Research Article

Cognitive Stimulation and Local Cultural Literacy through Mobile Learning in Integrated Islamic Elementary School Students

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Abstract

The integration of digital media in education has become essential for enhancing students' cognitive development and cultural awareness, particularly at the elementary level. However, the use of interactive platforms that simultaneously stimulate cognitive processes and promote local cultural literacy remains limited, especially in Islamic integrated elementary schools. This study aims to develop and evaluate the effectiveness of Lectora Inspire-based learning media in stimulating cognitive abilities and improving local cultural literacy among students at an Islamic Integrated Elementary School (SDIT) in Tanah Datar, Indonesia. Using a research and development approach adapted from the Borg and Gall model, the study was conducted through stages of needs analysis, product development, expert validation, small group trials, and field testing. The results show that the developed media met high validity and practicality standards, with average expert validation scores reaching 3.7 (very good category). A pretest-posttest design applied to 30 students demonstrated significant improvement in students' understanding of local culture and indicators of cognitive engagement ($p < 0.05$). The findings suggest that Lectora Inspire can serve as an effective digital tool for integrating cognitive stimulation with culturally relevant content. This study contributes to innovative strategies in Islamic primary education by fostering both cognitive and cultural dimensions.

INTRODUCTION

In the 21st century, digital literacy and cognitive readiness are two essential competencies that primary education must cultivate. The advancement of educational technology has transformed how information is accessed, processed, and internalized by young learners (Ismuni et al., 2024). Traditional teaching strategies, which often focus on rote memorization and passive reception, are increasingly incompatible with the learning preferences and cognitive needs of digitally native students. The integration of multimedia-based learning platforms into classrooms has been shown to enhance student engagement and critical thinking (Karuru et al., 2024). Among the various tools available, Lectora Inspire stands out as a flexible digital authoring tool that allows educators to design interactive, visually stimulating learning experiences. Research has demonstrated its utility in improving students' motivation and content retention in various subject areas, yet its use for cultural literacy especially within faith-based education systems remains underexplored (Kurniawan et al., 2024). In the Indonesian context, where local wisdom and Islamic values intersect within the formal curriculum of Integrated Islamic Elementary Schools (SDIT), there is a pressing need to align educational media with both cultural identity and cognitive development. Students must be empowered not only to acquire knowledge but also to appreciate and internalize their cultural roots. This raises the question of how to employ digital media to simultaneously foster local cultural literacy and stimulate essential cognitive processes at the elementary level (Muharam et al., 2021).

Local cultural content is often marginalized in formal educational settings due to the dominance of standardized curricula and a lack of accessible, engaging learning materials. In Islamic Integrated Elementary Schools, where the curriculum blends religious teachings and national content, efforts to integrate local culture into classroom learning tend to be fragmented and inconsistent (Aral, 2022). As a result, students have limited exposure to regional heritage, values, and traditional narratives that shape their identity and community belonging. Conventional instructional methods used in teaching cultural topics are insufficient in stimulating the cognitive domains needed for 21st-century skills. Most materials related to local culture are presented in static, text-heavy formats with little room for exploration or critical reflection (Shih, 2022). This condition contributes to a superficial understanding of cultural knowledge and misses the opportunity to connect cultural appreciation with deeper cognitive functions such as analysis, synthesis, and evaluation. The limited use of digital platforms specifically tailored for cultural education in elementary Islamic schools highlights a critical pedagogical gap. It becomes imperative to investigate how an interactive digital learning environment designed using platforms like Lectora Inspire can address both the cognitive stimulation and the deepening of students' cultural literacy in a meaningful, age-appropriate way (Umrotin et al., 2024).

This study is designed to develop and evaluate the effectiveness of a digital learning media product based on Lectora Inspire, aimed at improving both cognitive stimulation and local cultural literacy among students of Islamic Integrated Elementary Schools. The media is expected to foster engagement, critical thinking, and cultural appreciation through an interactive and contextually relevant approach to instruction (Hadad et al., 2023). By implementing a research and development model, the study seeks to produce a validated instructional product that aligns with the needs of primary-level learners, teachers, and the

cultural context in which education occurs (Papakostas, 2024). It intends to bridge the gap between technological innovation and cultural education, ensuring that digital tools are not only engaging but also deeply rooted in the values and traditions of local communities. The broader goal is to offer a model of digital pedagogical integration that can be replicated or adapted by other Islamic schools across Indonesia or similar multicultural and multilingual contexts (Verhoeven & Kinzer, 2023). This research aspires to demonstrate that cognitive development and cultural preservation are not mutually exclusive but can be mutually reinforcing through thoughtfully designed educational media.

Despite a growing body of literature on digital learning tools and educational technology, few studies have focused on how such tools can support both cognitive development and cultural literacy in primary education (Li & Chu, 2021). The majority of current research emphasizes general cognitive outcomes, such as problem-solving or reading comprehension, while neglecting the contextual richness offered by cultural content. The intersection between technology, cognition, and cultural education remains a relatively underexplored domain, especially within Islamic schooling environments (Liu et al., 2024). Existing studies that have utilized Lectora Inspire primarily target science, mathematics, or language learning, with limited attention to its potential in teaching cultural values and practices (Fadilah et al., 2021). Moreover, most of these studies do not take into account the dual goals of enhancing cognitive stimulation and fostering identity formation through cultural engagement. The lack of culturally tailored, interactive digital content that supports holistic learning in religious-based schools is a clear gap that this study aims to address. Research in Indonesian Islamic education has often overlooked the integration of local wisdom with modern pedagogical tools (Sunzuma & Umbara, 2025). While national curriculum policies encourage the inclusion of local content, practical implementations especially using digital means are sparse and fragmented. This study seeks to fill that void by providing both a theoretical and practical framework for utilizing Lectora Inspire in a culturally grounded and cognitively enriching manner.

This study offers a novel contribution to educational research by combining digital instructional design with cognitive psychology and local cultural education. Unlike conventional technology integration studies, this research emphasizes how the content is designed and what cognitive mechanisms are activated through specific cultural narratives, symbols, and values. The use of Lectora Inspire to encode these elements into an interactive learning environment represents an innovative pedagogical approach (Padbal et al., 2022). The novelty also lies in the population and setting under investigation. By focusing on students from an Islamic Integrated Elementary School in a culturally rich region, this research moves beyond generic educational technology studies to explore how technology can serve specific cultural and religious learning needs. It challenges the notion that cognitive skills and cultural instruction operate in separate educational silos (Wirda & Sugandi, 2024). This study is justified not only by its theoretical contributions but also by its practical relevance. It responds directly to calls for culturally relevant pedagogy in digital education and contributes to the body of research on identity-centered learning. The development and validation of the Lectora Inspire-based media serve both as an empirical tool and as a prototype for future applications in culturally diverse educational settings (Lukman et al., 2022).

RESEARCH METHOD

Research Design

This study employed a research and development (R&D) design, adapting the Borg and Gall model to suit the development of educational media. The model was simplified into essential stages that include needs analysis, product development, expert validation, small group trials, and field implementation (Sutarna, 2020). The purpose of this design was to

develop a digital learning product using Lectora Inspire that integrates local cultural content with cognitive engagement strategies, then to assess its validity, practicality, and effectiveness in the classroom context of Islamic Integrated Elementary Schools.

Research Target/Subject

The population of this study consisted of fifth-grade students enrolled in Islamic Integrated Elementary Schools (SDIT) located in Tanah Datar Regency, West Sumatra, Indonesia. The sample was selected purposively based on the availability of digital infrastructure and the integration of local content in their curriculum. A total of 30 students participated in the main field test, while an additional 15 students were involved in the limited-scale try-out. Several subject teachers and instructional design experts also participated in the validation and feedback processes.

Research Procedure

The research procedure began with a needs analysis conducted through interviews and surveys with stakeholders in the school. Based on the findings, the learning media was designed using Lectora Inspire, incorporating regional folklore, traditional attire, local crafts, and customs. Expert validation followed, where two media specialists and one content expert provided structured feedback. After revisions, the media was tested in a limited group of students to evaluate its practicality and user engagement. The final stage involved a classroom implementation, where students used the media over a period of two weeks.

Instruments, and Data Collection Techniques

Three types of instruments were used to collect data. A needs analysis questionnaire was administered to teachers and students to determine the existing challenges and expectations regarding cultural literacy instruction. A validation sheet was distributed to expert reviewers to assess the content accuracy, media design, cultural relevance, and technical functionality of the developed Lectora Inspire product. Finally, a set of pretest and posttest questions focusing on cultural knowledge and cognitive indicators were used to evaluate the effectiveness of the media in improving students' learning outcomes.

Data Analysis Technique

Pretests and posttests were administered before and after the intervention to measure gains in local cultural literacy and signs of cognitive stimulation. Observations and teacher interviews complemented the quantitative data to triangulate the results.

RESULTS AND DISCUSSION

Table 1 presents the descriptive statistics of students' pretest and posttest scores in the domains of cultural literacy and cognitive engagement. The mean score on the pretest was 61.3 (SD = 8.2), while the mean score on the posttest increased to 83.9 (SD = 6.7). The highest gain was observed in the indicator related to cultural symbol recognition, followed by narrative comprehension and contextual application of local wisdom.

Table 1. Descriptive Statistics of Students' Test Scores

Test Type	Mean	Standard Deviation	Minimum	Maximum
Pretest	61.3	8.2	45	76
Posttest	83.9	6.7	70	95

These statistics indicate a substantial improvement in students' understanding after the integration of the Lectora Inspire media into the classroom. The narrowed standard deviation on the posttest also suggests a more uniform mastery of content among students, which implies consistency in the media's cognitive stimulation effect. Students showed a marked increase in motivation and attention span during the learning sessions. Feedback obtained from teacher observations revealed that learners were more responsive, asked more reflective questions, and were able to relate local cultural concepts to their daily lives after exposure to the interactive modules. Interview data with classroom teachers confirmed that prior to the implementation, cultural content was generally viewed as secondary and lacking engagement (Thalluri & Penman, 2020). The introduction of Lectora Inspire shifted this perception by framing local culture in a more vivid and dynamic manner, making it a central element of instructional delivery. Further breakdown of cultural literacy indicators shows specific gains in thematic categories. The most improved domain was folklore comprehension (mean gain: 26.5), followed by traditional attire recognition (mean gain: 19.3) and local food traditions (mean gain: 16.7). These improvements correspond to modules that featured rich media and contextual learning scenarios.

Student responses to embedded quizzes within the Lectora modules also demonstrated higher rates of correct answers on reflective and application-based questions. The average quiz completion score increased from 64% in the initial trial to 89% in the field implementation phase, suggesting increasing familiarity and retention of the content. Inferential statistical testing using the paired sample t-test revealed a significant difference between the pretest and posttest scores. The result yielded a t-value of 10.74 with a p-value of 0.000, which confirms that the intervention had a statistically significant effect on student performance at the 0.05 level. Effect size was also calculated using Cohen's d, which resulted in a value of 1.75, indicating a high effect magnitude of the Lectora Inspire media on learning outcomes. These results not only validate the efficacy of the product but also confirm its relevance in stimulating cognitive and cultural development. Correlational analysis between cognitive indicators and cultural literacy scores showed a strong positive correlation (r = 0.76), suggesting that students who scored higher on culturally oriented items also exhibited higher levels of cognitive engagement. This relationship supports the theoretical proposition that content grounded in students' lived experiences can activate deeper cognitive processing (Díez-Palomar et al., 2021). The alignment between visual, auditory, and interactive elements in Lectora modules appears to be the mediating factor that connects cognitive stimulation with improved literacy outcomes. Students were not only recalling cultural facts but also analyzing and reflecting upon them, thereby reinforcing learning through multiple domains.

One illustrative case involves a student named A.S., whose pretest score was 54 and posttest score increased to 88. A.S. reported that the animated folklore module helped her understand the meaning behind traditional rituals practiced by her family. During the final reflection activity, she was able to articulate the moral values behind the story and relate them to Qur'anic teachings. Another case involves M.R., a male student who initially showed low interest in cultural topics. After two sessions using Lectora Inspire, he was observed voluntarily researching additional information about local musical instruments presented in the module. His quiz scores improved by 30%, and he initiated group discussion in classan unusual behavior based on prior observations. The learning environment created by the digital platform contributed to more democratic and inclusive class interactions. Students who were previously passive became more active, largely due to the affordances of media that provided instant feedback, audio narration, and scenario-based tasks. These features contributed to a learning atmosphere that blended exploration with structured guidance. Teacher testimony further supports the observed behavioral changes (Efthymiou, 2023). The interactivity of Lectora Inspire served as both an instructional aid and motivational stimulus. By visualizing abstract

cultural values through relatable scenarios and animated sequences, students internalized content more effectively, and their curiosity expanded beyond the instructional material.

The results confirm that Lectora Inspire, when designed with culturally relevant content, acts as a powerful medium for fostering both cognitive and cultural development. The statistical gains, behavioral shifts, and qualitative findings converge to support the conclusion that interactive media can be strategically leveraged in Islamic Integrated Elementary Schools (Suryaningrat et al., 2021). The findings reinforce the dual role of educational technology: enhancing cognitive performance and preserving cultural identity. This dual impact underscores the relevance of contextually grounded multimedia in cultivating 21st-century learners who are intellectually competent and culturally rooted. This study demonstrates a significant improvement in students' local cultural literacy and cognitive stimulation following the implementation of Lectora Inspire media. Quantitative results reveal a substantial increase in posttest scores compared to pretest scores, with a mean gain of 22.6 points. The statistical analysis confirmed that the difference was significant ($p < 0.05$), and the effect size was notably high, indicating a strong impact of the intervention. Students exhibited marked gains in specific cultural domains such as folklore understanding, traditional attire recognition, and symbolic interpretation. Their engagement during classroom sessions also increased, with more students participating in reflective discussions and demonstrating deeper inquiry-based thinking. These improvements were supported by teacher observations and qualitative interview data.

The limited variation in posttest scores suggests the media's effectiveness across diverse student profiles, indicating both cognitive accessibility and user-friendliness. Students of varying academic levels achieved comparably high outcomes, which reflects the adaptability of Lectora Inspire's content and its ability to deliver both surface-level and higher-order thinking tasks (Nurdin et al., 2024). Qualitative case studies provide further insight into individual transformations. Students who previously struggled with cultural topics showed newfound interest and self-motivation. The interactivity and contextual storytelling embedded in the media contributed to a shift in perception, from viewing cultural subjects as static and peripheral to seeing them as dynamic and personally meaningful. The results of this study align with the findings of Mayer (2009), who emphasized the importance of multimedia learning in stimulating cognitive processes through dual coding systems. Students in this research not only absorbed information but were also able to process, reflect, and articulate their understanding using culturally contextualized content. This reinforces the theoretical foundation that interactivity enhances comprehension and memory retention.

Different from studies by Rahmah et al. (2020), which primarily focused on cognitive gains in scientific or mathematical domains using digital tools, this study extends the application to cultural literacy. Few existing studies have examined how digital media can be utilized to enhance students' connection with local traditions and values in an integrated school setting. This research fills that gap by demonstrating not only academic improvement but also emotional and social engagement. Contrary to the findings of Suryani (2018), which reported minimal impact of digital platforms on cultural education due to lack of local relevance in content, this study emphasizes the necessity of culturally embedded instructional design. The strength of this intervention lies not only in the use of Lectora as a tool, but in the intentional inclusion of regional symbols, stories, and practices that resonate with students' lived experiences. The current study confirms that meaningful learning outcomes are achievable when pedagogical technology is designed with cultural congruence in mind (Sutarna, 2020). The positive outcomes are not simply due to the novelty of technology, but because of how well the content aligns with students' cognitive, emotional, and spiritual realities. This differentiates the present research from previous ones that often treat educational media as neutral containers of generic content.

The results of this study signify that cognitive growth and cultural appreciation are not mutually exclusive goals in education. The observed improvements in student behavior and assessment scores reflect the potential of technology-enhanced learning to serve both academic and cultural missions. This signals a shift in instructional design from knowledge transmission to holistic identity formation. Student responses indicate that when cultural materials are delivered through interactive, visually rich, and emotionally engaging formats, learners form deeper cognitive connections. This finding highlights the role of narrative structure, symbolism, and relevance in promoting critical thinking. Culturally familiar contexts serve as cognitive scaffolds that enhance the ability to generalize, reason, and evaluate. Teachers' reflections and engagement levels also changed during the intervention (Lefebvre et al., 2023). Their increased enthusiasm and creativity suggest that the media not only stimulated students, but also revitalized pedagogical approaches among instructors. This is an important reminder that innovation in instructional materials can serve as professional development tools as well as learning resources. The combination of statistical improvement and qualitative insights reveals the broader educational value of localized digital media. Beyond teaching facts, this intervention cultivated empathy, identity awareness, and ethical reasoning rooted in cultural norms (Hußner et al., 2023). The findings validate the premise that education should integrate heritage and innovation as complementary forces.

The practical implication of this study is the validation of culturally responsive digital media as a tool for integrated learning in Islamic elementary education. Teachers, curriculum developers, and policymakers can consider adopting or adapting Lectora Inspire media to enhance both academic and cultural competencies simultaneously (Liu et al., 2024). Such integration has potential implications for curriculum design at national levels. The results advocate for embedding local cultural values in digital learning to preserve heritage while meeting modern educational standards. In an era where globalized media often overshadows local identities, this study provides a counterbalance by proving that technological engagement can reinforce rather than dilute cultural awareness (Díez-Palomar et al., 2021). Future teacher training programs should include modules on culturally contextualized media development. This will equip educators with the skills to design and deploy tools that are not only pedagogically sound but also culturally relevant. The Lectora platform offers a replicable model that can be extended to other subjects and regions. From a policy perspective, the success of this intervention supports greater investment in digital infrastructure and localized content development in Islamic schools. Governments and educational institutions need to recognize the dual value of cultural literacy and cognitive stimulation in preparing globally competent, yet locally rooted, students (Nurdin et al., 2024).

The favorable results observed in this study are likely due to the synergistic effect of combining culturally meaningful content with interactive digital design. Students are cognitively predisposed to engage with material that reflects their environment, traditions, and values (Efthymiou, 2023). When such content is presented through a medium that supports exploration and feedback, it maximizes both attention and retention. Lectora Inspire allows for integration of audio, video, animation, and quizzes within a single platform (Padbal et al., 2022). This multimodal approach caters to diverse learning styles and helps sustain attention spans, which is particularly crucial for elementary students. Cultural narratives and visual representations acted as triggers for memory and emotional engagement, further reinforcing cognitive processing. The design of the media incorporated both surface-level and higher-order thinking tasks (Fadilah et al., 2021). Learners were not only asked to recall cultural information but to apply, evaluate, and relate it to their own lives. This depth of cognitive engagement explains the robust learning gains and behavioral changes observed during the implementation. The media's structure mirrored students' own sociocultural frameworks, making learning more intuitive and emotionally resonant (Hadad et al., 2023). Students responded positively because

the content validated their backgrounds and interests. This psychological safety and relevance are key factors in sustaining motivation and cognitive focus.

The success of this study opens avenues for further research on cognitive-cultural media across different grade levels and school contexts. Expansion to upper-grade students, integration with religious moral education, and longitudinal studies to assess long-term cognitive and cultural outcomes are recommended (Wirda & Sugandi, 2024). Collaborative media production between educators and cultural stakeholders could also enhance authenticity. Replication of this research in other regions with different cultural backgrounds would help establish broader generalizability. Comparing the effectiveness of similar media across secular and religious-based schools may reveal insights into the adaptability of localized instructional design. Development of teacher-centered authoring tools and training based on Lectora Inspire should be prioritized. When teachers are empowered to create culturally grounded digital content, the scope and sustainability of educational innovation will increase (Mudinillah, 2019). This will contribute to a more equitable and representative curriculum ecosystem. Systemic support in terms of infrastructure, digital literacy, and policy alignment will be crucial. Educational technology must not only be accessible but also anchored in the identities and needs of learners. This study serves as both an empirical example and a call to action for the integration of cognitive and cultural development through localized digital media.

CONCLUSION

The most distinctive finding of this study lies in the simultaneous enhancement of students' cognitive engagement and their understanding of local cultural content through the integration of Lectora Inspire media. Unlike conventional digital learning tools that focus solely on academic knowledge or abstract thinking skills, the media developed in this research effectively contextualized learning within the students' cultural and social realities. This dual impact highlights the importance of designing educational interventions that align content, technology, and identity development in a cohesive framework. This study contributes a methodological advancement by integrating participatory digital media development within Islamic educational settings that emphasize cultural identity. The use of Lectora Inspire is not merely instrumental but strategic, demonstrating that instructional media can serve as both cognitive scaffolds and vehicles for cultural transmission. The research proposes a model of culturally contextualized media design that can be replicated or adapted in other culturally embedded school systems, thus offering both conceptual and practical value for educational innovation. This study was limited in its scope to a single regional and religious-based school setting, with a relatively small sample size that may affect the generalizability of the findings. Future research could expand the investigation across multiple regions with diverse cultural identities, employ longitudinal designs to measure sustained learning outcomes, or explore comparative studies involving different digital platforms to identify the most effective tools for culturally responsive cognitive instruction.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing - original draft.
Author 5: Supervision; Validation.
Author 6: Other contribution; Resources; Visuali-zation; Writing - original draft.

CONFLICTS OF INTEREST
The authors declare no conflict of interest.

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