

Integrating Indragiri Hulu Local Wisdom into Audiovisual Math Module for Elementary Education

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ABSTRACT

This study aimed to evaluate the effect of local wisdom-based audiovisual modules on improving learning outcomes in mathematics among second-grade students at YMI Tani Makmur Elementary School. The research employed a purposive sampling method to select students studying two- and three-dimensional shapes, aligning with the developed module. The study involved designing the module, validating it through expert reviews, and assessing student responses. Validation was conducted by teaching material experts (focusing on content and evaluation) and media experts (focusing on design, interactivity, and communicativeness). Expert validation results indicated an average score of 72.3% from material experts, categorized as "valid," and 94.4% from media experts, categorized as "very valid." These results confirmed that the module meets the validity criteria for audiovisual instructional materials. Observations during implementation revealed that educators found the module helpful in enhancing students' learning outcomes and motivation in mathematics. The findings demonstrate the potential of local wisdom-based audiovisual modules to make mathematics learning more engaging and effective for elementary school students. The study concludes that the validated module is a valuable tool for improving both motivation and academic performance in mathematics, supporting its use in elementary education settings. Further research could explore its application across different subjects and grade levels.

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1. INTRODUCTION

Mathematics education at the elementary school level is often faced with various challenges, especially in teaching abstract concepts such as flat shapes. Traditional teaching methods, primarily relying on textbooks and verbal explanations, often fail to engage students and bridge the gap between theory and practical application (Langland et al., 2023). As a result, students' understanding of mathematics remains limited, and their interest in the subject declines (Heckman & Weissglass, 1994;

Copur-Gencturk, 2021; Tytler et al., 2023; Kuzle, 2023). One key issue is the lack of connection between the subject matter and students' everyday lives, which diminishes the relevance of lessons and reduces motivation (Hansson, 2012; Kong et al., 2003).

In Indonesia, there is growing recognition of the importance of integrating local values and wisdom into education to make learning more meaningful and culturally relevant (Asmal & Latief, 2023). Local wisdom has great potential to increase students' learning motivation, as they can see a direct connection between the subject matter and their own environment and culture (Chang & Kuo, 2021). This study is particularly concerned with Indragiri Hulu, located in Riau Province, which is rich in cultural heritage, including traditional motifs in batik and weaving, folklore like the "Sutan's Pearl" myth, agricultural practices such as rice planting, and tools used in fishing and farming. Exploring the richness of the Indragiri Hulu regional culture through various aspects, such as food, traditional dance decorations, traditional clothing, folk games, and agricultural or fishing tools, can be used as basic concepts to understand the material in elementary mathematics classes. A person's local environment is partly responsible for providing the context that fosters connection, belonging, and personal motivation. Local culture can be integrated as a tie that connects lessons to the students' lives. By starting from a person's experience, we can inspire learning and make it stick. These cultural elements can serve as rich, visual contexts to explain mathematical concepts like symmetry, area, and proportion in ways that are both engaging and relevant to students' lives.

Despite the clear potential of integrating local wisdom into education, the use of local cultural elements in learning media—especially in mathematics—remains largely unexplored (Asmayawati et al., 2024; Yourong, 2023). The gap in the current research lies in the insufficient attention given to the integration of local culture with audiovisual learning tools, particularly in regions with rich cultural traditions like Indragiri Hulu. While numerous studies have explored the effectiveness of audiovisual media in education, they often overlook the cultural relevance of the materials, focusing primarily on general educational content without considering how local values can make the content more meaningful (Jerrim et al., 2013; Limpo et al., 2022). This lack of cultural integration means that students may fail to see the connections between abstract mathematical concepts and their own lives, reducing both engagement and retention. However, this potential is still not optimally utilized in the education system, especially in the development of mathematics learning media (Asmayawati et al., 2024). One of the main challenges is how to package the local wisdom in a form that is interesting and easily understood by students, especially in fairly abstract concepts such as mathematics (Susanto et al., 2022).

This research aims to address the gap in integrating local wisdom with innovative teaching tools by developing and implementing an audiovisual module based on Indragiri Hulu's cultural heritage for teaching flat shapes at YMI Tani Makmur Private Primary School. Audiovisual technology offers dynamic and interactive lessons, addressing the limitations of traditional, static teaching methods (Blake et al., 2023). While numerous studies highlight the benefits of audiovisual media in education, few explore its integration with local wisdom, especially in mathematics learning and topics like flat shapes (Altiner, 2024; Johnson et al., 2022; Ria et al., 2023). Most existing research focuses on the technology itself, such as the interactivity of digital tools, without considering the cultural disconnection between the educational content and students' personal experiences. This disconnect is particularly relevant in regions like Indragiri Hulu, where students' learning is heavily influenced by their cultural traditions and values. Local cultural relevance is a critical factor in enhancing students' understanding and engagement, yet existing learning media often fail to incorporate cultural values, potentially hindering motivation and comprehension. Embedding local wisdom into educational tools not only bridges this gap but also makes learning more relatable and meaningful for students (Matsuoka et al., 2023; Lu & Yang, 2024). By aligning innovative teaching methods with students' cultural identities, this study seeks to create a more effective and culturally resonant learning experience, thereby improving students' understanding and academic success.

This module is designed to integrate elements of Indragiri Hulu culture and local wisdom in learning, with the hope of improving students' understanding of the concept of mathematics while strengthening their cultural identity (Hu, 2021). The culture of Indragiri Hulu is chosen mainly due to its convenience with the school's location, but it is also a particularly good model due to the richness of its cultural products, such as traditional motifs, folklore, and other cultural symbols which can be drawn as a context in explaining the concept of mathematics (Romano, 2011). In this way, students are expected to understand the material more easily because they can relate it to the environment and culture that is already familiar to them in their daily lives. In addition, the module is also designed to be flexibly accessible through audiovisual devices, so that students can learn anytime and anywhere, in accordance with the rapid development of educational technology (Johnson et al., 2022). While audiovisual learning tools have been widely explored in educational research, this study is unique in combining these tools with local cultural wisdom, specifically for teaching mathematics at the elementary school level. This research, therefore, offers an innovative approach that not only enhances mathematical understanding but also serves as a means of preserving and promoting local cultural traditions. This approach not only has the potential to improve students' understanding of mathematical concepts, but also contributes to the preservation and introduction of local wisdom to the younger generation (Hoang et al., 2022).

Thus, this research is expected to make a significant contribution to the development of learning media that are more contextual and meaningful, and can be used as a model for developing learning media in other regions that have rich local wisdom. Through this approach, it is expected that mathematics learning in elementary schools can be more effective, interesting, and relevant to students' daily lives. In sum, this research can be more explicitly framed as an innovation that contributes to both educational technology and cultural preservation. By making mathematics more engaging, relevant, and culturally meaningful, this research aims to bridge the gap between traditional mathematical education and students' lived experiences, ultimately improving learning outcomes and student engagement. In doing so, it not only advances the field of educational technology but also promotes the preservation and appreciation of local cultures in modern education.

2. METHODS

This research aimed to develop a mathematics audiovisual module based on Indragiri Hulu's local wisdom for elementary school students and evaluate its effectiveness in improving learning outcomes. The study employed a Research and Development (R&D) design, using the ADDIE model (He, 2024) to guide the development and testing of the module. The research focused on the creation of the module and its subsequent evaluation for student learning achievement.

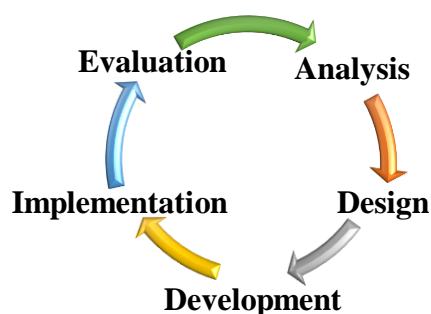


Figure 1. Research design in the ADDIE Model

The analysis stage is a phase conducted in the preliminary study, which includes problem analysis, material analysis, needs analysis, learner analysis, and product development analysis in the creation of

Math learning media. This phase included identifying the issues related to students' learning, particularly their challenges with abstract mathematical concepts, examining the content and structure of the mathematics curriculum to ensure that it aligns with local cultural elements, and assessing the specific needs of the students in terms of learning tools and methods that could enhance their understanding of mathematics. The analysis stage also aims to understand the characteristics and learning styles of the students to ensure that the module is engaging and accessible and analyze existing learning media and identify gaps in current educational tools, particularly those that integrate local cultural elements.

The design phase involved the creation of the mathematics audiovisual module, and the following steps were done: collecting materials, creating a draft of the materials to be discussed in the E-module according to the subjects to be taught, designing the E-module according to the characteristics of the students, preparing additional materials such as images, videos, and audio. Material collection is particularly important to be thorough in this stage so that the module draws from relevant cultural content from Indragiri Hulu, including traditional motifs, folklore, and local practices, to be incorporated into the module. The last step is the validation, in which a validation questionnaire was developed to evaluate the module from two perspectives: the media aspect (visual appeal, user interface) and the material aspect (clarity, appropriateness of the content). Two experts in educational technology and mathematics education validated the module using this questionnaire. These experts assessed the module's suitability (alignment with the material), clarity, systematics, and presentation of content. Validation in this study uses a Likert scale in the form of data symbolized by numbers: (5) strongly agree, (4) agree, (3) moderately, (2) disagree, (1) strongly disagree. The data obtained is then analyzed to determine the feasibility of the product developed. Calculation of data scores was analyzed by recapitulating the results of questionnaires conducted by using the formula (Westland, 2022):

$$P = \frac{\sum S}{N} \times 100\%$$

Description:

P : Percentage of score

$\sum S$: The number of scores obtained

N : Maximum total score

The percentage obtained is then converted into the validity level as follows:

Table 1. Media and material validation criteria.

Score range	Criterion
$p \geq 82$	Highly valid
$66 \leq p < 81$	Valid
$50 \leq p < 65$	Moderately Valid
$33 \leq p < 50$	Less valid
$p \leq 33$	Very Less valid

Source: (Susanti, 2018)

The next stage is development, where the researchers created the audiovisual E-Module outline which would be presented to experts for validation, and based on their feedback, formative revision is conducted to improve its clarity, effectiveness, and relevance. The resulting module were then tested in 2 classes designated as the experimental and the control classes in the implementation phase. A number of 20 (twenty) students are involved in this study. Small number of samples in this study can limit generalizability and influence research outcomes. It can be potentially for further research to consider ideal number of samples to get main implications of the sample size when interpreting a study. The researcher will carry out this implementation to determine the feasibility of the developed product.

The final stage of the study involved an evaluation process incorporating feedback and suggestions from two validators and 20 student users. This evaluation was based on input from subject matter experts, media experts, and the analysis of classroom experimental results. Students assessed the module on clarity, accuracy, and its impact on their learning outcomes. To measure the module's effectiveness, the 20 students engaged with the module over eight sessions, during which its performance was observed. The module's impact on students' learning outcomes was subsequently evaluated through a posttest. Specific criteria were applied to determine its overall effectiveness and alignment with educational objectives.

Table 2. Effectiveness criteria

Score range	Criterion
$p \geq 85$	Highly effective
$70 \leq p < 85$	effective
$55 \leq p < 70$	Moderately effective
$35 \leq p < 55$	Less effective
$p \leq 35$	Very Less effective

Source: (Susanti, 2018)

$$P = \frac{\sum S}{N} \times 100\%$$

Description:

P : Percentage of score

$\sum S$: The number of scores obtained

N : Maximum total score

The audiovisual e-module learning media is claimed as effective only if the posttest score is at ≥ 70 of the criteria (Barlian, 2016).

3. FINDINGS AND DISCUSSION

The findings of this study are presented sequentially, following the ADDIE framework to systematically address the development and implementation of the audiovisual module. Initial observations and interviews conducted during the analysis stage revealed a significant challenge in students' attitudes toward mathematics learning. Many students expressed a dislike for mathematics, primarily due to the way content was presented in traditional textbooks, which were limited to formulaic text and lacked engaging, contextualized examples. This highlights the need for innovative teaching materials that bridge the gap between abstract mathematical concepts and students' lived experiences.

The material analysis involved a thorough review of the curriculum, including the key and basic competencies, to align the selected content with the learning objectives. This analysis ensured that the developed module not only met academic requirements but also addressed the identified gaps in student engagement and understanding. The results of this stage emphasized the importance of connecting mathematics lessons to real-world and culturally relevant contexts to improve student motivation and comprehension.

To achieve this, the researchers integrated cultural elements from Indragiri Hulu, selecting artifacts, traditions, and visual elements that could serve as illustrative aids for teaching flat shapes. These culturally enriched visuals were incorporated into the module, which was meticulously designed to span 59 pages. Although the full module cannot be included in this paper or appendix, select pages are highlighted below to showcase its innovative design. These pages exemplify the integration of local wisdom with mathematical concepts, offering students a meaningful and engaging learning

experience. This approach underscores the potential of culturally responsive teaching materials in transforming how abstract subjects like mathematics are taught and perceived.

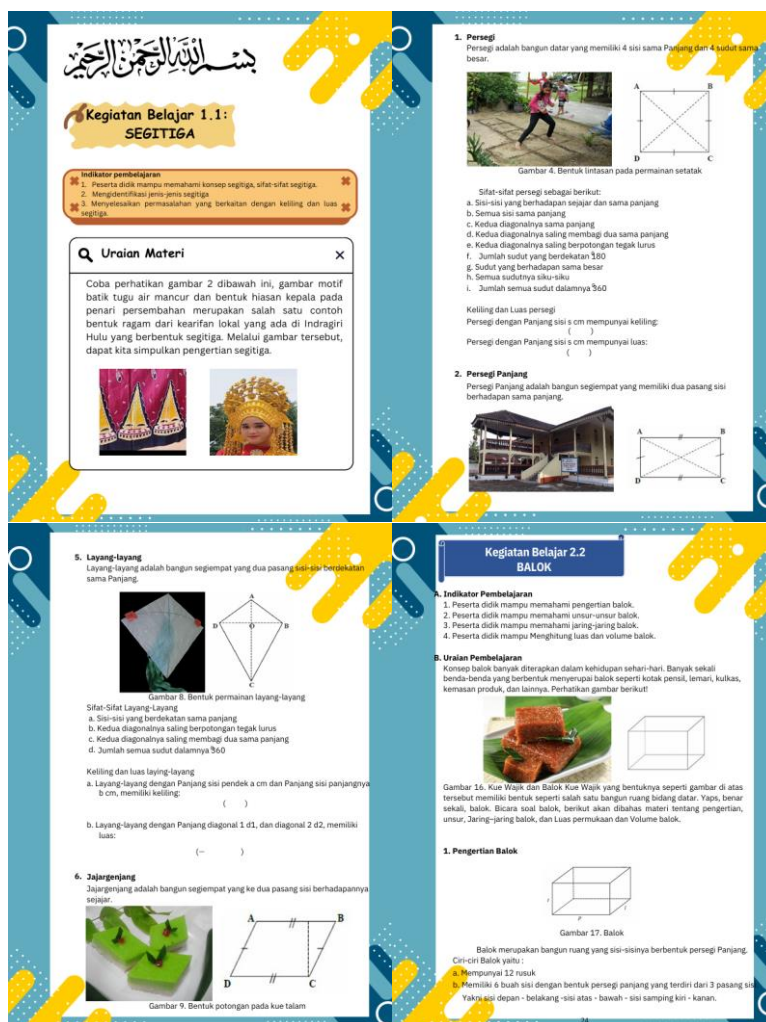


Figure 2. Selected pages from the e-module where cultural materials are associated with flat shapes

The developed module was submitted to validators for assessment and feedback. The evaluation process employed a five-point Likert scale as the assessment instrument, allowing validators to provide detailed ratings across multiple criteria, such as content relevance, design quality, interactivity, and cultural integration. Following the initial review, the author revised the e-module in line with the suggestions and recommendations provided by the two validators. This iterative process ensured that the module addressed any identified weaknesses and met high standards for educational effectiveness and usability. The revisions focused on enhancing the clarity of explanations, improving the visual appeal of the module, and ensuring alignment with both curricular objectives and the integration of local wisdom. After the revisions, the validators reassessed the module, confirming its readiness for further testing and implementation. This rigorous validation process underscores the importance of expert input in creating instructional materials that are not only pedagogically sound but also engaging and culturally relevant.

Table 3. Material Expert Validation Results

Aspects	Indicators	1	2	3	4	5
Material	Appropriateness Material and audiovisual				√	
	Clarity of material				√	
	Material systematics				√	
	Presentation of questions			√		
Evaluation	Accuracy of question selection				√	
	Clarity of the question				√	
	The truth of the question			√		
	Question suitability			√		
	Questions can improve students' abilities			√		
Average				72,3%		

Material expert validation consists of two aspects, namely material and evaluation aspects. It was suggested to add HOTS questions, set boundaries on which local wisdom was discussed in module, and ensure not too broad scopes of examples to allow students understand Indragiri Hulu local wisdom. For media expert validation, it was suggested that captions be provided for the photos and videos in the module. While the results of the media expert assessment in the assessment of media experts, the aspects that are put forward are aspects of appearance, attractiveness, interactive and communicative.

The results of the material expert validation obtained an average of 72.3% with a criteria range of $66 \leq p < 81$ and declared "Valid" after making revisions. The score implies that the module is suitable to use to teach mathematics for elementary school students.

Table 4. Media Expert Validation Results

Aspects	Indicators	1	2	3	4	5
Display	Image clarity					√
	Color and clarity of writing					√
	Design suitability				√	
	Text and decorations on e-modules				√	
Pull	Colour in the medium					√
	Content of the material					√
	Word and sentence selection				√	
	Media appeal					√
Interactive and communicative	Suitability of the language used				√	
	Communicative					√
	Easy to use in learning					√
Average				93%		

Table 4 shows that the media aspect received particularly high scores in interactive and communicative categories, reflecting the module's ability to engage students in a way that traditional textbooks may not. The results of the calculation of media experts obtained an average of 93% with a range of criteria $p \geq 82$ and declared "Very Valid" after making revisions. Thus, the e-module product is suitable for using and testing in teaching and learning mathematics. The result of students score obtained from posttest are shown below:

Table 5. Result of Posttest

Number of Students	Completion Interval	Criterion
20	≥ 75	Complete
5	< 75	Incomplete
Percentage	87%	Highly effective

From the data obtained above, it can be seen that the average percentage shows the criteria as “very effective,” with a score of 87% of students having good learning achievement after being taught using the audiovisual module- local wisdom-based.

Figure 3. Learning using audiovisual modules

After the product is developed, the product is validated by material and media experts, which aims to determine the validity of the product developed. The assessment instrument in this study used a Likert scale of 5 answers, and the validator filled in the assessment sheet after the author revised the e-module product according to the suggestions submitted by the two validators.

The last step is evaluation. Based on the results of the implementation stage, the e-module still needs to be evaluated. In this stage, the final revision of the e-module is carried out based on the suggestions given by students at the implementation stage. Based on the suggestions or input from students, suggestions for the e-module were obtained, namely the need to add practice questions to the e-module and hope that this e-module is available at school. It can be seen from students' responses below:

Saya lebih suka belajar matematika dengan modul ini karena ada gambar dan suara, bisa lebih faham lagi kalau ada banyak latihannya... [Translation: I prefer studying mathematics with this module because there are pictures and sounds, I can understand more if there is a lot of practice] (Student 1)

Nanti modul, e.. buku ini ada disekolah, Bu? [Translation: Later in the module, e... is this book available at school, ma'am?] (Student 2)

Overall, the validation results and student effectiveness test suggest that the audiovisual module, incorporating local cultural elements, has the potential to significantly enhance students' understanding and engagement in mathematics. The module's high ratings in both content and media design, coupled with positive student feedback, indicate that this approach could be a model for future educational innovations.

Discussion

The findings of this study provide a comprehensive understanding of the development and implementation of a local wisdom-based audiovisual module for teaching mathematics, structured according to the ADDIE framework. Initial observations revealed a general dislike for mathematics among students, largely due to traditional textbooks that lacked interactive and engaging elements. This underscores the need for innovative teaching materials that integrate cultural relevance to enhance student motivation and comprehension, a gap supported by recent research emphasizing the importance of culturally responsive pedagogy (Matsuoka et al., 2023; Lu & Yang, 2024).

Material and media validation results highlight the effectiveness of the module's design. Material experts identified areas for improvement, such as incorporating higher-order thinking skills (HOTS) questions and narrowing the scope of local wisdom examples to ensure clarity and focus. The media experts rated the module highly for interactivity and visual appeal, with an average score of 93%, categorized as "very valid." These findings align with current trends in educational technology, which emphasize the importance of interactive and contextually relevant materials to foster engagement and deeper learning (Blake et al., 2023; Johnson et al., 2022).

The module's effectiveness was further validated through its implementation. Posttest results indicated that 87% of students achieved a score meeting the "complete" criterion (≥ 75), reflecting the module's "very effective" impact on learning outcomes. Students' feedback corroborated these findings, with comments highlighting the benefits of audiovisual features and requests for additional practice exercises to enhance understanding. This aligns with studies suggesting that integrating multimedia and cultural relevance significantly improves students' engagement and achievement in STEM subjects (Altiner, 2024; Ria et al., 2023).

4. CONCLUSION

The development of the audiovisual math module aimed to assist and motivate elementary school students in understanding mathematical concepts, particularly two- and three-dimensional shapes. The findings demonstrated that the module met the criteria for validity and effectiveness as a local wisdom-based audiovisual learning tool. Both material and media validations confirmed its suitability for classroom use, while observations during implementation indicated that the module significantly supported both students and teachers in enhancing learning outcomes and motivation in mathematics. These results highlight the potential of integrating local cultural elements with technology to create engaging and contextually relevant educational tools. However, the research is limited by its focus on a single subject area and specific cultural context, which may affect the generalizability of the findings. Future research should explore the broader application of similar modules across diverse subjects and cultural settings, examining long-term impacts on student engagement and achievement. Expanding this approach can contribute to the growing trend of integrating local culture and advanced technology in education to create more meaningful and effective learning experiences.

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