

Development and validity of the local wisdom-based moduloka e-module to support elementary school students' problem-solving skills

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Received: Jul 30, 2026 | **Revised:** Aug 30, 2026 | **Accepted:** Aug 31, 2026 | **Published Online:** Sept 28, 2026

Abstract

Developing contextual digital teaching materials that integrate local wisdom is essential to support mathematics learning in primary schools. This study aimed to develop and validate MODULOKA, an e-module based on Jepara's local wisdom, focusing on fractions for fourth-grade students. The study employed a Research and Development (R&D) method using the ADDIE model, limited to the analysis, design, and development stages. Participants in the needs analysis stage included one teacher and ten fourth-grade students, while product validation involved two media experts and three subject matter experts. Data were collected through observations, needs-analysis questionnaires, and validation sheets, all using a 5-point Likert scale. The validation results indicated that MODULOKA achieved a media validity score of 91.2% ("Very Valid") and a content validity score of 88% ("Very Valid"). Product revisions were made based on the validators' feedback, including adding a glossary, improving material presentation, and refining local wisdom visualizations. Consequently, MODULOKA was deemed highly valid and suitable as digital teaching material for fraction lessons that incorporate Jepara's local wisdom. Future research is required to assess the practicality and effectiveness of MODULOKA, including its potential to support mathematical problem-solving skills through classroom implementation.

Keywords: E-Modul, Jepara local wisdom, MODULOKA, validity.

How to Cite: Rohmah, A., Amaliyah, F., & Riswari, L.A. (2026). Development and validity of the local wisdom-based moduloka E-module to support elementary school students' problem-solving skills. *Aksioma: Jurnal Matematika dan Pendidikan Matematika*, 17 (2), 203-214. <https://doi.org/10.26877/cgtsp750>

INTRODUCTION

Mathematics is a compulsory subject for elementary and secondary school students and is a core component of the national education curriculum. As a foundational science, mathematics is used to solve problems across various disciplines and everyday situations (Yunizal et al., 2024). Amaliyah (2025) stated that mathematical literacy is crucial for students, as it emphasizes understanding, reasoning, and applying mathematical concepts in daily life. Furthermore, mathematics education facilitates reasoning, shapes students' thinking patterns, and cultivates evidence-based attitudes (Riswari, Fitriana, et al., 2023).

Mathematics learning aims to develop mathematical reasoning, representation, connections, communication, and problem-solving skills (National Council of Teachers

of Mathematics, as cited in Riswari et al., 2023). Based on this framework, mathematical problem-solving is a fundamental standard that students must master (Amaliyah et al., 2026; Riswari & Ermawati, 2024). These skills are considered vital because they enable students to approach problems from novel perspectives. Problem-solving ability is defined as a person's skill in describing, reasoning, estimating, and interpreting information to find solutions (Riswari, Fitriana, et al., 2023). It lies at the heart of mathematics education as a core competency.

One tool that can facilitate students' mathematical problem-solving skills through independent learning is an instructional module. Modules can foster student enthusiasm when systematically and engagingly arranged, allowing students to acquire knowledge, understand concepts, and develop problem-solving strategies autonomously (Amaliyah et al., 2022). However, minimal active participation and weak higher-order thinking skills are often due to monotonous instructional methods that fail to capture students' attention (Kumalasari et al., 2025). This condition is exacerbated by the underutilization of interactive media, which negatively impacts student engagement (Amaliyah & Santoso, 2025). Therefore, a learning strategy that fosters an interesting, interactive, and meaningful atmosphere is needed to increase students' motivation and engagement in mathematics.

One innovation increasingly implemented in education is the use of e-modules. E-modules are digital-based learning media equipped with interactive features, such as animations, simulations, and direct feedback, designed to increase student participation and comprehension. The integration of technology can enhance student interest, provide interactive learning experiences, and encourage active involvement (Riswari et al., 2025). Compared to conventional modules, interactive e-modules offer a more dynamic and enjoyable learning experience, thereby increasing motivation, especially in subjects often perceived as difficult, such as mathematics (Nurvitasari et al., 2022). Furthermore, the development of interactive e-modules has been shown to significantly enhance students' mathematical problem-solving abilities (Adiastuty et al., 2024). Engagingly presenting complex material makes it easier for students to understand and motivates them to participate actively in the learning process (Latri, 2023).

However, the mere existence of e-modules is insufficient to create meaningful learning if the content is disconnected from students' lives. Local wisdom encompasses

the values, knowledge, traditions, and cultural practices developed within a community and passed down through generations. In basic education, local wisdom serves as an excellent contextual learning resource because it originates from an environment familiar to students. Integrating local wisdom into teaching materials helps students grasp abstract concepts more concretely, increases their appreciation for regional culture, and makes learning more relevant to their daily experiences (Susanti & Saputro, 2025). The integration of local cultural contexts, often referred to as ethnomathematics, provides a meaningful bridge between mathematical concepts and students' real-world environments, thereby facilitating a deeper understanding of the subject (Ni'matussa'adah & Malasari, 2024). Consequently, instructional methods that link local wisdom with learning media not only boost the desire to learn but also reinforce local cultural identity (Amaliyah et al., 2025).

Jepara Regency possesses various local wisdom resources that can serve as learning resources, including the art of Jepara carving, the furniture industry, geometric motifs in traditional carvings, and the cultural traditions of coastal communities. For example, Jepara carving motifs contain elements of lines, angles, plane shapes, patterns, and symmetry, which are closely related to elementary school mathematics concepts. Utilizing Jepara's local wisdom in mathematics instruction enables students to identify problems in their surroundings, analyze information, and find solutions using the mathematical concepts they have learned (Rahmawati et al., 2022). Thus, local wisdom serves as a bridge between mathematical concepts and real-life situations. By integrating this potential, the knowledge students acquire becomes practical for solving societal problems (Riswari et al., 2023).

Based on a review of prior research, there remains a significant need for digital teaching materials that integrate Jepara's local wisdom into mathematics instruction, particularly for fractions. Developing teaching materials that combine digital technology, local cultural contexts, and contextual presentations of fraction concepts is highly relevant. This study aimed to assess the feasibility of developing the "MODULOKA" e-module, designed to deliver contextual learning by using Jepara's local culture as a learning resource. The development focuses on the product's validity to ensure it is suitable for supporting elementary school students.

METHODS

This study employed a Research and Development (R&D) design. The R&D method is used to produce new product designs, test their effectiveness, and validate newly created educational products. The development model applied in this study was the ADDIE model, which consists of five systematic stages: Analysis, Design, Development, Implementation, and Evaluation.

However, due to practical constraints, this study was limited to the first three stages. The first stage, *analysis*, involved identifying the problems in the current learning process and determining the instructional needs. The second stage, *design*, focused on drafting and structuring the media based on the collected information. The third stage, *development*, involved the actual creation of the product and its validation instruments. Validity tests were subsequently conducted, comprising media validity and material (content) validity assessments.

This study adhered to ethical principles regarding research involving primary school students. Data collection was conducted after obtaining formal permission from the school. The teacher and students involved in the needs analysis phase were informed of the research objectives and data collection procedures. Participation was voluntary, and the data obtained were used strictly for research purposes, with students' identities kept confidential.

Product validity was assessed by two media expert validators and three subject matter expert validators. The validators were selected for their expertise in educational media, elementary mathematics education, and instructional material development. To assess the quality of the developed e-module, a questionnaire using a 5-point Likert scale was administered. The media validation instrument consisted of 20 items covering five aspects, while the subject matter validation instrument comprised 22 items across seven aspects. The data obtained from the validation sheets were analyzed quantitatively using percentage calculations (Irawan & Hakim, 2021). The results from both media and materials experts were then categorized according to the criteria presented in Table 1.

Table 1. Validation Score Category

Scores in Percentage	Category
86% - 100%	Very Valid
76% - 85%	Valid
60% - 75%	Quite Valid
55% - 59%	Less Valid
0% - 54%	Invalid

(Andani, 2022)

RESULTS AND DISCUSSION

Analysis Stage

During the analysis stage, observations and questionnaires were utilized to identify the needs of teachers and students. The needs analysis involved one teacher and ten fourth-grade students. The observation results indicated that the instructional materials used in class were predominantly traditional student worksheets, despite the availability of supporting equipment such as projectors and televisions. The questionnaire responses revealed that six students (60%) expressed a need for more engaging and interactive instructional materials, while four students (40%) reported that examples related to their local environment or culture helped them understand the subject matter better. These findings highlighted a clear necessity for contextual digital instructional materials for mathematics, specifically for the topic of fractions. This needs analysis data served as the foundation for developing MODULOKA to improve students' mathematical problem-solving abilities.

Design Stage

In the design stage, the MODULOKA e-module was structured and drafted. This stage involved assembling the main components of the e-module, which included the cover, foreword, learning objectives, usage instructions, an introduction to Jepara's local wisdom, fraction materials, contextual examples, learning videos, exercises, answer explanations, the author's profile, and access information. MODULOKA was designed using Canva, while Microsoft Copilot AI was utilized to create supporting illustrations for the learning videos. The media was designed in great detail, incorporating elements

of local Jepara wisdom to maximize student engagement. The final output is an interactive flipbook accessible via a Canva-powered website.

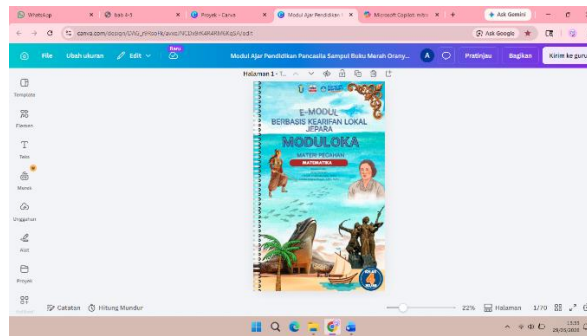


Figure 1. Structure and Main Features of the MODULOKA E-Module
Development Stage

This stage involved product creation and expert validation. The developed MODULOKA learning media underwent validity testing with media and content experts to obtain quantitative assessments and qualitative feedback for improvement.

The first validity test was administered to two media experts. The assessment was conducted using a Media Expert questionnaire, and the results are presented in Table 2.

Table 2. Media Expert Validation Results

No	Aspect	Validator		Mean	Validation
		I	II		
1.	Visual Design and Aesthetics	100%	84%	92%	Very Valid
2.	Technical Engineering and Accessibility	100%	90%	95%	Very Valid
3.	Instructional Design	100%	85%	92%	Very Valid
4.	Media Quality	100%	80%	90%	Very Valid
5.	General Feasibility	95%	80%	87%	Very Valid
Overall Average				91,2%	Very Valid

Three subject-matter experts conducted the second validity test to evaluate the e-module's content. The results are presented in Table 3.

Table 3. Subject Matter Expert Validation Result

No	Aspect	Validator			Mean	Validation
		I	II	III		
1.	Curriculum Compatibility and Learning Objectives	86%	80%	86%	84%	Valid
2.	Truth and Completeness Material	85%	80%	95%	86%	Very Valid
3.	Relationship and Contextuality (Local Wisdom Context)	86%	100%	100%	95%	Very Valid
4.	Readability and Clarity Presentation	80%	85%	95%	86%	Very Valid
5.	Integration and Consistency	93%	80%	93%	88%	Very Valid
6.	Implementation in Learning	93%	80%	93%	88%	Very Valid
7.	Security and Neutrality Material	90%	80%	100%	90%	Very Valid
Overall Average					88%	Very Valid

Based on the validation results, both media and subject matter experts categorized the e-module as "Very Valid." However, several constructive suggestions were provided for product refinement, as outlined in Table 4.

Table 4. Validator Suggestions and Input Improvements

Validator	Suggestions and Input	Revision Action
Media Expert	Add a glossary to help students understand unfamiliar terms	A glossary page containing key terms and definitions was added to the e-module
Subject Matter Expert	Improve the writing of the	The text was revised and

Validator	Suggestions and Input	Revision Action
	material to avoid redundant and repetitive explanations.	simplified to ensure clarity, proper punctuation, and conciseness.

Based on the feedback, a glossary was successfully integrated into the e-module. Furthermore, the instructional text was revised to eliminate repetition and ensure clarity, thereby enhancing reading comprehension for fourth-grade students.

The finalized MODULOKA is a digital flipbook presented via a website. It integrates Jepara Regency's local wisdom using a Problem-Based Learning (PBL) approach, enabling students to relate mathematical concepts to everyday contexts. The module is accessible online at: <https://ruanghiwalani.my.canva.site/modul-ajar-kearifan-lokal-jepara-buku-modul-interaktif-ilustratif>.

This study aimed to develop and test the feasibility of MODULOKA, an e-module integrating Jepara's local wisdom for fraction learning in fourth-grade elementary school. Validation was conducted to assess the product's quality regarding media design and content suitability. As stated by Yopita et al. (2024), expert product validation is a crucial step to ensure the feasibility and validity of newly developed instructional materials prior to field implementation.

The media validity test, conducted by two media experts, yielded an overall score of 91.2% ("Very Valid"). The e-module excelled particularly in technical engineering and accessibility (95%), ensuring that the system runs smoothly, is responsive, and is easy for elementary students to use. This operational ease is supported by a robust instructional design (92%), where the material is systematically structured to guide independent learning effectively. The quality of the multimedia, which seamlessly integrates text, images, and interactive elements, brings the content to life. Regional aesthetic elements, such as digital illustrations of Jepara wood-carving motifs, proportional woodcutting, and interactive simulations of traditional foods like *horok-horok*, make the visual design child-friendly, aesthetically pleasing, and culturally rich. These findings align with Zuhriyah et al. (2024), who asserted that well-designed digital media validated by experts

significantly enhances the learning experience. While the media expert validation involved only two specialists (which serves as an initial feasibility indicator), the high scores confirm that MODULOKA is technically and visually ready for educational use.

The subject matter validation, conducted by three experts, yielded an overall score of 88% ("Very Valid"). The material presented aligns well with the curriculum and learning objectives for fourth-grade mathematics. The module's primary strength lies in its excellent relationship and contextuality (95%), successfully delivering fraction concepts through direct linkages to Jepara's local culture. In MODULOKA, local wisdom is not merely used for visual decoration but is directly linked to the mathematical representation of fractions. For instance, Jepara wood-carving motifs are used to illustrate a single whole divided into equal parts, helping students identify the numerator and denominator. The context of wooden furniture illustrates the division of length into equal segments, while the local delicacy *horok-horok* represents the division of a whole into consumable portions. Consequently, these cultural objects serve as a functional mathematical context for introducing the "part of a whole" concept. This approach is consistent with the findings of Bayu and Wibawa (2021), who highlighted that expert-validated contextual learning materials effectively bridge abstract concepts and real-world applications.

Despite the high validation scores, the experts provided valuable feedback to optimize the e-module. The media experts suggested adding a glossary, which was subsequently incorporated to expand students' vocabulary on unfamiliar terms. The subject matter experts advised streamlining the text to eliminate redundancies and correct punctuation errors. Following these revisions, the visual and mathematical presentations became more explicit, ensuring that the concept of fractions appears concrete and understandable to young learners. Overall, the combination of interactive digital features and strong local content makes MODULOKA a highly effective and innovative teaching resource that simultaneously develops mathematical problem-solving skills and fosters an early appreciation of regional heritage.

CONCLUSION

Based on this research and development study, MODULOKA is a highly feasible digital flipbook e-module that successfully integrates Jepara's local wisdom with the topic of fractions for elementary school students. The validation results indicated that

MODULOKA achieved a score of 91.2% from media experts and 88% from subject matter experts, both categorized as "Very Valid." These results confirm that the e-module meets the necessary pedagogical, technical, and content feasibility criteria. Consequently, MODULOKA is highly suitable for use as a contextual digital teaching material in primary mathematics education.

This study was limited to the analysis, design, development, and expert validation phases. Therefore, it did not measure the practicality or effectiveness of MODULOKA on actual student learning outcomes or mathematical problem-solving abilities. Future research should focus on conducting practicality and effectiveness tests through direct classroom implementation, specifically assessing MODULOKA's impact on enhancing students' problem-solving skills in mathematics.

ACKNOWLEDGMENTS

The author expresses his deepest gratitude to all parties who have provided support, guidance, and assistance in the completion of this scientific article.

DECLARATIONS

- Author Contribution : AR: Conceptualization, Writing - Original Draft, Editing and Visualization; FA: Review & Editing; LAR: Review & Editing.
- Funding Statement : This study received no specific funding from government agencies, nonprofit organizations, or other external sources. All research activities were conducted independently, with support from the Elementary School Teacher Education Study Program, Faculty of Teacher Training and Education, Muria Kudus University.
- Conflict of Interest : The authors declare no conflict of interest.
- Additional Information : Materials, including simulation data, program files, and supporting documents, are available from the corresponding author upon request.

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