

The Integration of Local Wisdom in Mathematics Education: Developing a Culture-Based Digital Platform for Mathematical Literacy in the Kuta Traditional Village

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Abstrak

Penelitian ini bertujuan untuk menjelaskan kelayakan platform digital untuk literasi matematika berbasis budaya Kampung Adat Kuta dan menganalisis respons siswa terhadap penggunaannya dalam pembelajaran matematika. Metode penelitian yang digunakan adalah Penelitian dan Pengembangan (R&D) dengan model pengembangan Analisis, Desain, Pengembangan, Implementasi, dan Evaluasi (ADDIE). Teknik pengumpulan data meliputi wawancara semi-terstruktur dan kuesioner. Instrumen penelitian terdiri dari lembar panduan wawancara dan kuesioner penilaian kualitas media. Subjek penelitian adalah pakar materi, pakar media, dan siswa kelas 8 SMP Negeri 10 Tasikmalaya. Hasil penelitian menunjukkan bahwa platform digital yang dikembangkan berhasil mengintegrasikan kearifan lokal Kampung Adat Kuta ke dalam pembelajaran matematika secara interaktif. Kelayakan platform dinilai berdasarkan aspek kelayakan konten, presentasi, dan bahasa oleh pakar materi, serta aspek tampilan, kemudahan penggunaan, kegunaan, dan grafis oleh pakar media. Kedua pakar menyimpulkan bahwa platform tersebut sangat layak digunakan. Lebih lanjut, siswa memberikan respons yang sangat positif terhadap penggunaan platform digital ini. Oleh karena itu, dapat disimpulkan bahwa integrasi kearifan lokal melalui media digital dapat menjadi alternatif inovatif untuk meningkatkan literasi matematika siswa.

Kata Kunci: Pengembangan media pembelajaran interaktif; Adobe Animate; Penelitian & Pengembangan; ADDIE; SPLDV.

Abstract

This study aims to explain the feasibility of a digital platform for mathematical literacy based on the culture of Kampung Adat Kuta and to analyze students' responses to its use in mathematics learning. The research method employed is Research and Development (R&D) with the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) development model. Data collection techniques included semi-structured interviews and questionnaires. The research instruments consisted of interview guideline sheets and media quality assessment questionnaires. The research subjects were material experts, media experts, and eighth-grade students of SMP Negeri 10 Tasikmalaya. The results of the study indicate that the developed digital platform successfully integrates the local wisdom of Kampung Adat Kuta into mathematics learning in an interactive manner. The feasibility of the platform was assessed based on content, presentation, and language feasibility aspects by material experts, as well as display, ease of use, usability, and graphic aspects by media experts. Both experts concluded that the platform is highly feasible for use. Furthermore, students gave very positive responses toward the use of this digital platform. Therefore, it can be concluded that the integration of local wisdom through digital media can serve as an innovative alternative to enhance students' mathematical literacy.

Keywords: Development of interactive learning media; Adobe Animate; Research & Development; ADDIE; SPLDV.

I. INTRODUCTION

Contemporary mathematics education has shifted its focus from merely achieving students' cognitive abilities toward developing the capacity to connect mathematical concepts with various real-world situations. A pivotal competency relevant to these demands is mathematical literacy, defined as an individual's capacity to formulate, employ, and interpret mathematics across a variety of life contexts (OECD, 2022). Mathematical literacy plays a strategic role in equipping students with critical, logical, and creative thinking skills, as well as the proficiency to solve everyday problems (Jufri et al., 2024; Qolbi & Afriansyah, 2024; Sofyan, Puspitasari, & Maryani, 2025).

Nevertheless, results from both national and international assessments indicate that the level of mathematical literacy among Indonesian students remains relatively low (Kemendikbudristek, 2023). This condition reflects underlying issues in the implementation of mathematics instruction in schools. Learning that remains abstract, emphasizes procedural rote learning, and lacks connection to real-life contexts causes students to struggle in applying mathematical concepts functionally (Hutagaol et al., 2025). Consequently, the mathematical knowledge acquired in the classroom has not become fully meaningful for the students' lives.

On the other hand, Indonesia possesses a wealth of local wisdom that holds significant potential as a contextual learning resource. Local culture encompasses not only social and philosophical values but also various mathematical concepts integrated into

community practices. A prime example is found in the Kuta Traditional Village in Ciamis Regency, West Java, which continues to preserve ancestral traditions in various aspects of life, such as land distribution systems, the form and structure of traditional houses, social regulations, and the execution of traditional ceremonies. These various practices contain mathematical values that can be analyzed and integrated into learning through an ethnomathematics approach, which studies the relationship between mathematics and culture (D'Ambrosio, 2001; Devita, Puspitasari, Afriansyah, 2025).

Previous studies have shown that integrating local culture into mathematics learning through an ethnomathematical approach yields a positive impact on the instructional process. Mathematics material becomes more meaningful when presented through contexts close to the students' lives (Arwadi et al., 2024). Furthermore, the emotional and social engagement of students increases, thereby fostering learning motivation and conceptual understanding of mathematics (Barton & Frank, 2003; Efwan et al., 2024). Culture-based learning also contributes to the preservation of local heritage by contextually introducing traditional values to the younger generation.

Despite these benefits, the utilization of local wisdom in mathematics education remains limited, particularly in the development of digital-based learning media that can be widely accessed. Meanwhile, advancements in educational technology provide significant opportunities to present innovative,

interactive, and flexible learning media. Integrating digital technology with local cultural contexts and strengthening mathematical literacy can serve as an effective strategy to address the challenges of mathematics education in the modern era.

In line with these needs, this study utilizes the Heyzine digital platform as a medium for developing mathematical literacy based on local culture (Iqrima, Zulkarnain, & Kamaliyah, 2023). Heyzine is a digital flipbook platform that allows for the interactive, visual, and responsive presentation of teaching materials across various devices (Mayer, 2020; Hariastuti, Amin, & Utami, 2024). This platform supports the integration of text, images, cultural illustrations, videos, and relevant interactive links to authentically represent the local wisdom of the Kuta Traditional Village. Additionally, Heyzine is web-based and does not require additional application installation, thereby supporting flexibility for both independent and structured learning (Setiawan & Wulandari, 2022). These characteristics make Heyzine a potential medium for delivering contextual mathematics learning and supporting the strengthening of mathematical literacy through a digital-based ethnomathematical approach.

Based on the aforementioned context, this research focuses on developing a digital platform for mathematical literacy based on the culture of the Kuta Traditional Village. This innovation is expected to contribute to improving students' mathematical literacy while reinforcing their understanding of local culture

through meaningful, contextual mathematics learning that aligns with the advancements in educational technology.

II. METHOD

This research employs a Research and Development (R&D) approach, aimed at producing and testing the feasibility of an educational product in the form of a digital mathematical literacy platform based on local wisdom. The R&D approach was selected due to its relevance in developing innovative, contextual learning products oriented toward improving instructional quality (OECD, 2022). In its execution, this study adapts the ADDIE model, which encompasses five primary stages: Analysis, Design, Development, Implementation, and Evaluation (Branch, 2009). The ADDIE model is considered to have a systematic yet flexible workflow, making it suitable for developing digital learning media integrated with local cultural values.

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developing digital learning media integrated with local cultural values.

The first stage is Analysis, which aims to identify mathematics learning needs in elementary schools and the opportunities for integrating the culture of the Kuta Traditional Village into the instructional process. At this stage, the researcher conducted literature studies, field observations, and interviews with cultural leaders, teachers, and students within the Kuta Traditional Village environment. The data obtained were used to formulate the competencies to be developed, the platform user characteristics, and the relevant local cultural elements to be contextualized in mathematics learning (D'Ambrosio, 2001).

The second stage is Design, which includes planning the digital platform structure, designing the user interface, and organizing the learning content. A platform blueprint was developed, covering navigation schemes, material delivery flows, and the integration of mathematical concepts with local cultural elements. This integration is realized through the utilization of geometric shapes in traditional house architecture, symmetry patterns in weaving arts, and number concepts that appear in various activities and traditional ceremonies of the Kuta community (Barton & Frank, 2003). Furthermore, the platform design considers principles of instructional design and educational technology to ensure the media developed is engaging, user-friendly, and suitable for elementary school students' characteristics.

The third stage is Development, the process of realizing the product based on

the predetermined design. At this stage, the platform was developed using web-based or mobile software. The initial product was then subjected to a validation process by subject matter experts—covering mathematics education and local culture—and learning media experts. Validation was conducted to assess content quality, visual appearance, and platform functionality. The results from the validators served as the basis for product revision and refinement before field testing (Mayer, 2020).

The fourth stage is Implementation, which involved limited field testing at elementary schools situated around the Kuta Traditional Village. This stage aimed to gain insights into teacher and student responses to the platform's use and to gather preliminary data regarding its effectiveness in improving students' mathematical literacy. The trial was conducted over several learning sessions, with data collection techniques including observation, questionnaires, and mathematical literacy tests (Penelitian 2022).

The final stage is Evaluation, aimed at assessing the overall quality and effectiveness of the digital platform. This included formative evaluation throughout the development process and summative evaluation following the implementation phase. Summative evaluation focused on measuring the improvement in students' mathematical literacy before and after using the platform, as well as the level of user satisfaction with the developed learning media (Penelitian 2023).

By applying the ADDIE-based R&D approach, this study is expected to produce

a mathematics learning platform that is pedagogically effective, user-friendly, and relevant to the local cultural context. Beyond supporting mathematical literacy, the developed platform is expected to strengthen students' cultural identity, making mathematics learning more contextual, relevant, and meaningful in daily life. Furthermore, the platform is expected to achieve a high level of feasibility and receive positive responses from both students and teachers. The classification of feasibility assessment refers to established criteria (Penelitian 2020), while the classification of student response assessment follows applicable provisions (Kusumawardhani et al., 2022).

Once all data were collected, the percentage of the assessment results was calculated using the following formula:

$$H_x = \left(\frac{\text{Total skor yang diperoleh}}{\text{Skor maksimum}} \right) \times 100\%$$

The instrument calculation results were then classified based on the feasibility assessment criteria (Penelitian 2020) and the student response assessment criteria (Kusumawardhani et al., 2022).

Table 1.

Feasibility Assessment Classification	
Feasibility Percentage	Interpretation
81% - 100%	Very Feasible
61% - 80%	Feasible
41% - 60%	Fair
21% - 40%	Less Feasible
0% - 20%	Not Feasible

Table 2.

Student Response Assessment Classification	
Feasibility Percentage	Criteria
Pr < 20%	Very Less Positive
20% < Pr < 40%	Less Positive
40% < Pr < 60%	Fair
60% < Pr < 80%	Positive
80% < Pr < 100%	Very Positive

III. RESULT AND DISCUSSION

This research was primarily conducted in the Kuta Traditional Village, located in Karangpaningal Village, Tambaksari District, Ciamis Regency, West Java. The study commenced with an ethnomathematical exploration of the community's daily practices. The findings were subsequently contextualized and developed into mathematics instructional materials. The implementation of the digital mathematical literacy platform based on the Kuta Traditional Village culture was carried out at SMP Negeri 10 Tasikmalaya. The product underwent validation by both subject matter and media experts before the field-testing phase. The development process strictly adhered to the ADDIE model.

1. Analysis Phase

The analysis phase aimed to identify mathematics learning needs in junior high schools through observations and interviews with teachers and students. Findings revealed that existing instructional materials relied heavily on standard textbooks, lacking the integration of local wisdom, specifically the culture of the Kuta Traditional Village. Consequently, students remained unfamiliar with the cultural values in their surroundings, despite the potential of local culture to provide a more meaningful learning context.

Furthermore, the schools implement the *Kurikulum Merdeka*, emphasizing the strengthening of literacy competencies. Interviews with mathematics teachers indicated that most students struggle with contextual mathematical literacy problems. Assessment data placed students' mathematical literacy in the lower-middle

category. This underscores the need for more contextual, engaging, and relevant instructional strategies. Traditional materials were deemed less interactive and failed to optimally attract student interest. Thus, developing a digital platform that integrates Kuta Traditional Village wisdom is a necessary innovation to enhance students' mathematical literacy.

2. Design Phase

During the design phase, the initial framework for the digital platform was established. Mathematical literacy content was mapped to Kuta Traditional Village wisdom, including instructional materials, contextual problems, interactive features, and a user-friendly interface. Initial designs were validated by experts to ensure content accuracy and aesthetic feasibility, serving as the basis for refinement before moving to the development phase.

3. Development Phase

The development phase realized the design into a functional digital platform. Key components included learning content, pre-test and post-test instruments, and student response questionnaires.

- Digital Platform Content Creation: Content integrated mathematical literacy into the Kuta cultural context, sourced from textbooks, local wisdom literature, and field documentation. Web-based applications and graphic design tools were utilized to create an interactive platform. Visual elements such as traditional houses, weaving patterns, and community activities served as contextual illustrations to bring the material closer to students' lives.

- Pre-test and Post-test Instruments: These instruments were designed to measure the improvement in mathematical literacy after using the social arithmetic materials based on local wisdom.
- Student Response Questionnaires: Designed using a Likert scale to gauge student feedback on platform aesthetics, usability, material meaningfulness, and perceived impact on their mathematical understanding.
- Expert Validation: The platform was validated by two experts.
 - Subject Matter Validation: Conducted by a mathematics teacher to assess content feasibility, presentation, and language. The average score was 94.48% (Very Feasible), indicating the product could be used without revision.

Results of Material Expert Validator			
No	Aspect	Score Generated	Category
1	Content suitability	98%	Very Eligible
2	Presentation suitability	88,45%	Very Eligible
3	Language suitability	97%	Very Eligible
Total		94,48%	Very Eligible

- Media Validation: Conducted by a Mathematics Education lecturer. The average score was 92% (Very Feasible). The expert suggested improving the Quiz menu interface to ensure it is not too small and allows for more efficient access.

Table 4.
Media Expert Validator Results

No	Aspect	Score Generated	Category
1	Display	92%	Very Eligible
2	Ease and Benefits of Using Digital Platforms	94%	Very Eligible
3	Graphics	90%	Very Eligible
	Total	94,48%	Very Eligible

Thus, the product is declared fit for use with improvements.

Table 5.

Media Expert Comments and Suggestions

Comments	Suggestions
-	It's best not to make the quiz display too small, as this can make it difficult for users to complete the quiz. Furthermore, to ensure more efficient quizzes, users should be able to start the quiz directly without having to wait for admin approval or access.

Media experts suggested adding visual changes to the Quiz menu. The resulting improvements are shown in the following Figure 1.

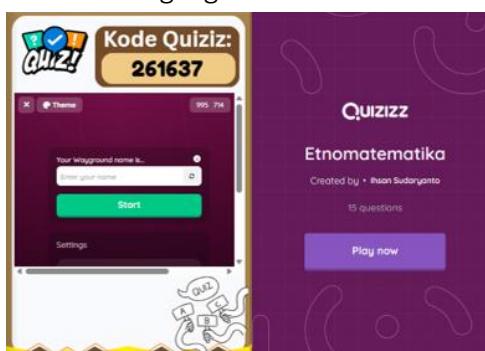


Figure 1. Before Repair (Left) After Repair (Right).

4. Implementation Phase

At this stage, researchers conducted a trial of the use of a digital platform for mathematical literacy based on the culture of the Kuta Traditional Village in several schools, namely SMPN 10 Tasikmalaya City. During the learning activities, students used the digital platform as an interactive learning medium for four meetings. The material and questions presented in the platform were linked to the context of the local wisdom of the Kuta Traditional Village, so that students could relate mathematical concepts to the surrounding culture. Before the learning activities, students were given a pre-test first, to determine the extent of their mathematical literacy abilities. After the pre-test was implemented, the results obtained that students' mathematical literacy abilities were at levels 2 and 3. During the learning process, researchers utilized the digital platform in four meetings. After the learning ended, students were again given a post-test to determine whether the teaching materials used were able to improve their mathematical literacy abilities. In addition, at the end of the learning, students were also asked to fill out a questionnaire to obtain information about their responses to the developed teaching materials, whether they were positive or negative.

5. Evaluation Phase

This stage presents the evaluation results, which include an analysis of the validity, effectiveness, and practicality of the digital platform developed and implemented at SMPN 10 Tasikmalaya City. Based on validation results from material

and media experts, the digital platform was categorized as very suitable for use. Meanwhile, based on student responses to the use of local wisdom-based teaching materials, the response obtained was categorized as very positive. The following table presents the results of student responses.

Table 6.

Student Response Results

No	Aspect	Score Generated	Category
1	Content Suitability	92%	Very Positive
2	Ease and Benefits of Using Digital Platforms	94%	Very Positive
3	Local Wisdom Content	90%	Very Positive
Total		94,48%	Very Positive

Based on the questionnaire given to students, the average score was 93%, which is categorized as very positive. The pre-test results of students' mathematical literacy skills at SMPN 10 Kota Tasikmalaya are as follows:

Table 7.

Pretest Results of Students' Mathematical Literacy Skills

Category (level)	Total Students	Description
1	3	Not Completed
2	10	Not Completed
3	14	Completed
4	2	Completed
5	-	-
6	-	-
Total	29	-
%	55,17	-

The data shows that most students are still at levels 2 and 3, while the completion

rate of 29 students reached 55.17%, which is considered adequate. After students participated in learning using a local wisdom-based platform, post-test results showed the following improvements:

Table 8.
Posttest Results of Students' Mathematical Literacy Skills

Category (level)	Total Students	Description
1	2	Not Completed
2	5	Not Completed
3	12	Completed
4	6	Completed
5	3	Completed
6	1	Completed
Total	29	-
%	75.86%	-

Post-test results showed a significant increase in mastery from 55.17% to 75.86%, an improvement of 20.69%. This indicates that the local wisdom-based digital platform effectively enhances mathematical literacy.

The improvement in mathematical literacy demonstrates that integrating cultural contexts helps students understand and apply concepts meaningfully. Kuta Traditional Village wisdom provides real mathematical structures—such as land distribution systems and geometric architecture—allowing students to engage in the process of formulating, employing, and interpreting mathematics.

Specifically, student progress was supported by mastering concepts like social arithmetic, ratios, and contextual data interpretation. Economic activities of the indigenous community served as the context for social arithmetic problems,

while traditional architecture introduced geometry (plane figures, similarity, and measurement) in a visual and concrete manner. This aligns with Realistic Mathematics Education (RME), which posits that mathematics is more easily understood when linked to situations that are "real" to the student, physically or culturally.

Furthermore, the digital platform's multimodal presentation—combining text, images, and cultural illustrations—contributed to this success. This aligns with Multimedia Learning Theory, where integrated cognitive channels lead to more effective learning. Visualizing the Kuta culture reduced the abstraction of mathematical material. The very positive student response (93%) suggests the platform provided an engaging and motivating experience, consistent with findings that cultural digital media enhance active engagement and positive attitudes toward mathematics. In conclusion, the synergy between local wisdom and digital technology is key to improving mathematical literacy, making learning relevant, applicable, and aligned with 21st-century educational demands.

IV. CONCLUSION

Based on the research findings, it can be concluded that a digital mathematical literacy platform based on the local wisdom of the Kuta Traditional Village was successfully developed using the ADDIE model, encompassing the stages of analysis, design, development, implementation, and evaluation. The integration of local cultural elements into

mathematical content renders the learning process more contextual, engaging, and meaningful for students.

Validation results indicate that the developed platform is categorized as "Very Feasible," with assessment percentages of 94.48% from the subject matter expert and 92% from the media expert. These achievements demonstrate that the platform meets the feasibility criteria across various aspects, including material suitability, mathematical concept accuracy, local wisdom integration, as well as aesthetic appeal, navigation, and media functionality. These validation scores signify that the culture-based mathematical content of the Kuta Traditional Village is presented systematically, contextually, and in alignment with the objective of strengthening students' mathematical literacy.

Furthermore, student responses to the digital platform's use were "Very Positive," reaching a percentage of 93%. This result reflects high levels of student interest, ease of use, and a positive perception of the media's utility in assisting them to comprehend mathematical concepts through a local cultural context. Consequently, the developed digital platform is not only theoretically feasible but also possesses high potential effectiveness in supporting contextual and meaningful mathematics education.

In summary, this study confirms that the integration of ethnomathematics based on Kuta Traditional Village wisdom into a digital platform serves as an innovative alternative solution to improve students' mathematical literacy while simultaneously

reinforcing their understanding and appreciation of local culture.

This research offers several significant implications for the field of education, particularly mathematics education. First, the high validation scores and positive student responses demonstrate that culture-based mathematics learning delivered digitally is capable of increasing student engagement and interest, which has long been a major challenge in mathematics instruction. Second, this study shows that local wisdom can be integrated systematically and measurably into mathematics learning without compromising conceptual depth, and it even has the potential to strengthen students' conceptual understanding. Third, the utilization of flipbook-based digital platforms like Heyzine implies an expansion of learning access that is more flexible, independent, and adaptive to advancements in educational technology.

Furthermore, this study contributes to the body of knowledge in mathematics education and instructional media by presenting a development model for an ethnomathematics-based digital mathematical literacy platform. These findings are expected to serve as an empirical reference for educators and researchers in integrating local wisdom into mathematics learning in an innovative and sustainable manner.

Based on the research results, several recommendations are proposed: For Mathematics Teachers: It is recommended to develop or utilize local wisdom-based digital platforms as alternative instructional media to strengthen mathematical literacy while introducing regional culture to

students. The teacher's role is crucial in integrating cultural content to ensure students receive a more contextual learning experience; For Students: It is recommended to actively utilize this digital platform to explore mathematical concepts linked to local culture, thereby making the learning process more enjoyable and fostering a sense of love and appreciation for regional heritage; For Future Researchers: It is recommended to conduct trials on a broader scale and across different regions to test the platform's effectiveness more generally. Additionally, the development of more varied interactive features, such as simulations or educational games, should be considered to make the learning media increasingly engaging and innovative; For Instructional Media Developers: It is expected that they continue to enhance the quality of the interface, navigation, and interactive features to ensure the platform is more appealing and user-friendly. Adding varied content—such as interactive quizzes, simulations, or educational games—can increase student engagement. Moreover, the integration of local wisdom should be conducted more comprehensively by ensuring the accuracy and relevance of cultural content to the curriculum. Continuous feedback from teachers, students, and subject matter experts is essential for the ongoing refinement of the media.

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