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Science E-Module for Improving Cultural Literacy among Fifth-Grade Elementary School Students

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Abstract

Cultural literacy is an essential competency for elementary school students to understand and appreciate local cultural values within the learning process. However, its integration into science learning remains limited due to the lack of innovative and context-based instructional materials. This study aimed to develop and evaluate a science e-module titled Daerahku Kebanggaanku to enhance the cultural literacy skills of fifth-grade elementary school students. The study involved elementary school teachers and students in Kulon Progo, Yogyakarta. The research employed the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages. The product was tested through individual, small group, and field trials, followed by implementation in experimental and control classes. Data were collected through interviews, observations, questionnaires, and tests, and analyzed qualitatively and quantitatively. The results indicate that the e-module is valid, practical, and effective in improving students' cultural literacy, as evidenced by very feasible validation results and very practical teacher and student responses, with an N-gain score of 0.69 in the moderate category, indicating strong feasibility and greater student engagement and understanding in the Science and Social Science (IPAS) subject. These findings highlight the novelty of a culturally integrated e-module that supports meaningful science learning in elementary education.

INTRODUCTION

Background of the Study

Technological development has influenced teaching methods, moving learning from teacher-centred to student-centred, and emphasising 21st-century skills (Hariri et al., 2024; Lauder & Mayhew, 2020). However, the integration of technology into elementary classrooms remains limited, with activities still dominated by textbooks and conventional methods (Head et al., 2023; Rahmawati et al., 2025). In Integrated Science and Social Studies (IPAS) learning, this issue becomes more crucial because the subject requires students to understand the relationship between natural and social phenomena holistically (Hamzah, 2021; Sadevi & Sayekti, 2023). Previous studies have shown that technology integration can enhance higher-order thinking skills and student engagement. However, these studies mostly focus on general digital media use and do not specifically integrate cultural literacy into IPAS learning at the elementary level (Elmalı & Kıyıcı, 2022; Rochmah et al., 2025).

Literacy remains a fundamental challenge in the Indonesian education system. It encompasses not only reading and writing, but also interpreting, evaluating, and applying information (Hasan et al., 2022; Albahiri et al., 2025). Cultural literacy is essential for appreciating and understanding local values, traditions, and identity in a multicultural society (Helaluddin, 2018; Pratiwi & Asyarotin, 2019). However, empirical findings indicate that students' literacy engagement is still relatively low, and learning resources have not optimally supported the development of cultural literacy. Based on a needs analysis conducted in five elementary schools in Kulon Progo, most students showed low engagement in learning and preferred interactive media, while 91% of students expressed the need for more varied and engaging learning resources. In addition, teachers reported that they had never developed or used electronic modules, especially those that integrate cultural content in IPAS learning (Ajlouni et al., 2025). This condition indicates a gap between the demands of 21st-century learning and its implementation in classrooms.

Based on these conditions, there is a need for innovative learning media that not only utilize technology but also integrate cultural literacy into IPAS learning. Previous studies on e-modules generally focus on improving motivation, learning outcomes, or subject comprehension, but have not explicitly emphasized the integration of cultural literacy as a core objective (Rusmini et al., 2023; Winatha & Abubakar, 2018). Therefore, this study aims to fill this gap by developing a culturally integrated learning medium for fifth-grade elementary students. The research problems can be formulated as follows: (1) how to develop a learning medium that integrates cultural literacy in IPAS learning, (2) how to determine the feasibility and practicality of the developed medium, and (3) how effective the medium is in improving students' cultural literacy.

Problem of the Study

The challenges identified in the background indicate a gap between the demands of 21st-century learning and the reality of classroom practices. Although technology integration is expected to support student-centered learning and the development of higher-order thinking skills, its implementation in elementary education remains limited. Learning is still dominated by textbooks and conventional teaching approaches, resulting in passive learning environments and low student engagement (Firdaus & Permana, 2024; Sari & Pujiastuti 2023). This issue becomes more critical in IPAS learning, which requires students to understand the relationship between natural and social phenomena in a meaningful and contextual way. However, the lack of interactive and innovative learning media causes learning to remain abstract and less relevant to students' real-life experiences (Ariyani & Kristin, 2021; Yulia & Suttrisno, 2024).

Furthermore, the gap is also evident in the development of literacy, particularly cultural literacy. While literacy is recognized as a key competence involving critical thinking and the ability to process information, its implementation in schools has not been optimal (Hasan et al., 2022; Oktariani & Ekadiansyah, 2020). Cultural literacy, which plays a vital role in fostering students' understanding of cultural diversity and national identity, is still rarely integrated into learning practices (Ahsani & Azizah, 2021; Pratiwi & Asyarotin, 2019). Existing instructional materials have been shown to prioritise theoretical knowledge over connecting learning content to students' cultural contexts. This hinders students' ability to develop a meaningful understanding of the subject and apply what they have learnt to real-life situations (Mashinja & Mwanza, 2020; Riyanto & Kawuryan, 2025). These issues are further compounded by empirical findings from primary schools in Kulon Progo. An analysis of observations and needs revealed that teachers rarely use digital learning media and have never developed e-modules specifically designed to support cultural literacy in IPAS learning. Consequently, learning activities are often characterised by a lack of engagement and variety, resulting in a monotonous educational experience for students. A needs analysis involving 73 fifth-grade students has revealed that approximately 91% of them expect more interactive and engaging learning materials to help them understand culturally related content (Faddillah, 2024; Kusumawati, 2024). These findings highlight a clear discrepancy between the need for innovative, culturally relevant learning media and current classroom practices, forming the basis of this study to develop a culturally integrated e-module for IPAS learning.

Research's State of the Art

The integration of technology in education has encouraged the development of various digital learning media, including the science learning e-module. An e-module is defined as a digital learning resource designed systematically to facilitate independent and interactive learning through multimedia integration (Triwahyuningtyas et al., 2020). In the context of elementary science learning (IPAS/IPS), e-modules are characterized by being self-instructional, self-contained, adaptive, and user-friendly, enabling students to learn independently according to their pace and needs (Najuah et al., 2020). The development of e-modules generally follows systematic instructional design models such as ADDIE, which consists of analysis, design, development, implementation, and evaluation stages to ensure the effectiveness of the learning media (Branch, 2009). In addition, indicators of a good e-module include the clarity of learning objectives, the relevance of content, the quality of presentation, interactivity, and the suitability of evaluation instruments (Marsela et al., 2022). These characteristics make e-modules a promising medium to support active, flexible, and student-centered learning in elementary education.

Electronic modules (e-modules) offer a promising solution to address these challenges. An e-module is a digital learning resource that integrates various multimedia elements such as text, images, videos, and animations to support independent learning (Febrina et al., 2020). The interactive nature of e-modules enables students to engage more actively with learning materials and helps them understand abstract concepts more easily (Padwa & Erdi, 2021). In addition, e-modules can be accessed through various digital devices such as computers, laptops, and smartphones, making learning more flexible and accessible (Widiastuti, 2021). Previous studies have shown that e-modules can enhance students' motivation, improve learning outcomes, and support the development of students' critical thinking skills (Winatha & Abubakar, 2018).

Several previous studies have demonstrated the effectiveness of e-modules in improving learning outcomes. Oktavia et al. (2021) developed a mind map-based e-module that was found to be valid and attractive for elementary students. Hartatiana and Wardani (2024) showed that context-based e-modules improved students' understanding and received positive responses. Meanwhile, Andani et al. (2022) found that problem-based e-modules enhanced students' learning independence and higher-order thinking skills. However, these studies have several limitations. First, they mainly focus on cognitive outcomes such as comprehension, critical thinking, and independence, while affective and sociocultural aspects are rarely addressed. Second, most e-modules are designed for general subject understanding without explicitly integrating cultural literacy as a core learning objective. Third, the learning content is often not contextualized with students' local cultural environments, reducing its relevance and meaningfulness for students. These gaps indicate the need for more comprehensive learning media that integrate cognitive, affective, and sociocultural dimensions.

Cultural literacy is an essential competency in 21st-century education, especially in multicultural contexts such as Indonesia. Cultural literacy refers to the ability to understand, interpret, appreciate, and apply cultural values in everyday life (Ahsani & Azizah, 2021). It also involves the awareness of cultural diversity, tolerance, and the ability to interact effectively in a pluralistic society (Helaluddin, 2018; Pratiwi & Asyarotin, 2019). Indicators of cultural literacy include the ability to identify cultural elements, understand cultural contexts in texts, and apply cultural knowledge in social communication (Safitri & Ramadan, 2022). In elementary social studies (IPS), cultural literacy plays a strategic role because IPS learning aims to develop students' social awareness, critical thinking, and a sense of responsibility as members of society (Sapriya, 2009). However, IPS learning materials are often presented in a theoretical manner and lack contextualization, making it difficult for students to connect the learning content with real-life cultural experiences.

In the implementation of the Merdeka Curriculum, the integration of science and social studies into IPAS provides an opportunity to connect scientific knowledge with social and cultural contexts (Hamzah, 2021). However, existing instructional materials are still dominated by text-based resources and lack interactive and contextual features. As a result, students often struggle to understand abstract

concepts, particularly those related to culture and social life. Therefore, there is a need to develop learning media that not only utilize digital technology but also explicitly integrate cultural literacy into IPAS learning in a contextual and meaningful way.

Gap Study and Objective

Although previous studies have demonstrated the effectiveness of e-modules in improving learning outcomes, critical thinking, and learning independence, most of these studies primarily focus on cognitive aspects of learning (Andani et al., 2022; Awaludin & Japar, 2018; Oktavia et al., 2021). The integration of sociocultural competencies, particularly cultural literacy, remains limited. Cultural literacy is not only the ability to understand cultural values but also to interpret, appreciate, and apply them in social contexts (Ahsani & Azizah, 2021; Pratiwi & Asyarotin, 2019). This competency is essential in multicultural societies such as Indonesia, as it supports the development of tolerance, social awareness, and national identity (Helaluddin, 2018; Yusuf et al., 2020). However, the integration of cultural literacy into digital learning media, especially e-modules at the elementary school level, has not been widely explored, indicating a significant research gap.

This gap is further evident in the implementation of IPAS learning under the Merdeka Curriculum. Although IPAS is designed to connect natural and social phenomena holistically and contextually, learning materials are still dominated by printed textbooks and lack interactive and contextual features (Hamzah, 2021). As a result, cultural concepts tend to be abstract and less meaningful for students, reducing engagement and participation in learning (Ariyani & Kristin, 2021). Empirical findings from needs analysis conducted in elementary schools in Kulon Progo show that teachers rarely use or develop e-modules and still rely on conventional teaching materials. A survey involving 73 fifth-grade students revealed that approximately 91% of students expressed the need for more interactive and engaging learning media that support culturally related learning (Faddillah, 2024). These findings highlight the urgent need for innovative, interactive, and culturally contextualized learning media. Based on these gaps, this study aims to develop and evaluate a science e-module titled *Daerahku Kebanggaanku* to enhance the cultural literacy skills of fifth-grade elementary school students in IPAS learning. Specifically, this study aims to: (1) develop a valid e-module based on expert judgment, (2) examine the practicality of the e-module based on teachers' and students' responses, and (3) evaluate the effectiveness of the e-module in improving students' cultural literacy skills. Through these objectives, this research is expected to provide an innovative and context-based learning medium that supports meaningful learning and integrates cultural literacy into elementary education.

METHOD

Type and Design

This study employed a research and development (R&D) approach to develop and evaluate an electronic learning module titled *Daerahku Kebanggaanku* aimed at enhancing cultural literacy skills among fifth-grade elementary school students in IPAS learning. The development process followed the ADDIE instructional design model, which consists of five stages: analysis, design, development, implementation, and evaluation. This model was selected because it provides a systematic, iterative framework for designing, developing, and validating educational products that are aligned with students' needs. The analysis stage involved identifying learning problems and students' needs in IPAS learning through observations and interviews with teachers and students from several elementary schools in Kulon Progo. The schools were anonymized to maintain confidentiality (e.g., Public Elementary School 1, Public Elementary School 2, Public Elementary School 3, Private Elementary School 1, and Private Elementary School 2). The findings were used to inform the learning objectives and content of the e-module. The design and development stages involved the production and refinement of the e-module through expert validation and iterative revisions. The evaluation stage assessed the quality of the final product using formative and summative evaluations.

Data and Data Sources

This study utilized both qualitative and quantitative data collected during the development and implementation of the e-module. Qualitative data were obtained from observations, interviews, and open-ended feedback from teachers and students, while quantitative data were collected from expert validation results, questionnaire responses, and students' learning outcomes measured by pretest and posttest scores. The primary data sources were fifth-grade students and teachers in Kulon Progo Regency. The development process was conducted through sequential trials, including one-to-one, small group, and field trials, to obtain feedback on usability and practicality. Secondary data were obtained from relevant literature, including books, scientific journals, and curriculum documents, to support the theoretical foundation of the study.

Data Collection Technique and Instruments

Data collection techniques were aligned with each stage of the ADDIE model to ensure systematic and comprehensive data collection. During the analysis stage, data were collected through observations and semi-structured interviews to identify learning problems, student characteristics, and the need for developing an e-module. Observation sheets included indicators such as student engagement, teaching methods, and the use of instructional media, while interview guidelines explored teachers' experiences and students' learning difficulties. During the development stage, validation data were collected using expert-judgment questionnaires completed by material and media experts. The questionnaires assessed aspects such as content accuracy, language clarity, presentation quality, and media design. In addition, practicality data were obtained from teacher and student response questionnaires administered during one-to-one, small group, and field trials. These questionnaires evaluated ease of use, attractiveness, clarity of material, and usefulness of the e-module using a Likert scale (1–5).

The implementation stage involved two groups: an experimental class at a public elementary school (School A) that used the developed e-module and a control class at a private elementary school (School B) that used conventional learning materials. The schools were selected using purposive sampling based on the availability of adequate learning facilities. Both groups received the same learning objectives, duration, and instructional procedures, with the only difference being the learning media used. Students' cultural literacy skills were measured using a pretest and posttest consisting of 20 multiple-choice items covering four aspects: (1) knowledge of local culture, (2) understanding of cultural values, (3) application of cultural knowledge in daily life, and (4) appreciation of cultural diversity. The instrument was tested for validity using product-moment correlation and reliability using Cronbach's Alpha, with $\alpha \geq 0.70$ indicating acceptable reliability.

Data Analysis

The data were analyzed using both qualitative and quantitative techniques aligned with the ADDIE development model's stages. Qualitative data obtained from observations, interviews, and open-ended responses were analyzed using the interactive model of data reduction, data display, and conclusion drawing. This analysis was conducted to identify patterns, categorize feedback, and provide a basis for revising and improving the developed e-module at each stage of development. Quantitative data were obtained from expert validation, questionnaires, and students' test results. The feasibility and practicality of the module were analyzed using descriptive statistics and percentage scores. The interpretation criteria are presented in Table 1.

Table 1. Criteria for Feasibility and Practicality

Percentage	Category
81–100%	Very feasible / Very practical
61–80%	Feasible / Practical
41–60%	Fair
≤40%	Not feasible / Not practical

These criteria were adapted from a standard Likert scale interpretation commonly used in educational research (Sugiyono, 2019). The effectiveness of the e-module was evaluated using pretest and posttest results. Students' learning improvement was measured using the normalized gain (N-gain) formula:

$$N - gain = \frac{Posttest - Pretest}{Maximum\ Score - Pretest}$$

The N-gain scores were interpreted into three categories: low ($g < 0.30$), moderate ($0.30 \leq g < 0.70$), and high ($g \geq 0.70$). Furthermore, an independent samples t-test was conducted to assess significant differences between the experimental and control groups, following prerequisite tests for normality (Kolmogorov-Smirnov test) and homogeneity (Levene's Test). All statistical analyses were performed at a significance level of 0.05 using appropriate statistical software.

RESULTS

Needs Analysis and Design of the E-Module

The development of the *Daerahku Kebanggaanku* e-module began with a needs analysis conducted through interviews and questionnaires involving teachers and fifth-grade students from five elementary schools in Kulon Progo. The results revealed that teachers had not yet developed or used electronic modules for IPAS learning, particularly those that explicitly integrate cultural literacy. In addition, students reported that learning activities relying solely on government textbooks were less engaging and made it difficult to understand abstract cultural concepts. Furthermore, 91% of students expressed the need for more interactive and varied learning media to support their understanding of cultural literacy concepts. These findings indicate a significant gap between existing learning resources and students' learning needs, particularly in terms of interactivity, contextualized learning, and cultural relevance. Based on these findings, the design stage focused on developing an interactive e-module that integrates cultural literacy into IPAS learning. The module consists of three main topics: (1) local cultural heritage, (2) regional economic activities, and (3) local superior products. The design also includes learning activities, illustrations, exercises, and formative assessments to enhance students' engagement and conceptual understanding (Figure 1).

Development and Revision of the E-Module

The development stage yielded an initial e-module prototype incorporating multimedia elements, such as images, icons, and interactive navigation features, to enhance student engagement. This initial version of the product was subsequently validated by both subject-matter and media experts to assess its quality in terms of content accuracy, instructional design, and visual presentation. Based on feedback from the validators, several important revisions were made to improve the overall quality of the e-module. The language used in the module was simplified to better align with the cognitive level of fifth-grade students, ensuring the content was easily understood. In addition, the clarity of the learning objectives was improved, allowing students to more clearly identify the expected learning outcomes. The instructions for using the module were also refined to make navigation and independent learning more intuitive for users. Furthermore, the presentation of cultural literacy content was adjusted to be more contextual and relevant to students' everyday experiences, thereby strengthening its meaningfulness. Improvements were also made to the layout, typography, and visual consistency to create a more appealing and user-friendly interface.

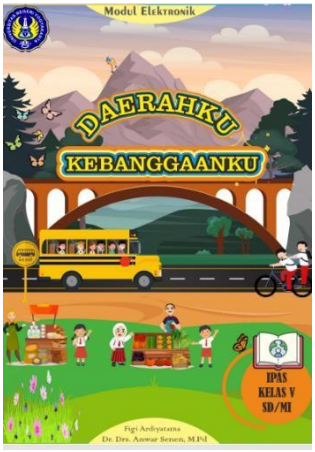
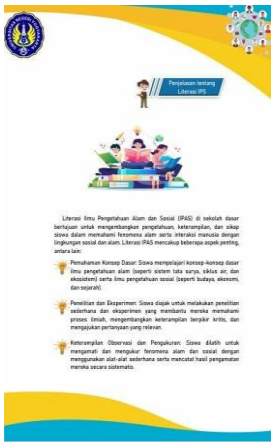


Figure 1. E-module Daerahku Kebanggaanku

Overall, these revisions enhanced both the pedagogical and technical aspects of the e-module. The revision process reflects an iterative development approach that actively incorporates expert feedback, ensuring that the final product meets the required standards of instructional quality and usability for classroom implementation (Figure 2). The developed product can be viewed through the following link:
https://drive.google.com/drive/folders/1DFk_y82Nh42g-r-zZlfZIfK7cl69Nk3H?usp=sharing

Before Revision



After Revision

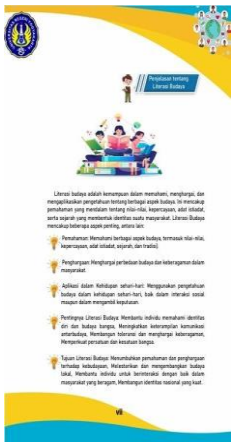


Figure 2. Revised Display of adjustments to the explanation of cultural literacy

Feasibility of the E-Module

The feasibility of the e-module was evaluated through expert validation, as presented in Table 2 below.

Table 2. Results of Expert Validation of the E-Module

Validator	Aspect Evaluated	Score (%)	Category
Subject matter expert	Content feasibility	82%	Very feasible
Media expert	Media design	90.67%	Very feasible

The validation instruments consisted of multiple assessment items based on four aspects: content, language, presentation, and graphics. The maximum score was converted into percentages using a Likert scale. The results indicate that both validators rated the module as very feasible, meaning that the product meets the criteria for use as a learning medium. The subject-matter expert score (82%) suggests that the content is relevant and accurate but still requires minor revisions, particularly to align cultural literacy explanations with students' contextual understanding. Meanwhile, the higher

score from the media expert (90.67%) indicates that the module has strong visual design, layout consistency, and interactivity.

Practicality of the E-Module

The practicality of the e-module was evaluated across three stages: one-to-one, small group, and field trials. Each stage involved both teachers and students to assess usability, clarity, and learning support. The one-to-one trial involved three students representing different ability levels and one teacher. This stage aimed to identify initial usability issues and gather feedback on clarity and navigation. The results indicated that students were able to use the module independently, although minor revisions were needed in instructions and wording.

The small group trial involved eight students and one teacher. At this stage, students showed increased engagement when interacting with the module. The integration of images and exercises supported their understanding of cultural literacy concepts, indicating that the module effectively facilitated active learning. The field trial involved 22 students and one teacher in a real classroom setting. The results demonstrated that the module could be effectively implemented in classroom learning, with students showing higher levels of motivation and participation.

Table 3. Results of Teacher and Student Responses

Trial Stage	Respondent	Mean Score (%)	Category
One-to-One Trial	Teacher and Students	88.50	Very Practical
Small Group Trial	Teacher and Students	92.30	Very Practical
Field Trial	Teacher and Students	96.10	Very Practical

Based on Table 3 the results consistently show a high level of practicality. The increasing trend across trial stages indicates that revisions made after each stage improved the module's usability. Although the results indicate strong practicality, the absence of a standard deviation suggests that further statistical analysis could provide deeper insight into response variability.

Effectiveness of the E-Module

The effectiveness of the e-module was evaluated using a quasi-experimental pretest–posttest control group design.

Table 4. Comparison of Pretest and Posttest Results

Group	Pretest Mean	Posttest Mean	N-Gain	Category
Control Class	69.75	79.50	0.32	Moderate
Experimental Class	77.50	93.75	0.69	Moderate

Based on Table 4 both groups fall into the moderate category; however, the experimental class achieved a substantially higher gain compared to the control class. This finding indicates that the use of the developed e-module is more effective in improving students' cultural literacy skills than conventional learning methods. To ensure the validity of this comparison, an Independent Sample t-test was conducted. The pretest comparison showed no significant difference between the control and experimental groups ($p > 0.05$), indicating that both groups had equivalent initial abilities before the intervention. In contrast, the posttest comparison revealed a significant difference ($p < 0.05$), indicating that the experimental class performed significantly better after the e-module was implemented. These findings confirm that the observed improvement in the experimental group was not influenced by initial differences but was due to the instructional treatment using the developed e-module.

Overall, the results show that the developed e-module meets the feasibility standards, as validated by experts, and is very practical for classroom use across different stages of the trials. Furthermore, the e-module has proven effective in improving students' cultural literacy, as evidenced by N-gain results and statistical test results. More importantly, these findings highlight that integrating cultural literacy into digital learning media can enhance both student engagement and learning

outcomes. The consistent improvement across feasibility, practicality, and effectiveness aspects suggests that the developed e-module is a valid and reliable instructional innovation for IPAS learning.

DISCUSSIONS

Learning modules play a crucial role in supporting students' understanding of instructional materials and facilitating independent learning processes. In this study, the electronic module *Daerahku Kebanggaanku* was developed as a learning medium to enhance cultural literacy in IPAS learning. The findings indicate that modules function not only as learning resources but also as structured guides that assist both teachers and students in achieving learning objectives. This aligns with previous research, which states that well-designed modules can improve learning effectiveness and student engagement (Purnomo & Wilujeng, 2016; Sulistyaningrum et al., 2024). More importantly, the integration of digital features within modules creates opportunities for more interactive, student-centered learning experiences, which are essential in 21st-century education. Thus, the developed e-module contributes to strengthening the role of instructional media in bridging the gap between traditional and digital learning environments.

The developed module was designed using a culture-based approach by integrating cultural literacy elements into IPAS learning materials. This approach is significant because learning that is connected to students' cultural contexts tends to be more meaningful and easier to understand. According to Branch (2009), instructional design should consider learners' environments and cultural backgrounds to ensure relevance and effectiveness. In this study, integrating local cultural content, such as cultural heritage, economic activities, and regional products, supports contextual learning and promotes deeper understanding. This finding is consistent with recent studies that emphasize the importance of culturally responsive pedagogy in improving student engagement and identity formation (Ahsani & Azizah, 2021; Yusuf et al., 2020). Therefore, this research extends previous studies by demonstrating how cultural literacy can be systematically embedded into digital learning media within elementary education.

The results of the needs analysis confirm that both teachers and students require more interactive and culturally relevant learning media. The dominance of textbook-based instruction limits students' engagement and reduces opportunities for meaningful learning experiences. This finding is consistent with recent studies indicating that traditional learning materials often fail to meet the needs of digital-native learners (Kawuryan et al., 2025; Khasanah et al., 2025). The development of the *Daerahku Kebanggaanku* e-module directly addresses this gap by providing a more engaging and contextual learning resource. Furthermore, the alignment between students' needs and the developed product indicates that needs analysis is a critical stage in instructional design. This supports the argument that effective educational innovation must be grounded in empirical evidence from real classroom contexts.

The feasibility results indicate that the developed e-module meets the required standards as a learning medium. The validation scores from both subject matter and media experts fall within the "very feasible" category, suggesting that the module is appropriate in terms of content accuracy, design quality, and usability. From a theoretical perspective, the characteristics of effective modules, such as being self-instructional, adaptive, and user-friendly, can be used to interpret these findings (Hafis et al., 2022). The revisions made in response to expert feedback, including improvements to language clarity and visual design, demonstrate the importance of iterative development in producing high-quality learning media. Similar findings have been reported in recent studies showing that expert validation significantly enhances the quality of instructional products (Adawiyah et al., 2025). Therefore, the feasibility results not only validate the product but also reinforce the importance of systematic development processes in educational research.

The practicality results further indicate that the developed module is highly usable in classroom learning. The consistent increase in practicality scores from one-to-one trials to field trials suggests that iterative revisions successfully improved the usability of the module. This finding is important because practicality reflects how well a product can be implemented in real learning situations. The

positive responses from both teachers and students indicate that the module is easy to use, engaging, and supportive of learning activities. These results are consistent with previous studies that highlight the role of interactive media in improving student participation and motivation (Sulistyaningrum et al., 2024; Wiwiwta & Hanadayani, 2022). Thus, the practicality findings confirm that the module is not only theoretically sound but also practically applicable in real educational settings.

The effectiveness results show that the developed e-module significantly improves students' cultural literacy skills. The N-gain score of 0.69 falls within the moderate category, indicating meaningful improvement in learning outcomes. Although the category is moderate, the higher gain compared to the control class suggests that the e-module provides a more effective learning experience than conventional methods. This finding aligns with studies showing that digital learning media can enhance conceptual understanding and learning outcomes (Andani et al., 2022; Triwahyuningtyas et al., 2020). Furthermore, the t-test results confirm that the improvement is statistically significant and not influenced by initial differences between groups. This strengthens the argument that the developed module has a real impact on students' cultural literacy development.

One of the main strengths of the developed module lies in its contextual cultural approach, which integrates IPAS learning with real-life cultural experiences. This approach allows students to connect abstract concepts with their daily lives, making learning more meaningful. According to Sumayana (2017), local wisdom-based learning enhances students' understanding of social and cultural values. In this study, students were able to relate learning materials to their own environments, which contributed to improved comprehension. This finding supports the theory that contextual learning enhances both cognitive and affective learning outcomes. Therefore, integrating cultural literacy into digital learning media represents an important contribution to instructional design.

The findings of this study also highlight the role of external factors, particularly teacher facilitation and student participation, in influencing learning outcomes. Teachers play a key role in guiding students, providing explanations, and facilitating discussions during the use of the e-module. Effective teacher support helps students interpret cultural content more deeply and apply it in broader contexts. In addition, active student participation enhances the effectiveness of the learning process by encouraging exploration and interaction with the material. These findings indicate that the success of digital learning media is not solely determined by the product itself but also by the way it is implemented in the classroom. Therefore, future research should consider integrating teacher training and instructional strategies to maximize the effectiveness of digital learning media.

From a theoretical perspective, this study contributes to the development of educational technology and culturally responsive pedagogy. The findings demonstrate that integrating cultural literacy into digital learning media can enhance not only cognitive outcomes but also sociocultural competencies. This extends previous research that primarily focused on cognitive aspects of learning. In addition, this study provides empirical evidence that culturally integrated e-modules can support meaningful learning in elementary education. From a practical perspective, the developed module provides an alternative learning resource relevant to students' needs and contexts. Thus, this research contributes to both theory and practice by providing a model for integrating cultural literacy into digital learning environments.

CONCLUSION

This study contributes to the development of educational technology by designing and evaluating a culturally integrated electronic module titled Daerahku Kebanggaanku for IPAS learning in elementary schools. The findings confirm that the developed e-module is valid, practical, and effective in enhancing students' cultural literacy skills, as evidenced by expert validation, positive user responses, and improved learning outcomes. The main novelty of this study lies in integrating cultural literacy with digital learning media within a contextual IPAS framework, which not only supports cognitive development but also strengthens students' sociocultural awareness. This contribution extends previous research that primarily focused on cognitive outcomes by demonstrating that culturally contextualized digital learning media can provide more meaningful and engaging learning

experiences. Despite these contributions, this study has several limitations to consider. The implementation was conducted in a limited number of schools within a specific region, which may affect the generalizability of the findings. In addition, the study primarily examined short-term improvements in cultural literacy skills based on pretest and posttest results, without exploring long-term impacts. Future research is therefore recommended to involve a broader and more diverse sample across different regions and educational contexts. Further studies may also investigate the long-term effectiveness of culturally integrated e-modules and explore incorporating more advanced digital features to enhance learning experiences. The findings of this study also have important implications for educational practice. The developed e-module can serve as an innovative and contextualized learning resource to support IPAS instruction in elementary schools. Teachers are encouraged to integrate cultural literacy into classroom learning by using digital media to connect academic content to students' cultural environments. In addition, schools and policymakers should support the implementation of technology-based learning by providing adequate digital infrastructure and professional development for teachers. Through such efforts, the integration of culturally relevant digital learning media can promote meaningful learning while strengthening students' cultural awareness and their appreciation of local heritage.

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