 25% compared with pre-test performance, indicating meaningful gains in students' numeracy achievement after using the materials. Students also demonstrated stronger abilities to identify relevant information, analyze quantitative relationships, evaluate solution strategies, and draw logical conclusions in contextual tourism problems. These findings indicate that the developed materials are valid, practical, and potentially effective for meaningful numeracy learning. Broader trials are recommended to examine their effectiveness across diverse elementary school contexts.

ABSTRAK

Penelitian ini bertujuan untuk mengembangkan dan mengevaluasi bahan ajar numerasi berbasis pariwisata Jawa Barat yang dirancang untuk menumbuhkan kemampuan berpikir kritis siswa sekolah dasar. Penelitian menggunakan pendekatan Research and Development dengan model ADDIE yang mencakup tahap analysis, design, development, implementation, dan evaluation. Analisis kebutuhan

dilakukan melalui telaah kurikulum, wawancara, dan penyebaran angket pada tiga sekolah dasar. Produk dikembangkan untuk siswa kelas IV dan V dalam bentuk modul numerasi, lembar kerja peserta didik, dan panduan guru yang mengintegrasikan materi pengukuran, estimasi, operasi aritmetika, dan analisis data sederhana dengan konteks autentik Kawah Putih, Tangkuban Perahu, dan Pantai Pangandaran. Validitas produk dinilai oleh tiga ahli yang mewakili bidang pendidikan matematika, kurikulum, dan pendidikan sekolah dasar, sedangkan kepraktisan diukur melalui angket respons guru dan siswa. Uji coba terbatas melibatkan 75 siswa dengan menggunakan tes awal dan tes akhir untuk mengukur numerasi dan berpikir kritis serta didukung oleh observasi pembelajaran. Hasil validasi ahli memperoleh skor rata-rata keseluruhan sebesar 3,55 pada skala empat sehingga bahan ajar termasuk kategori sangat valid. Respons guru dan siswa berada pada rentang 85% sampai 90% dan termasuk kategori sangat praktis. Kinerja siswa pada tes akhir meningkat sebesar 25% dibandingkan dengan tes awal, yang menunjukkan adanya peningkatan bermakna dalam pencapaian numerasi setelah menggunakan bahan ajar. Siswa juga menunjukkan kemampuan yang lebih baik dalam mengidentifikasi informasi relevan, menganalisis hubungan antarkuantitas, mengevaluasi strategi penyelesaian, dan menarik kesimpulan logis pada masalah pariwisata kontekstual. Temuan ini menunjukkan bahwa bahan ajar yang dikembangkan valid, praktis, dan berpotensi efektif untuk mendukung pembelajaran numerasi yang bermakna. Uji coba yang lebih luas diperlukan untuk menilai efektivitasnya pada konteks sekolah dasar yang lebih beragam.

Copyright © 2026 by the authors

This is an open access article distributed under the terms of the CC BY-SA license (<http://creativecommons.org/licenses/by-sa/4.0>).

INTRODUCTION

Numeracy is a basic competency that elementary school students need to meet the demands of 21st-century life. It includes not only computational ability but also the ability to interpret quantitative information, analyze data, and apply mathematical concepts in everyday contexts (Brown et al., 2020; Geiger et al., 2015). Numeracy is an important foundation for developing individuals who can think logically, make evidence-based decisions, and participate productively in modern society (Tout, 2020; Steen, 2017). The Merdeka Curriculum also emphasizes literacy and numeracy as central learning priorities in elementary schools so that students can develop thinking skills and solve contextual problems from an early age (Culture, 2020; Kemendikbudristek, 2022). Therefore, numeracy learning should be designed to encourage students to think critically and reflectively and to apply mathematical concepts in real-life situations (OECD, 2019; NCTM, 2020).

However, numeracy learning in elementary schools still shows a gap between ideal expectations and classroom practice. The results of the Program for International Student Assessment (PISA) indicate that Indonesian students' numeracy skills remain below the international average, particularly in solving contextual problems that require critical thinking (OECD, 2020; OECD, 2022). Previous studies have also shown that many students struggle to connect mathematical concepts with everyday situations because learning is often oriented toward procedures and routine exercises (Stacey, 2015; Pang & Kim, 2016). These findings are consistent with field observations showing that the teaching materials used by teachers are still predominantly procedural and provide limited opportunities for students to analyze, evaluate, and independently develop problem-solving strategies. As a result,

students tend to memorize problem-solving steps without understanding the mathematical meaning underlying the problem context (Lithner, 2017; Schukajlow et al., 2018).

This gap can be reduced by developing numeracy teaching materials that are relevant to students' local contexts. Context-based learning has been shown to enhance students' motivation, engagement, and conceptual understanding because the material is closely related to their experiences (Widodo & Kurniasih, 2021; Boaler, 2016). Contextualization in mathematics also helps students build connections between abstract concepts and authentic situations, thereby supporting higher-order thinking skills (Stillman et al., 2016; Sullivan et al., 2021). West Java tourism has strong potential as a learning context because it provides various forms of numerical information that can be used in numeracy activities, such as distances between destinations, travel costs, numbers of visitors, and the management of tourist facilities. This context can encourage students to analyze data and make decisions based on quantitative information in a more meaningful way (Moschkovich, 2018; Tout & Gal, 2015).

In addition, the development of teaching materials that integrate active approaches, such as Problem-Based Learning (PBL) and Project-Based Learning (PjBL), can strengthen students' critical thinking skills. These approaches place students in real-world problem situations that require them to identify information, analyze data, and formulate logical solutions (Blumenfeld et al., 1991; Hmelo-Silver, 2016). Project-based learning has also been shown to encourage active student engagement, collaboration, and critical thinking skills in mathematics learning (Kokotsaki et al., 2016; Condliffe et al., 2017). Previous research has shown that project-based learning materials effectively enhance critical thinking skills and numeracy understanding among elementary school students (Kurniawati, 2020; Wulandari, 2020; Sari & Putra, 2021).

Although several previous studies have examined the development of numeracy teaching materials and the integration of local contexts in learning, several gaps remain, particularly in the use of West Java tourism as an authentic context for developing numeracy teaching materials that simultaneously strengthen elementary school students' critical thinking skills. Previous research has tended to examine numeracy separately or to use cultural contexts without explicitly linking them to the development of critical thinking skills. Therefore, the novelty of this study lies in the development of numeracy teaching materials that are not only contextually based on West Java tourism but also systematically designed to stimulate students' critical thinking through authentic problems, contextual data analysis, and decision-making based on real situations. Thus, this study contributes to bridging contextual numeracy learning and the enhancement of higher-order thinking skills among elementary school students.

Furthermore, contextual numeracy teaching materials can help teachers create learning experiences that are more relevant to students' environments and support effective curriculum implementation (Setiawan & Indrawati, 2021; Darling-Hammond et al., 2020). Thus, the development of numeracy teaching materials based on the tourism context of West Java is important for helping elementary school students engage in critical thinking in a more directed, meaningful, and 21st-century-oriented learning process. Based on this background, this study focused on developing numeracy teaching materials based on the tourism context of West Java to support elementary school students in improving their critical thinking skills through contextual and authentic numeracy activities.

Despite the growing body of research on contextual numeracy, local-context-based learning, and the implementation of approaches such as PBL and PjBL, few studies have explicitly integrated these elements into a structured set of numeracy teaching materials tailored for

elementary school students. Previous studies have generally used real-life contexts or local culture as learning backgrounds, but they have not always systematically designed numeracy tasks that foster critical thinking through staged cognitive processes such as analysis, evaluation, and decision-making. In addition, although PBL and PjBL have been widely recognized for promoting higher-order thinking, their application has often focused on instructional strategies rather than on the development of concrete, ready-to-use teaching materials that embed specific regional potential, such as tourism in West Java, as the core context. Therefore, this study differs from prior research by incorporating a local tourism context into numeracy learning and developing structured teaching materials that intentionally align numeracy content, contextual problems, and critical thinking indicators in an integrated manner. This integrated approach is expected to provide a more practical and pedagogically grounded contribution to the implementation of contextual numeracy learning at the elementary school level.

METHOD

This study used a Research and Development (R&D) approach to develop numeracy teaching materials based on the tourism context of West Java to support the critical thinking skills of elementary school students. The R&D method was selected because it focuses on developing educational products while testing their feasibility and effectiveness in real learning contexts (Richey & Klein, 2020). This study applied the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. This model was chosen because it provides a systematic and structured approach to developing teaching materials, from needs identification to final product refinement (Branch, 2020). The following section presents the stages of the ADDIE development model adapted from Rayanto et al. (2020).

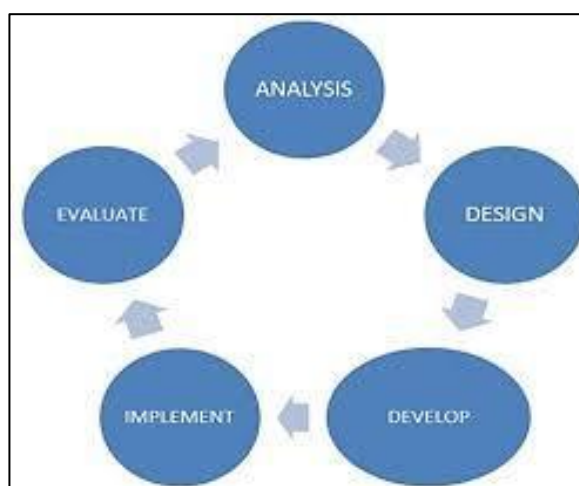


Figure 1. ADDIE Development Model

Based on Figure 1, at the analysis stage, the researcher examined the needs of students and teachers for contextual numeracy teaching materials that could encourage critical thinking. The analysis was conducted through a curriculum review to ensure alignment with the learning outcomes of the Merdeka Curriculum, as well as through interviews and questionnaires involving participants from three elementary schools in West Java. The participants consisted of six teachers and 75 students from Grades IV and V, who were selected using purposive sampling based on their experience in implementing the Merdeka Curriculum and their willingness to participate in the study. The selected schools represented

urban and semi-urban characteristics to capture variations in learning environments. This approach ensured that the data collected reflected diverse classroom conditions and supported a more comprehensive analysis of the developed teaching materials. The results of this analysis served as the basis for determining relevant numeracy materials and local tourism contexts that were close to students' experiences.

The design stage was carried out by structuring teaching materials that integrated numeracy concepts, such as measurement, estimation, arithmetic operations, and simple data analysis, with the context of West Java tourist destinations, including Kawah Putih, Tangkuban Perahu, and Pangandaran Beach. The integration of this local context aimed to enhance student engagement and help them understand mathematics meaningfully through real-life situations (Widodo & Kurniasih, 2021). At this stage, the researchers also designed learning activities that required students to analyze quantitative information and make data-based decisions as a means of strengthening critical thinking.

The development stage was carried out by creating a prototype of the teaching materials in the form of student modules, student worksheets, and teacher guides. The prototype was then validated by three experts consisting of a mathematics education specialist, a curriculum expert, and an elementary school practitioner to assess the feasibility of the content, language, presentation, and relevance to the learning context. The validation process employed a structured validation instrument in the form of a Likert-scale questionnaire (1 = inappropriate to 4 = highly appropriate), covering several aspects, including content accuracy, language clarity, instructional design, and contextual relevance. The scores obtained from each validator were averaged and converted into percentages using the formula $(\text{mean score}/\text{maximum score}) \times 100\%$. The validity category was determined based on predefined criteria, namely 81%–100% = very valid, 61%–80% = valid, 41%–60% = moderately valid, 21%–40% = less valid, and 0%–20% = invalid. This validation process ensured that the developed teaching materials met the required academic standards and were relevant to the needs of elementary school students before being implemented in the learning process (Richey & Klein, 2020).

The implementation stage was carried out through limited trials in several elementary schools in West Java. Teachers used the teaching materials for numeracy learning in the tourism context, while the researchers observed the learning implementation and collected data through classroom observations, teacher and student questionnaires, and numeracy tests administered before and after the learning process. Pre-test and post-test data were used to observe changes in students' numeracy and critical thinking skills after they used the developed teaching materials. In this study, critical thinking was operationally defined as students' ability to analyze information, evaluate problem-solving strategies, and make reasoned decisions in the context of numeracy tasks. The indicators of critical thinking included (1) identifying relevant information, (2) analyzing relationships between quantities, (3) evaluating solution strategies, and (4) drawing logical conclusions. These indicators were measured using test items designed as contextual numeracy problems, particularly those related to tourism situations in West Java. Each item was accompanied by a scoring rubric that assessed students' responses based on accuracy, reasoning, and completeness, with scores ranging from 1 (low) to 4 (high). This approach ensured that both numeracy skills and critical thinking abilities were evaluated systematically and consistently.

The evaluation stage was conducted both formatively and summatively. Formative evaluation took place during the development process to improve the product based on expert feedback and trial results. Summative evaluation was conducted at the end of the study to assess the validity, practicality, and effectiveness of the teaching materials in

supporting students' critical thinking. The research data were analyzed by reviewing expert validation results, user responses, and improvements in students' learning outcomes based on the comparison of pre-test and post-test scores.

RESULTS AND DISCUSSION

This study successfully developed numeracy teaching materials integrated with the tourism context of West Java to support the improvement of critical thinking skills in elementary school students. The products included numeracy modules, student worksheets (LKPD), and teacher guides designed for fourth- and fifth-grade students. The teaching materials covered numeracy concepts such as measurement, estimation, and basic arithmetic operations, including multiplication and division, which were linked to local tourism contexts such as Kawah Putih, Tangkuban Perahu, and Pangandaran Beach. The integration of the tourism context became one of the main strengths of the learning materials because students were more interested when numeracy problems were related to real situations around them, such as estimating travel costs or calculating distances between tourist destinations. These findings are in line with the research by Widodo and Kurniasih (2021), which emphasized that context-based learning enhances student motivation and makes mathematics learning more relevant.

In addition to producing contextual teaching materials, this study received feedback from education experts indicating that the teaching materials demonstrated strong validity in terms of content, presentation, and alignment with the curriculum. The experts suggested further strengthening the quality of the problem-solving questions so that students would be more encouraged to connect quantitative data with real-life situations. This finding is in line with the view of Richey and Klein (2020) that expert validation is an important step in development research to ensure that teaching materials are suitable for real classroom learning.

After the numeracy teaching materials based on the tourism context of West Java had been developed, the researchers conducted a validation stage to ensure the product's feasibility before implementation. Expert validation was an important step in this development research because it assessed the appropriateness of the content, clarity of language, quality of presentation, and relevance of the context used in the teaching materials. This process helped ensure that the teaching materials were not only contextually engaging but also aligned with applicable academic and curriculum standards (Richey & Klein, 2020). The results of the expert validators' assessment of the developed teaching materials are presented in Table 1.

Table 1. Expert Validation Results for Numeracy Teaching Materials

Aspects Evaluated	Average Score	Validity Category
Content Appropriateness	3.6	Very Valid
Language Appropriateness	3.5	Very Valid
Presentation Quality	3.4	Valid
Suitability of Local Context	3.7	Very Valid
Overall Average	3.55	Very Valid

Note: Scores were based on a 1–4 scale.

Based on the validation results in Table 1, the numeracy teaching materials based on the tourism context of West Java were categorized as very valid. The validators assessed that the teaching materials included numeracy content aligned with the learning outcomes of elementary school students and supported the development of critical thinking through contextual problem-solving activities. The high score for the relevance of the local context

indicated that the integration of West Java tourism successfully provided a learning experience that was relevant and close to students' lives. This is important because real-world contexts can enhance student engagement and help students understand mathematical concepts more meaningfully (Widodo & Kurniasih, 2021).

In addition, the language and presentation aspects also received very valid categories, indicating that the teaching materials were structured clearly and used language appropriate to the characteristics of elementary school students. Thus, the developed teaching materials were not only valid in terms of content but also practical for teachers to use in teaching. These findings support the view that expert validation is a crucial stage in development research to ensure product quality before broader testing is conducted (Richey & Klein, 2020). Overall, the validation results provided a strong basis for concluding that the numeracy teaching materials based on the tourism context of West Java were suitable for implementation as learning tools that support the improvement of numeracy and critical thinking among elementary school students.

After the teaching materials were declared valid by experts, the next stage was to test their practicality through limited implementation in elementary schools. Practicality is an important indicator in development research because it shows the extent to which teaching materials are easy for teachers to use and well received by students in real learning contexts. Practicality was evaluated by collecting teacher and student responses through questionnaires covering ease of use, student interest in the tourism context, and the contribution of the teaching materials to numeracy understanding. User responses are important to ensure that the product is not only theoretically feasible but also effective and realistically applicable in the classroom (Branch, 2020).

The practicality indicators used in this study were further elaborated into several sub-indicators to provide a more comprehensive evaluation of the developed teaching materials. For teacher respondents, practicality was assessed through aspects such as clarity of instructions, ease of implementation in classroom settings, suitability for the learning objectives, and alignment with the elementary school curriculum. Meanwhile, for student respondents, the indicators included the attractiveness of the tourism-based context, clarity of the presented material, ease of understanding numeracy concepts, and the extent to which the materials supported active engagement in learning activities. Each sub-indicator was measured using multiple questionnaire items to ensure data reliability and capture a more detailed representation of user responses. Although these sub-indicators are not presented in tabular form, they served as the basis for calculating the overall practicality scores reported in this study. The results of the teacher and student response questionnaires are presented in Table 2.

Table 2. Results of Teacher and Student Questionnaire Responses to the Teaching Materials

Respondent	N	Practicality Indicator	Mean Score (1–5)	Percentage (%)	Category
Teacher	5	Ease of Use of Teaching Materials	4.40	88%	Very Practical
Teacher	5	Alignment with Elementary School Education	4.25	85%	Very Practical
Students	75	Interest in the Tourism Context	4.50	90%	Very Practical

Students	75	Support for Understanding	Numeracy	4.35	87%	Very Practical
----------	----	---------------------------	----------	------	-----	----------------

Notes:

- 1) The respondents consisted of five teachers and 75 students.
- 2) The instrument used a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).
- 3) Percentage scores were calculated using the formula: $(\text{Mean Score} / 5) \times 100\%$.
- 4) The practicality category intervals were defined as follows:
 - 81%–100% = Very Practical;
 - 61%–80% = Practical;
 - 41%–60% = Moderately Practical;
 - 21%–40% = Less Practical;
 - 0%–20% = Not Practical.

Based on the survey results in [Table 2](#), the numeracy teaching materials based on the tourism context of West Java were categorized as very practical from both the teachers' and students' perspectives. Teachers provided positive responses, especially regarding the ease of use and the suitability of the teaching materials for learning needs in elementary schools. This indicates that the teaching materials were structured clearly and supported teachers in implementing context-based numeracy learning more effectively. These findings are in line with the ADDIE model, which emphasizes the importance of developing learning products that can be applied in real and sustainable classroom contexts (Branch, 2020).

Students also showed a high level of interest in the use of the tourism context in numeracy learning. The highest percentage appeared in the student interest indicator, indicating that the integration of local tourism created a more meaningful learning experience. Real-world contexts help students understand that mathematics is not only related to calculation procedures but can also be used to solve everyday problems. These results support the research by Widodo and Kurniasih (2021), which asserted that context-based learning enhances students' motivation and engagement in numeracy education.

In addition, students' responses to the numeracy understanding indicator also fell within the very practical category. This finding shows that the teaching materials helped students connect mathematical concepts with authentic situations, such as calculating travel costs or determining distances between tourist destinations. Thus, the developed teaching materials were not only contextually engaging but also effective in supporting students' conceptual understanding and critical thinking. Overall, the responses from teachers and students confirmed that the numeracy teaching materials based on the tourism context of West Java met the practicality criterion and had the potential to be applied more widely in numeracy learning in elementary schools.

After the numeracy teaching materials had been declared valid by experts and practical based on teacher and student responses, the next stage was to test their effectiveness in improving elementary school students' numeracy and critical thinking skills. The effectiveness of the teaching materials was evaluated through a comparison of pre-test and post-test results administered to students before and after the use of teaching materials based on the tourism context of West Java. The use of a pre-test and post-test design in development research aims to observe changes in students' abilities quantitatively as a direct impact of implementing the learning product (Creswell & Creswell, 2018). The results of the comparison of students' average scores are presented in [Figure 2](#).

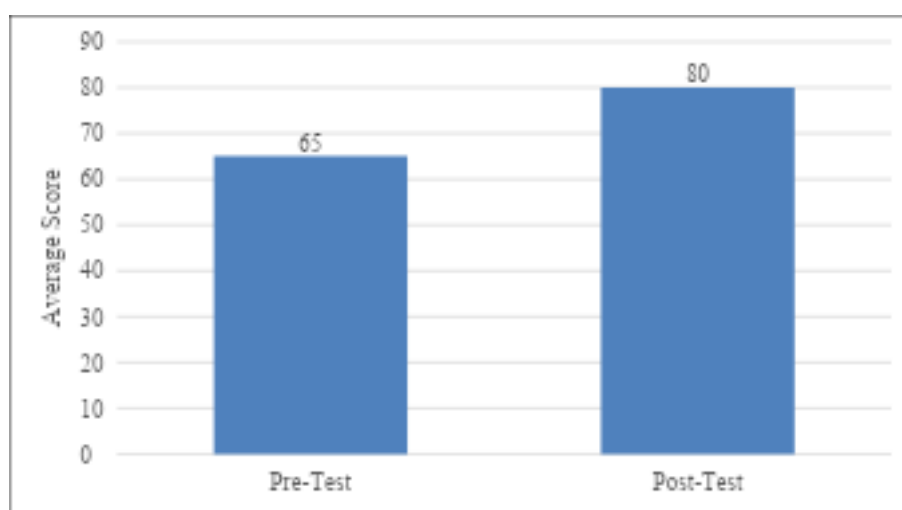


Figure 2. Comparison of Pre-Test and Post-Test Scores

Based on Figure 2, the average student scores increased after the use of numeracy teaching materials based on the tourism context of West Java. The post-test score increased by 25% compared with the pre-test score, indicating that the developed teaching materials were effective in helping students better understand and apply numeracy concepts. This increase was calculated based on the mean scores obtained by students, in which the average score increased from 60 in the pre-test to 75 in the post-test. The percentage gain was determined using the formula: $((\text{Post-test Mean} - \text{Pre-test Mean}) / \text{Pre-test Mean}) \times 100\%$. The assessment instrument consisted of several items designed to measure students' numeracy skills and critical thinking abilities and was administered to 75 students. Both the pre-test and post-test were constructed with equivalent levels of difficulty to ensure comparability of results. This improvement indicated that students not only made progress in computational skills but also enhanced their ability to think critically through contextual problem-solving activities.

These results are consistent with the numeracy literacy framework, which emphasizes students' ability to use mathematics to understand and solve everyday problems (OECD, 2020). The local tourism context provided authentic experiences that encouraged students to connect mathematical concepts with real-life situations, such as calculating travel costs, estimating distances, and determining efficient routes. Such contextual learning has been shown to enhance conceptual understanding and the relevance of mathematics for elementary school students (Widodo & Kurniasih, 2021).

In addition, the improvement in students' abilities was also related to the use of Project-Based Learning and Problem-Based Learning approaches in the teaching materials. These approaches positioned students as active problem solvers, so they were involved in data analysis, discussion, and numeracy-based decision-making. These findings support Kurniawati's (2020) research, which showed that project-based learning effectively enhances critical thinking skills because students are directly involved in meaningful problem-solving activities. Thus, the pre-test and post-test results indicated that numeracy teaching materials based on the tourism context of West Java contributed to improving students' numeracy skills while also supporting the development of critical thinking in elementary school students. This product has the potential to become an alternative contextual teaching material that can be used more widely to support relevant and meaningful mathematics learning.

Classroom observations during the implementation were conducted using a structured observation sheet to systematically capture students' engagement levels. The observed aspects included students' participation in discussions, responsiveness to teacher instructions, involvement in group work, and initiative in completing assigned tasks. The results indicated that the tourism context-based teaching materials enhanced students' active engagement, as reflected in increased participation during discussions, more collaborative interactions within groups, and greater enthusiasm when completing tasks related to travel planning activities. These observations were analyzed descriptively to identify patterns of student engagement throughout the learning process. This condition aligns with the findings of Blumenfeld et al. (1991), which stated that Project-Based Learning encourages student engagement because students face real, challenging, and meaningful activities. The local tourism context was proven to be a factor that made numeracy learning more engaging and stimulated students to think more deeply.

The role of the teacher was also an important factor in supporting the success of contextual learning. The survey results showed that most teachers felt that the teaching materials made it easier for them to teach numeracy concepts because the materials were structured and aligned with students' environments. Teachers played a role in facilitating discussions, providing guidance, and encouraging students to express their opinions and think critically. This is in line with Setiawan's (2022) research, which stated that context-based teaching materials help teachers improve learning effectiveness because students find it easier to relate abstract concepts to real-life experiences.

Nevertheless, this study also found several challenges in implementing project-based learning materials. One of the main constraints was limited learning time because project-based activities required a longer duration than conventional learning. In addition, some students had difficulty connecting mathematical concepts with the tourism context, especially in questions that required more complex data analysis. Therefore, further teacher training in project-based learning time management and more intensive scaffolding for students who need additional support are necessary.

Overall, the research results showed that numeracy teaching materials based on the tourism context of West Java were effective in improving the critical thinking skills of elementary school students. The integration of local tourism contexts made numeracy learning more relevant, engaging, and meaningful, while the Problem-Based Learning and Project-Based Learning approaches enhanced student engagement and facilitated deeper learning. This study makes an important contribution to the development of contextual numeracy teaching materials that support students in understanding mathematics as a tool for logical thinking in everyday life.

CONCLUSION

This study aimed to develop numeracy teaching materials based on the tourism context of West Java to support the critical thinking skills of elementary school students. The results showed that the developed teaching materials, in the form of modules, student worksheets, and teacher guides, were deemed valid by experts and received very practical responses from both teachers and students. The implementation of the teaching materials also had a positive impact on improving students' numeracy skills, as evidenced by a 25% increase in post-test scores compared with pre-test scores. These findings indicate that the integration of local tourism contexts can make numeracy learning more relevant and engaging and can encourage students to solve authentic problems critically. This study was completed at the development and limited testing stage; therefore, the resulting teaching

materials can be used as an alternative source of contextual numeracy learning in elementary schools. The main contribution of this study lies in providing numeracy teaching materials that connect mathematical concepts with students' real-life experiences through the context of local tourism, thereby supporting meaningful learning and strengthening numeracy literacy from an early age. Further research should be conducted through broader trials involving schools with various characteristics to measure the effectiveness of the teaching materials in greater depth. In addition, similar teaching materials can be developed using other local contexts and by adding more complex numeracy activities to accommodate differences in students' abilities and support the implementation of project-based learning more optimally.

ACKNOWLEDGMENTS

The authors express their gratitude to KEMENDIKTISAINTEK for financial support through research grant number 0667/E5/AL.04/2024, which made this research possible.

REFERENCES

- Blumenfeld, P. C., Soloway, E., Marx, R. W., & Krajcik, J. S. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, 26(3–4), 369–398. <https://doi.org/10.1080/00461520.1991.9653139>
- Boaler, J. (2016). *Mathematical mindsets*. Jossey-Bass.
- Branch, R. M. (2020). *Instructional design: The ADDIE approach*. Springer. <https://doi.org/10.1007/978-0-387-09506-6>
- Brown, R., Schmitt, M., & Peterson, S. (2020). Numeracy and mathematics in everyday contexts. *Educational Studies in Mathematics*, 104(2), 187–205.
- Condliffe, B., Quint, J., Visher, M. G., Bangser, M. R., Drohojowska, S., Saco, L., & Nelson, E. (2017). *Project-based learning: A literature review*. MDRC.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.
- Culture, M. of E. and. (2020). *Emergency curriculum implementation guide: Literacy and numeracy*. Directorate General of Early Childhood Education, Primary Education, and Secondary Education.
- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 24(2), 97–140. <https://doi.org/10.1080/10888691.2018.1537791>
- Geiger, V., Goos, M., & Forgasz, H. (2015). A critical orientation to numeracy across the curriculum. *ZDM Mathematics Education*, 47(4), 611–623. <https://doi.org/10.1007/s11858-014-0648-1>
- Hmelo-Silver, C. E. (2016). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 28(1), 1–12. <https://doi.org/10.1023/B:EDPR.0000034022.16470.F3>
- Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools*, 19(3), 267–277. <https://doi.org/10.1177/1365480216659733>
- Kurniawati, T. (2020). Implementation of project-based learning to improve critical thinking skills of elementary school students. *Journal of Basic Education*, 12(1), 45–56.

- Lithner, J. (2017). Principles for designing mathematical tasks that enhance imitative and creative thinking. *ZDM Mathematics Education*, 49(6), 937–949. <https://doi.org/10.1007/s11858-017-0867-3>
- Ministry of Education, Culture, Research, and Technology. (2022). Kurikulum Merdeka: Panduan pembelajaran dan asesmen.
- Moschkovich, J. (2018). Building on students' mathematical thinking in context. *Journal for Research in Mathematics Education*, 49(2), 148–165.
- NCTM. (2020). *Catalyzing change in early childhood and elementary mathematics*. National Council of Teachers of Mathematics.
- OECD. (2019). *OECD future of education and skills 2030*. OECD Publishing.
- OECD. (2020). *PISA 2018 results: What students know and can do (Volume I)*. OECD Publishing. <https://doi.org/10.1787/5f07c754-en>
- OECD. (2022). *PISA 2022 mathematics framework*. OECD Publishing. <https://doi.org/10.1787/dfe0bf9c-en>
- Pang, J., & Kim, O. K. (2016). Supporting students' mathematical modeling competencies. *Educational Studies in Mathematics*, 93(3), 293–312. <https://doi.org/10.1007/s10649-016-9705-3>
- Rayanto, Y. H., Supriyo, & Sugianti. (2020). Applying objectivist instructional design of addie model on learning reading comprehension. *Proceedings of the International Conference on Community Development (ICCD 2020)*, 795–799. <https://doi.org/10.2991/assehr.k.201017.175>
- Richey, R. C., & Klein, J. D. (2020). *Design and development research: Methods, strategies, and issues*. Routledge. <https://doi.org/10.4324/9780203826034>
- Sari, D., & Putra, Z. (2021). Contextual numeracy learning to improve elementary students' critical thinking. *Journal of Mathematics Education*, 12(1), 55–68.
- Schukajlow, S., Kaiser, G. & Stillman, G. Empirical research on teaching and learning of mathematical modelling: a survey on the current state-of-the-art. *ZDM Mathematics Education* 50, 5–18 (2018). <https://doi.org/10.1007/s11858-018-0933-5>
- Setiawan, H. (2022). Local context-based teaching materials to improve learning effectiveness in elementary school. *Journal of Primary Education Studies*, 8(2), 115–128.
- Setiawan, H., & Indrawati, R. (2021). Problem-based learning model to improve the critical thinking skills of elementary school students. *Journal of Basic Education*, 17(2), 211–228.
- Stacey, K. (2015). The Real World and the Mathematical World. In: Stacey, K., Turner, R. (eds) *Assessing Mathematical Literacy*. Springer, Cham. https://doi.org/10.1007/978-3-319-10121-7_3
- Steen, L. A. (2017). *Numeracy: The new literacy for a data-drenched society*. Routledge.
- Stillman, G., Brown, J., & Galbraith, P. (2016). *Research into mathematical applications and modeling*. Springer. https://doi.org/10.1007/978-981-10-1419-2_14
- Sullivan, P., Clarke, D., & Clarke, B. (2021). Teaching with challenging tasks. *Journal of Mathematics Teacher Education*, 24(2), 105–128. <https://doi.org/10.1007/s10857-020-09491-7>
- Tout, D. (2020). Evolution of numeracy and quantitative literacy. *Numeracy*, 13(1), 1–15. <https://doi.org/10.5038/1936-4660.13.1.1838>
- Tout, D., & Gal, I. (2015). Perspectives on numeracy: Reflections and challenges. *ZDM Mathematics Education*, 47(4), 691–702. <https://doi.org/10.1007/s11858-015-0672-9>

- Widodo, A., & Kurniasih, F. (2021). The effectiveness of local context-based learning in improving the literacy and numeracy of elementary school students. *Journal of Mathematics Education*, 11(2), 134–145.
- Wulandari, T. (2020). The effect of project-based teaching materials on the numeracy skills of elementary school students. *Journal of Innovative Education*, 14(3), 99–107.