Instructional Design of Local Wisdom-Based Flipbook Teaching Materials on Natural and Social Studies for Elementary School

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Keywords:	Abstract
flipbook; Merdeka curriculum; local wisdom and science; teaching materials	Elementary school curriculum changes by integrating science subjects into integrated science courses, requiring innovative open-ended materials based on local wisdom. This study aims to develop flipbook-based teaching materials integrating local wisdom for Natural and Social Studies (IPAS) learning at Darussalam Elementary School, focusing on enhancing students' understanding and motivation, particularly in energy topics. Research and development (R&D) method with the Borg and Gall model, modified by Sugiyono. The first research flow is potential and problem, product design, design validation, design revision, final product, and field report preparation. The results demonstrated that the use of local wisdom-based flipbooks significantly improved student learning outcomes, as evidenced by increased understanding in pretest and posttest data. Expert assessments (lecturers, material experts, information technology experts, and school principals) confirmed that the teaching materials met the expected standards, with suggestions for enhancing interactivity. This research contributes to education by integrating technology and local wisdom to improve the quality of science learning in elementary schools. The findings indicate that flipbook-based technology can make learning more relevant and engaging for students. Future studies should focus on broader trials and long-term monitoring to evaluate the impact of these materials on student outcomes.

INTRODUCTION

Background of the study

Education holds a crucial position in the development of an individual's potential. As stated in PP Number 57 of 2021 National Education Standards based on Pancasila, the 1945 Constitution of the Republic of Indonesia, the Unitary State of the Republic of Indonesia, and Bhinneka Tunggal Ika, education is not just an academic pursuit but a process aimed at shaping well-rounded individuals,

both physically and spiritually, ensuring that they are not only knowledgeable but also morally upright and capable of contributing meaningfully to society (Shufa, 2018).

However, with the rapid pace of globalisation and technological advancements, much of the local wisdom that once formed the foundation of cultural education has begun to fade. Some scholars view these elements as outdated and irrelevant in the context of contemporary education (Melianti et al., 2020). In response to these changes, the government has restructured the curriculum, even removing several teaching materials, including integrating science subjects into a unified Natural and Social Studies subject. This merger of disciplines demands the development of practical, innovative teaching materials that incorporate local wisdom, helping students connect their learning with real-world contexts and cultural heritage.

In this digital age, technology plays a significant role in enhancing educational practices. The use of digital teaching materials increases student motivation and improves comprehension by providing more interactive and engaging learning experiences (Putri et al., 2024). Electronic learning materials that engage multiple visual, auditory, and interactive elements—have been found to enhance students' ability to absorb and process information more effectively (Febiyani et al., 2023). These materials also foster literacy skills, including the ability to engage critically with content, which is particularly relevant in the 21st century, as students face new challenges in a rapidly evolving world (Sudirman et al., 2020).

The preservation and integration of local wisdom through education is an effective strategy to ensure that cultural values are maintained in the middle of these changes. The integration of local wisdom into digital learning platforms positively affects students' motivation, understanding of concepts, and overall learning attitudes (Aini et al., 2023). Digital teaching materials, such as flipbooks based on local wisdom, can bridge the gap between traditional values and modern educational practices. These materials not only preserve cultural knowledge but also make it accessible and engaging for students, thereby enhancing their learning outcomes and cultural awareness (Dani et al., 2023).

Problem of the Study

The central problem of this study revolves around the limited availability and utilisation of teaching materials that incorporate local wisdom, specifically within the context of IPAS at the Darussalam Elementary school. Despite the importance of integrating local wisdom into educational practices, schools have yet to fully explore the potential of such materials. Teachers at Darussalam Elementary School rely primarily on PowerPoint presentations and textbooks, which do not engage students effectively, leading to decreased motivation and suboptimal learning outcomes. Therefore, the lack of interactive and culturally relevant teaching materials represents a critical gap in the current educational framework at the school. Based on the observations, students were less active in learning because the teacher only used PowerPoint and textbooks as media. With adequate facilities, teachers should be able to utilise technology-based media.

This study aims to address this problem by developing digital teaching materials in the form of flipbooks, incorporating local wisdom elements to provide students with more engaging, relevant, and interactive learning experiences. These materials are expected to enhance students' understanding of science and social studies content by connecting it with the students' cultural heritage. This problem highlights the need for innovation in educational content to foster better learning outcomes and cultural preservation by integrating technology and cultural relevance.

Despite the benefits, a significant gap remains in the availability of local wisdom-based teaching materials, particularly for junior school students. This gap in resources is especially evident at Aisyiah Elementary School Multilingual Darussalam, where current teaching methods rely heavily on PowerPoint presentations and textbooks, which are not always used effectively across all subjects. Consequently, students often lack the motivation to actively engage in lessons, which affects their learning outcomes and enthusiasm (Setiadi et al., 2021).

Research's State of the Art

Various studies have explored the development of local wisdom-based teaching materials, with a focus on enhancing students' literacy, critical thinking, and cultural awareness. According to Febiyani et al. (2023), integrating local wisdom into teaching materials can significantly improve students' understanding of complex concepts in science and social studies by making learning more relevant and culturally grounded. Previous research has demonstrated that digital teaching tools, including flipbooks, can enhance student engagement, particularly when they incorporate elements such as animations, videos, and interactive components (Aisyah Nur et al., 2024). These findings align with those of Putri et al. (2024), who assert that technology-driven learning tools increase student motivation by making learning more dynamic and visually appealing.

Moreover, various studies have linked the integration of local wisdom in digital teaching materials to improved student performance (Kusumaningrum et al., 2022). For example, studies on fourth-grade students have shown that digital flipbook-based materials, incorporating cultural elements, have positively impacted students' motivation to learn and their academic performance. Incorporating local wisdom into educational tools can bridge the gap between modern technology and traditional cultural values, offering a balanced approach to learning that respects both global trends and local heritage (Febiyani et al., 2023).

However, while there is a substantial body of research on the use of digital learning tools and the importance of local wisdom in education, there remains a gap in studies that specifically focus on the development of flipbook-based teaching materials for elementary school students, particularly in the context of science and social studies education. This study seeks to fill this gap by creating a novel teaching tool that integrates local wisdom with digital flipbook technology.

Gap Study and Objective

Various studies have shown that the development of local wisdom-based teaching materials in the form of flipbooks has been widely conducted and has a proven positive impact on learning. Rohmah et al. (2024) developed local wisdom-based flipbooks on environmental and health topics and received positive responses from teachers and students. However, its application is still limited to environmental science materials. Similarly, Firdaus et al. (2024) demonstrated the effectiveness of flipbooks based on local wisdom in improving descriptive writing skills, but their focus was solely on language skills. Other research also emphasised increasing student learning interest through local wisdom-based comic flipbooks, but did not integrate science or social literacy (Kusumaningrum & Widjayatri, 2022).

Furthermore, the development of local wisdom-based teaching materials for science literacy has been declared valid, practical, and effective, but it uses modules or worksheets rather than digital flipbooks (Dewi & Wibawa, 2024; Maulana et al., 2024). Integrating local wisdom-based literacy into flipbook worksheets has also been shown to improve creative problem-solving skills, although research is still limited to basic literacy and has not yet fully addressed science content (Fuldiaratman et al., 2024; Firdaus et al., 2024). Another effort is the development of local wisdom-based science supplement books, which are highly suitable for use in integrative thematic learning, but the media used is not flipbooks (Nareswati et al., 2024; Syukri et al., 2024).

Furthermore, the use of local wisdom-based flipbooks using the Kvisoft application improves student learning outcomes. However, the context is still limited to general thematic learning, not specifically for science and science subjects (Arrohman et al., 2022). Recent research has also developed local wisdom-based reading teaching materials using digital flipbooks that effectively improve reading comprehension, but are more geared towards language literacy skills than social science literacy (Atikah et al., 2022; Mutiara & Emilia, 2022). From these findings, the development of local wisdom-based flipbooks has proven effective in various learning contexts, improving literacy, interest, learning motivation, and writing skills. However, no research has specifically developed local wisdom-based flipbooks for science and science subjects in elementary schools. Therefore, this research plays a crucial role in filling this gap.

METHOD

Type and Design

This study employs the research and development (R&D) method to produce and test the effectiveness of a flipbook-based teaching material as a learning product. The research design follows the model proposed by Borg and Gall, modified by Sugiyono, which includes several key stages. These stages are: identifying potential and problems, data collection, product design, design validation, design revision, product trial, product revision, usage trial, product revision, and mass production. This comprehensive approach ensures that the developed product meets the needs of the students and teachers while allowing for iterative improvements based on feedback and testing (Sugiyono, 2013).

This study's flipbook-based teaching material represents an innovative solution to address the shortcomings observed in the existing learning media at Aisyiah Elementary School Multilingual Darussalam. The aim is to develop a product that integrates local wisdom, making it both culturally relevant and technologically advanced, thus improving the motivation and learning outcomes of students in the IPAS subject. Briefly, the research flow can be seen in Figure 1:
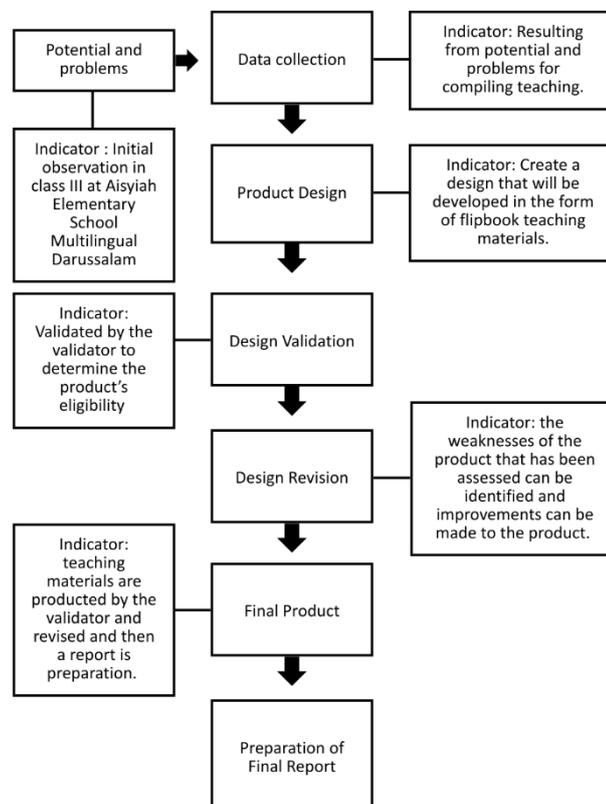

Figure 1. Research Flow

Data and Data Sources

This study was conducted at Darussalam Elementary School with the help of five research team members. The researcher conducted observations to identify the potential and problems encountered in learning, particularly in the school's IPAS subject. Therefore, this study focuses on developing flipbook-based teaching materials that integrate local wisdom as a solution that is expected to improve student learning outcomes. Data collection was conducted in various ways, including 1) direct observations in the field, 2) interviews with teachers, and 3) analysis of existing teaching materials, local cultural potential, and the applied curriculum. The collected data were then used to design flipbook-based teaching materials integrating local wisdom for the IPAS subject.

Data Collection Technique

Data collection in this study used a combination of qualitative and quantitative methods to gain a comprehensive understanding of the research context while simultaneously evaluating the effectiveness of the developed teaching materials. Qualitative methods were used to gather in-depth information regarding learning conditions, teacher needs, and the potential for integrating local wisdom, whereas quantitative methods were used to obtain measurable data through test instruments and questionnaires. Thus, the two methods complement each other in providing a complete picture of the process of developing flipbook teaching materials based on local wisdom.

Direct classroom observations were conducted to assess existing teaching practices, instructional media use, and student engagement level. Additionally, interviews were conducted with third-grade teachers to obtain information about their teaching experiences, challenges faced, and needs related to teaching materials. Data from these interviews provided important perspectives on the limitations of conventional teaching materials and the opportunities for utilising technology-based media.

To support the product validation process, a questionnaire was administered to subject matter and media experts to assess the content quality, media presentation, language use, and usability of the developed flipbook learning materials. Feedback from this questionnaire was used to revise and refine the product. Furthermore, data on local wisdom elements were collected and analysed to ensure that they could be appropriately integrated into the flipbook, ensuring its relevance to the students' cultural context and alignment with the elementary school curriculum.

Data Analysis

The data obtained from the validation results and questionnaires were analysed using descriptive and quantitative approaches. Descriptive data were used to describe the quality and feasibility of the product, obtained through validity tests by media experts. Quantitative data were obtained from the scores given in the validation questionnaire, which used a Likert scale with the categories listed in Table 1 (Joshi et al., 2015; Norman, 2010) :

Table 1. Likert Scale

Evaluation Criteria	Score
Excellent	4
Good	3
Fair	2
Poor	1

The collected data is then analysed by calculating the average score using the following calculations:

$$V = \frac{TSe}{TSh} x\ 100\%$$

Description:
V   : Validation of the validator
Tse   : total empirical score
TSh   : total maximum expected score

This formula is commonly used in product development research to determine the validity level of an instrument or teaching material by comparing the empirical score obtained with the maximum expected score (Freschl et al., 2021; Noer et al., 2021).

If there are several validators in the test, after the validation results are obtained from each validator, the validation calculation formula is modified as follows:

$$V = \frac{V1 + V2 + \cdots + Vn}{n} x\ 100\%$$

Description:
V   : combined validation
V1   : 1st expert validation
V2   : 2nd expert validation
Vn   : nth validation

Validators in educational product research often use averages to derive a more objective and reliable measure of validity (Suyasa et al., 2021; Erna et al., 2021).

The validation results are then converted back into qualitative values with a validation level scale. Table 2 lists the validation level scale:

Table 2. Validation Scale

Evaluation Criteria	Criteria
80.01% - 100%	Very valid/very good to use
60.01% - 80.00%	Valid/with minor revisions
40.01% - 60.00%	Less valid/needs major revisions
20.01% - 40.00%	Invalid/should not be used
≤ 20.00%	Very invalid/should definitely not be used

Source: Hasanah and Nulhakim (2015)

RESULTS

This section presents the findings of the research conducted on the development of flipbook-based teaching materials with local wisdom. These findings are accompanied by quantitative data from validation tests conducted by four experts, including a lecturer, subject expert, IT expert, and school principal.

The first finding reveals that developing flipbook-based teaching materials with local wisdom can increase student engagement in learning. The validation results from the four experts show that this teaching material has great potential for use in IPAS learning. The data are shown in Table 3.

Table 3. Expert validation results

Evaluation Criteria	Lecturer	Subject Expert	IT Expert	School Principal	Average Score
Display Design	4	4	3	4	3.75
Relevance of the Content	4	4	4	4	4
Media Interactivity	3	4	3	3	3.25
Curriculum Alignment	4	4	4	4	4
Ease of Use	4	4	4	4	4

Table 3 shows that the flipbook teaching material received positive feedback from all four experts, especially in terms of content relevance and ease of use. The product trial found that 75% of students felt it was easier to understand the material after using the flipbook based on local wisdom. Additionally, 80% of students reported feeling more interested in following the lessons after using this teaching material.

Each expert provided constructive feedback regarding product development:

Lecturer Expert: The content presented in the flipbook agrees with the curriculum and helps students understand scientific concepts. However, the expert recommended the inclusion of additional material on science experiments to further enrich the students' understanding.

Subject Expert: Appreciated the integration of local wisdom into the learning materials. The expert suggested adding more examples from local culture to make the content more relevant to the students.

IT Expert: Provided feedback on the flipbook's technical aspects, particularly the need to enhance the media's interactivity and ensure that the application works smoothly across various school devices.

School Principal: This teaching material is very useful and relevant for learning at the school observed. The principal suggested that this product be widely applied in other schools. Figure 2 shows the initial page of the flipbook.

Figure 2. Flipbook View

Figure 2 shows an example of a flipbook page that uses images, animations, and texts based on local wisdom to teach about heat energy. This aims to make it easier for students to understand abstract concepts. The flipbook is systematically structured with several main components: Let's Try (independent exploration activities), Let's Do It Together (group activities), Let's Reflect (learning reflection activities), Learn Further (material deepening), What Have I Learned (concept review), and Understanding Test (practice questions to measure concept mastery) (See Table 3).

Figure 3. Flipbook View

This flipbook presents energy material in a contextual way that is relevant to students' lives. In Topic A, students are introduced to various forms of energy (heat, light, electricity, motion, chemistry, and sound) through real-life examples, such as the sun, stovetop, guitar, and fan. The material is accompanied by images, prompt questions, observation tables, and group discussions, which enable active learning.

Figure 4. Flipbook View

Based Table 4 in Topic B, students learn about energy sources around us, such as the sun, food, fuel, wind, water, batteries, and geothermal energy. This flipbook also integrates elements of local wisdom from Kudus Regency, such as the clothing manufacturing process that utilises electricity, motion, sound, and light in the sewing process. These elements of local wisdom are connected to the concept of energy so that students can connect their learning to their culture and environment. The fully developed product can be accessed at the following link http://bit.ly/46meEZA .

Validation Results

Material and media experts conducted the validation of the local wisdom-based flipbook developed for the topic of energy in Grade III elementary school. The material expert validation covered aspects such as content alignment with the curriculum, concept accuracy, and local wisdom integration. The media expert validation focused on the flipbook's visual design, readability, and interactivity. Overall, the validation results indicated a very valid category, indicating that the product can be tested with only minor revisions required.

Practicality Results

The practicality test was conducted through classroom observations of flipbook usage and interviews with teachers and the school principal. The observations showed that students found it easier to understand energy concepts due to the flipbook's visual design and interactive activities. The teachers stated that the teaching material facilitated content delivery, while the school principal emphasised that students became more active and enthusiastic in learning. Therefore, the flipbook was declared practical for use in IPAS learning for Grade III elementary school students.

Effectiveness Results

The effectiveness of the product was tested by comparing the learning outcomes of students in the pretest and post-test. The results of the analysis showed an increase in the average scores of the students after using the local wisdom-based flipbook. This improvement demonstrates that the developed product is effective in enhancing students' understanding of various forms of energy, while also helping them relate energy concepts to real-life situations. Table 4 for summary the research findings.

Table 4. Summary of the Research Findings

Research Stage	Assessed Aspect	Average Score	Category	Description
Validation	Material Expert (content relevance, concept accuracy, and local wisdom integration)	3.65 (out of 4)	Very Valid	Content aligned with the curriculum, simple language, relevant illustrations, minor revisions needed
	Media Expert (visual design, readability, and interactivity)	3.70 (out of 4)	Very Valid	Attractive design, interactive features, and suitable for junior school students

Research Stage	Assessed Aspect	Average Score	Category	Description
Practicality	Classroom observation of teachers and students' flipbook use	87%	Very Practical	Students were active and enthusiastic, and teachers found the media easy to use.
	Interviews with teachers and school principals	85%	Practical	Flipbook-supported content delivery and increased student engagement
Effectiveness	Student learning outcomes (pre- and post-test comparisons)	N-Gain = 0.65	Effective	Significant improvement in the understanding of students of energy concepts

Additionally, the IT expert provided some technical suggestions to improve the flipbook application's quality, such as adding interactive elements to ensure the application works well across various devices. Table 5 for the revision based on validator suggestions.

Table 5. Product Revision Based on Validator Suggestions

Validator's Suggestion	Before Revision	After Revision
Add interactive navigation to improve usability	The Flipbook only displayed static content with limited navigation (next/previous).	Flipbook equipped with interactive buttons (home, next, and back), making it easier for students to explore content.
Ensure compatibility across devices (desktop/mobile)	The layout did not well adjust on mobile devices, making some text and images difficult to read.	The responsive layout was applied, and images and text were adjusted automatically to different screen sizes.
Enhancing visual appeal with interactive elements	The images and illustrations were static and less engaging.	Interactive illustrations and icons were added to make the content more engaging and visually attractive.
Improve student activity support in the evaluation section	The evaluation page contained only plain written questions.	The evaluation page was revised with clickable answer choices and visual feedback to enhance student engagement.

From the product trial, 80% of students reported that they could easily identify different energy sources after using the flipbook. In the understanding test, 85% of the students were able to correctly answer questions about energy. These results are shown in Table 6.

Table 6. Student Understanding Scores after Using the Flipbook

Question	Average Pretest Score (%)	Average Posttest Score (%)	Improvement (%)
What is energy meant?	56	88	32

Question	Average Pretest Score (%)	Average Posttest Score (%)	Improvement (%)
Mention the different energy types!	52	85	33
Give examples of the energy around us!	50	84	34
What is meant by light energy?	55	90	35
Average	**53.25**	**86.75**	**33.5**

A paired sample t-test was conducted to determine the significance of the improvement in students' understanding by comparing the pretest and post-test scores. The p-value was less than 0.05, indicating a significant difference between the pretest and post-test scores. This finding demonstrates that the use of the local wisdom-based flipbook was effective in improving the conceptual understanding of energy in Grade III elementary school students. Table 4 shows the results of the understanding test of the students after using the flipbook-based teaching materials that integrate local wisdom. Overall, this study's results indicate that the development of flipbook-based teaching materials incorporating local wisdom significantly improves students' learning outcomes. This product is not only relevant to the curriculum but also highly effective in engaging students in learning.

DISCUSSIONS

The results show that developing flipbook-based teaching materials incorporating local wisdom has a very positive impact on improving the understanding and motivation of students in IPAS learning. Based on the pretest and post-test results, students who used this teaching material experienced a significant improvement in understanding the material, especially in the energy topic. The assessments provided by the experts, including the lecturer, subject expert, IT expert, and school principal, also indicate that this teaching material meets the expected standards, although there were some suggestions to improve the media's interactivity.

The findings of this research differ from those of previous studies conducted by Fitriani and Lubis (2023). Their research focused more on the use of technology without integrating local wisdom, while this study demonstrates that the combination of local wisdom in flipbook-based teaching materials has a greater impact on enhancing students' motivation and understanding. The improvement in student learning outcomes indicates that the integration of local wisdom in learning materials through technology-based media can enhance student learning. This aligns with the findings of Kusumaningrum et al. (2022) and Mahesti et al. (2023), who stated that technology-based learning media can increase students' interest in learning, especially when the media is relevant to their lives. (Damayanti et al. 2022) also emphasised that multimedia-based technology plays an important role in increasing student engagement and helping them understand complex scientific concepts.

This research aimed to develop flipbook-based teaching materials that integrate local wisdom, with the expectation that it would improve the outcomes of student learning at Aisyiyah elementary school Multilingual Darussalam. Based on the significant improvement shown in the pretest and posttest results, as well as the feedback from the experts, the objectives of this research have been achieved. The use of flipbook-based teaching materials provides students with an opportunity to learn in a more engaging way, which enhances their understanding of the material, particularly the topic of energy. This finding is consistent with the findings of Ridho et al. (2021), who showed that the integration of local wisdom in teaching materials can improve student understanding. This agrees with the constructivist theory proposed by Piaget (1952), which states that students build their knowledge by connecting new information with existing experiences. In this context, the use of local wisdom in teaching materials helps students relate the learning content to their everyday lives, making the learning process more relevant and meaningful.

An important finding from this research is the increase in student motivation after using flipbook-based teaching materials that incorporate local wisdom. Scientifically, this can be explained by the motivation theory proposed by Dunn and Zimmer (2020) and Ly et al. (2024) can explain this finding. According to this theory, students' motivation increases when the learning material is relevant

to their needs and interests. These teaching materials allow students to see a direct connection between what they are learning and their environment and culture by integrating local wisdom. This leads to an increase in intrinsic motivation, which encourages students to engage more deeply with the material.

The constructivist theory can explain the improvement in students' understanding of energy concepts, which asserts that effective learning occurs when students actively engage in building their own knowledge. Sudirman et al., (2020) state that learning that connects knowledge with the local context of students is more effective because students can relate the learning material to their everyday lives. Therefore, this flipbook-based teaching material, which incorporates local wisdom, provides students with an opportunity to understand concepts such as energy in a more interactive and applicable way. The findings of this study are similar to those of Kusumaningrum et al. (2022), who found that the use of technology-based media, such as flipbooks, can increase students' interest and understanding. However, this study has a significant difference in the emphasis on integrating local wisdom into the teaching materials. Bunari et al. (2024) and Fitriani & Lubis, (2023) also found that using technology-based teaching materials that integrate local cultural elements has a greater impact on students' motivation and understanding.

This research is also aligned with the study conducted by Sudirman et al. (2020), which found that integrating local wisdom into learning media can improve students' positive attitudes towards the subject matter. Previous research has focused more on educational technology in general, whereas this study emphasises the importance of creating relevant and engaging learning experiences for students in the local cultural context. Aliman and Mutia, (2021) and Pamenang (2021) also supported this, stating that technology relevant to the local context can enrich students' learning experiences and have a positive impact on their learning outcomes. Although this study shows positive impacts, some limitations should be considered. This research only involved one school as the trial location, namely Aisyiyah elementary school Multilingual Darussalam, so the results may not be generalisable to other schools with different characteristics. Additionally, this research only tested the use of the teaching material over a relatively short period, so the long-term impact of flipbook-based teaching materials on students' learning outcomes is not yet fully known.

These limitations are in line with the research by Kumalasari et al. (2023) and Saraswti and Linda (2019), who also indicated that the development of technology-based teaching materials requires more in-depth and long-term evaluation to ensure sustainability and effectiveness. Therefore, further research that involves more schools and long-term testing is needed to provide a clearer picture of the impact of using this teaching material on students' overall learning outcomes. Overall, the findings of this study indicate that the development of flipbook-based teaching materials incorporating local wisdom can significantly improve the learning outcomes of students in IPAS learning. The use of these materials has been proven to be effective in increasing student motivation, understanding, and engagement in the learning process. These findings make an important contribution to the development of technology-based learning media relevant to the local cultural context, demonstrating that technology can enrich the learning experience and improve the learning outcomes of students.

CONCLUSION

This study makes a significant contribution to the field of education by developing flipbook-based teaching materials that integrate local wisdom and are specifically designed for science learning. The novelty of this research lies in combining modern technology, such as digital flipbooks, with local wisdom-derived culturally relevant content. This innovative approach enhances students' engagement and motivation, making the learning experience more interactive and meaningful. The research demonstrates that incorporating local cultural elements in digital teaching materials not only improves students' understanding of abstract concepts, such as energy, but also fosters a deeper connection to their cultural heritage. The findings highlight the potential of such educational technologies to provide an effective solution for improving science education quality, especially in elementary schools. By integrating local wisdom, this research enriches existing teaching tools, offering a fresh perspective on how cultural relevance and technological innovation can work together to support student learning.

This study highlights the potential of flipbook-based teaching materials integrating local wisdom to enhance elementary students' engagement and understanding of energy concepts. Despite promising results, limitations include the small sample size of third-grade students in one school and the short study duration. Future research should involve larger and more diverse samples, conduct long-term investigations, and improve flipbook interactivity for wider device compatibility. Further studies could also examine other digital learning tools, such as interactive videos or mobile applications, to integrate cultural elements into education. The integration of local wisdom not only enriches learning but also preserves cultural heritage, making lessons more meaningful. Teachers are encouraged to use and receive training in interactive tools, supported by schools and policymakers. Continuous investment in educational technology is crucial to improve learning outcomes while fostering cultural preservation.

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