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Research Article

GAMIFICATION WITH SOCIOCULTURAL RELEVANCE: DESIGNING A SERIOUS GAME BASED ON NUSANTARA FOLKLORE FOR HISTORY LEARNING

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Abstract

Conventional history education often struggles with student engagement due to pedagogical methods that lack interactivity and cultural resonance. While serious games offer a potential solution, many existing platforms use generic themes, failing to leverage the rich sociocultural context of learners, thereby limiting their educational impact. This research aims to design, develop, and evaluate a serious game for history learning by integrating Nusantara (Indonesian archipelago) folklore, creating a socioculturally relevant and immersive educational experience. Employing a Research and Development (R&D) approach with the ADDIE model, a prototype was developed and subsequently tested through a quasi-experiment with high school students to assess its impact on historical knowledge acquisition and engagement. The study resulted in a functional serious game where historical events are framed within compelling narratives from Nusantara folklore. Experimental results showed a statistically significant improvement in learning outcomes and higher engagement scores for the group using the folklore-based game compared to a control group using conventional learning methods. Integrating socioculturally relevant elements like folklore into serious games is a highly effective strategy for history education, enhancing both academic achievement and cultural appreciation, and offering a robust model for contextualized gamified learning.

Keywords: Gamification, History Learning, Serious Game

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INTRODUCTION

History education stands as a cornerstone of national identity and critical consciousness, yet it frequently confronts a significant pedagogical challenge: student disengagement. The subject is often perceived by learners as a static collection of dates, names, and events, disconnected from their contemporary realities (Luong & Manthiou, 2026). Traditional instructional methods, heavily reliant on textbook-based lectures and rote memorization, can exacerbate this perception, failing to ignite curiosity or foster a deep, meaningful connection with the past (Kononova & Prokudin, 2019). This passive learning model often struggles to cultivate the essential skills of historical thinking, such as analysis, interpretation, and understanding causality, leaving students with fragmented knowledge rather than a holistic grasp of their heritage.

The emergence of digital technologies has introduced powerful new paradigms for transforming educational experiences, with gamification and serious games standing at the forefront of this revolution (Uyanık, 2025). These approaches leverage the inherent motivational power of game mechanics—such as narrative, challenge, reward, and interactivity—to create rich, engaging learning environments. A substantial body of research has demonstrated the potential of serious games to enhance cognitive skills, improve knowledge retention, and boost learner motivation across various disciplines (Olsen & Hutson, 2025). By situating learners as active participants within a simulated environment, serious games can make abstract concepts tangible and complex processes understandable, offering a dynamic alternative to conventional instruction.

Effective learning, however, is not merely a product of sophisticated mechanics; it is deeply intertwined with context and relevance . Educational experiences that resonate with a learner's sociocultural background have been shown to be significantly more impactful, fostering a stronger sense of personal connection and intrinsic motivation. When educational content aligns with the cultural narratives, values, and identities of students, it moves from being external information to becoming a part of their own story (Meshchangina dkk., 2024). This principle of sociocultural relevance is particularly crucial in history education, where the ultimate goal is to help learners understand their place within a continuing historical narrative.

The widespread adoption of generic educational games presents a significant problem in achieving culturally resonant learning (Alam, 2022). Many serious games, often developed within a Western framework, utilize themes, historical settings, and narrative structures that are culturally distant from learners in diverse global contexts, such as the Indonesian archipelago (Nusantara). This 'one-size-fits-all' approach, while convenient for developers, creates a cultural and psychological disconnect that undermines the game's pedagogical potential (Funk dkk., 2022). A game centered on medieval European castles or the American Revolution, for example, may fail to capture the imagination or foster a sense of ownership among Indonesian students.

This cultural dissonance leads to a number of specific, detrimental consequences for the learning process. Students may engage with the game mechanics on a superficial level but fail to connect deeply with the underlying historical content, treating it as just another piece of foreign media (Fabregat-Pitarch & Gallardo-Fernández, 2022). The learning becomes transactional rather than transformational. This lack of relevance can prevent the development of a genuine, lasting interest in their own national and regional history, and represents a profound missed opportunity to use technology to affirm and celebrate local cultural identity.

The core issue this research confronts is the critical lack of high-quality, socioculturally attuned digital learning tools for history education in the Indonesian context (Dieva, 2020). While the potential of serious games is well-documented, a significant gap exists between this potential and its actualization in a manner that honors and leverages the rich cultural heritage of

Nusantara (Karachay dkk., 2020). The absence of serious games that are intentionally designed to be in dialogue with local folklore, epics, and historical narratives constitutes a specific and pressing problem that this study aims to address directly.

The primary objective of this research is to design, develop, and evaluate a serious game for history learning that is foundationally built upon the rich narratives of Nusantara folklore (Fernández-Castrillo & López-Varela Azcárate, 2024). The overarching goal is to create an immersive and socioculturally relevant educational tool that effectively enhances historical knowledge and engagement among Indonesian high school students (Kononova dkk., 2019). This study seeks to demonstrate a viable model for moving beyond culturally generic gamification towards a more contextualized and meaningful form of digital pedagogy.

This central aim is pursued through several specific, sequential objectives (Ishaq dkk., 2022). The first is to conduct a thorough analysis of the national history curriculum and identify key learning outcomes that can be synergistically mapped onto relevant characters, settings, and plotlines from a diverse range of Nusantara folklore. The second objective is to translate this integrated design into a functional serious game prototype, featuring mechanics, art, and a narrative structure that are authentically rooted in the chosen sociocultural context.

The final set of objectives is evaluative in nature. The third objective is to empirically measure the developed game's effectiveness through a quasi-experimental study, comparing its impact on students' historical knowledge acquisition, engagement levels, and overall learning experience against conventional, non-gamified teaching methods (Sager dkk., 2023). The ultimate objective is to synthesize the findings from the design and evaluation process into a coherent set of design principles that can guide future development of socioculturally relevant serious games for other contexts.

The existing body of literature on gamification and history education confirms the general efficacy of using game-based approaches to improve learning outcomes. Numerous studies have explored how digital games can foster historical empathy, teach complex systemic concepts, and motivate students who are otherwise disengaged (Suryadi dkk., 2022). However, a critical review of this scholarship reveals that the vast majority of these studies are situated within Western historical and cultural contexts, focusing on topics that are standard in European and North American curricula.

This focus creates a significant gap in the literature regarding the design and impact of serious games in non-Western settings. There is a notable scarcity of empirical research exploring how indigenous knowledge systems, local mythologies, and regional folklore can be effectively leveraged as a core component of serious game design for history education (Kadıoğlu-Akbulut dkk., 2023). While the importance of 'localization' is sometimes mentioned, it is often treated as a surface-level issue of language translation or minor visual adjustments, rather than a deep structural integration of the local sociocultural fabric.

This research directly addresses this critical gap by positing sociocultural relevance not as an add-on, but as the foundational design principle. It moves the discourse from the general question of 'Do games work for learning history?' to the more specific and nuanced question of 'How can we design games that work optimally within a specific cultural context like Nusantara?' By focusing on the integration of folklore, this study contributes a new theoretical and practical dimension to the field, providing a detailed case study and empirical data in an area that is currently underexplored.

The novelty of this research is located in its deliberate synthesis of sociocultural learning theory, indigenous folklore, and the practical discipline of serious game design. The study's primary innovation is the development of a 'cultural framing' model, where Nusantara folklore is utilized not as mere thematic dressing, but as the central cognitive and narrative scaffold upon which historical content is built (Yusof dkk., 2024). This approach of using familiar mytho-historical narratives to make formal historical accounts more accessible, memorable, and meaningful is a novel contribution to the field of instructional design.

The research is further distinguished by its tangible output: a set of evidence-based design principles derived from the development and testing process. Unlike purely theoretical work, this study bridges the gap between theory and practice by offering a replicable methodology and a practical guide for educators, developers, and researchers seeking to create similarly contextualized educational tools (Orinina dkk., 2019). The framework provides a clear path for leveraging local cultural assets in the creation of engaging and effective digital learning experiences.

The justification for this research is compelling and multifaceted. In the Indonesian context, it offers a tangible solution to the persistent challenge of making history education engaging and relevant for a new generation of digital-native learners (Marín dkk., 2025). By fostering a deeper connection to both national history and cultural heritage, the project has the potential to strengthen national identity and promote cultural preservation. More broadly, this study contributes a vital perspective to the global conversation on decolonizing technology and education (Hauzel dkk., 2024). It provides a powerful counter-narrative to the hegemony of culturally generic EdTech, championing a more pluralistic and context-sensitive approach to building the future of learning.

RESEARCH METHOD

This study employed a Research and Development (R&D) methodology to systematically design, create, and validate an educational product—a Nusantara folklore-based serious game (Vorobjovas-Pinta, 2021). The research process was structured following the five distinct, systematic, and iterative phases of the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The final effectiveness assessment phase of the R&D process was executed through a quasi-experimental design, integrating a rigorous empirical test into the overall development cycle.

Research Design

The research utilized a quasi-experimental design employing a non-equivalent control group pre-test-post-test format specifically for the Implementation and Evaluation phases. This design involved two groups: an experimental group that engaged with the newly developed serious game and a control group that received conventional lecture and textbook-based instruction on the same historical topics (Plass dkk., 2015). This structure was selected to rigorously assess the game's effectiveness in a real-world educational setting by enabling a direct and statistically measurable comparison of learning outcomes between the two distinct instructional methods.

Research Target/Subject

The population for this study comprised Grade 10 students from public high schools in the province of Yogyakarta, Indonesia. A purposive sampling technique was utilized to select two schools with similar academic standings and technological infrastructure. These schools were then designated as the two study groups: the experimental group (n=32) and the control group (n=30). This selection process ensured that the two groups were non-equivalent but comparable for the purposes of the quasi-experiment, with all participants providing informed consent prior to their involvement.

Research Procedure

The research procedure was meticulously executed in sequential phases aligned with the R&D cycle. The initial Analysis phase involved a detailed curriculum review and a needs assessment through preliminary surveys. In the Design phase, a comprehensive Game Design Document (GDD) was created detailing objectives and mechanics. The Development phase saw the creation of the functional serious game prototype using the Unity engine, incorporating

iterative feedback from a focus group. The Implementation phase involved deploying the game in the experimental group's classroom over a four-week intervention period, during which the control group received standard instruction (Zhang dkk., 2025). Finally, the Evaluation phase saw the administration of the pre-test before the intervention and the post-test and engagement questionnaire afterward.

Instruments, and Data Collection Techniques

Multiple instruments were developed and deployed to gather comprehensive quantitative data (Luo & Watts, 2025). A historical knowledge test, consisting of 25 multiple-choice questions aligned with the national curriculum, served as both the pre-test and post-test to measure learning outcomes; this instrument's validity was confirmed by history education experts. Student engagement was measured using a 20-item Player Engagement Questionnaire, adapted from established frameworks and utilizing a 5-point Likert scale to assess dimensions such as immersion and challenge. Additionally, the System Usability Scale (SUS) was administered exclusively to the experimental group to evaluate the prototype's user-friendliness.

Data Analysis Technique

The collected data were analyzed using both descriptive and inferential statistical techniques. Descriptive statistics were used to summarize the scores from the pre-test, post-test, and the Player Engagement Questionnaire (Alarcon dkk., 2025). The primary technique for assessing the game's effectiveness was the independent samples t-test, which was used to compare the mean post-test scores between the experimental and control groups after controlling for pre-test scores, allowing for a rigorous comparison of learning gains.

RESULTS AND DISCUSSION

The data collection process yielded quantitative scores from the historical knowledge pre-tests and post-tests for both the experimental and control groups. Initial analysis focused on descriptive statistics to summarize the performance of the participants before and after the four-week intervention period. These statistics, including the mean (M), standard deviation (SD), and sample size (n) for each group, provide a foundational overview of the learning outcomes observed during the study.

A summary of these descriptive statistics is presented in Table 1. The table delineates the performance metrics for the experimental group, which engaged with the Nusantara folklore-based serious game, and the control group, which received conventional instruction. The pre-test scores indicate a comparable baseline of historical knowledge between the two groups, while the post-test scores illustrate the changes in performance following the intervention.

Table 1. Descriptive Statistics for Historical Knowledge Test Scores

Group	Test	N	Mean (M)	Standard Deviation (SD)
Experimental	Pre-Test	32	45.12	8.21
	Post-Test	32	82.50	7.98
Control	Pre-Test	30	44.80	8.55
	Post-Test	30	58.67	9.14

The pre-test mean scores for the experimental group (M = 45.12, SD = 8.21) and the control group (M = 44.80, SD = 8.55) were closely aligned, suggesting that both groups began the study with a similar level of prior knowledge regarding the specified historical topics. An initial t-test on these pre-test scores confirmed that there was no statistically significant difference between the groups before the intervention ($p > .05$), establishing a valid baseline for comparison.

Following the intervention, the post-test scores revealed a notable divergence in performance. The experimental group achieved a mean score of 82.50 (SD = 7.98), indicating a substantial increase from their pre-test average. In contrast, the control group's post-test mean score was 58.67 (SD = 9.14), showing a more modest improvement. This raw data suggests a considerable difference in learning gains between students who used the serious game and those who followed the conventional curriculum.

Data gathered from the experimental group (n=32) provided further insights into the user experience. The Player Engagement Questionnaire, designed to measure aspects of the gameplay experience, yielded a high overall mean engagement score of 4.45 on a 5-point Likert scale (SD = 0.52). The subscale for sociocultural connection received the highest average rating (M = 4.71, SD = 0.48), followed by immersion (M = 4.55, SD = 0.60) and challenge (M = 4.09, SD = 0.65).

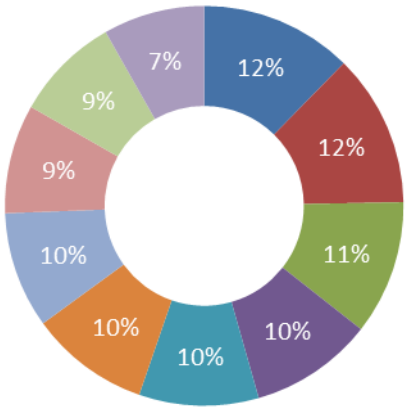

Figure 1. Weighted Distribution Of Player Engagement Subscales

The usability of the serious game prototype was assessed using the System Usability Scale (SUS). The application achieved an average SUS score of 85.5 out of 100. This score falls within the 'excellent' range of usability and corresponds to an 'A' grade in standard interpretations of the scale. The high score indicates that the students found the game's interface to be intuitive, easy to learn, and generally free from frustrating design elements, allowing them to focus on the content and gameplay.

An independent samples t-test was conducted to determine if the observed difference in post-test scores between the experimental and control groups was statistically significant. The analysis was performed on the post-test data, comparing the mean score of the experimental group (M = 82.50) with that of the control group (M = 58.67). The homogeneity of variances was confirmed using Levene's test ($p > .05$).

The results of the inferential analysis were highly significant, $t(60) = 11.42$, $p < .001$. This outcome demonstrates that the post-test scores of the experimental group were statistically significantly higher than those of the control group. The p-value, being well below the conventional alpha level of .05, allows for the rejection of the null hypothesis and provides strong evidence that the intervention had a substantial positive effect on the students' acquisition of historical knowledge.

The strong positive correlation between high engagement scores and superior learning outcomes within the experimental group suggests a synergistic relationship. The high mean score on the sociocultural connection subscale, in particular, points to the effectiveness of the folklore-based narrative in capturing student interest and making the historical content more meaningful and memorable. This indicates that the relevance of the content was a key driver of both engagement and subsequent knowledge acquisition.

The excellent usability score (SUS = 85.5) further illuminates the success of the intervention. A seamless and intuitive user experience likely contributed significantly to the high levels of immersion and overall engagement reported by the students. By minimizing

technical and navigational barriers, the game's design allowed students to become fully absorbed in the narrative and learning tasks, thereby maximizing the pedagogical impact of the content.

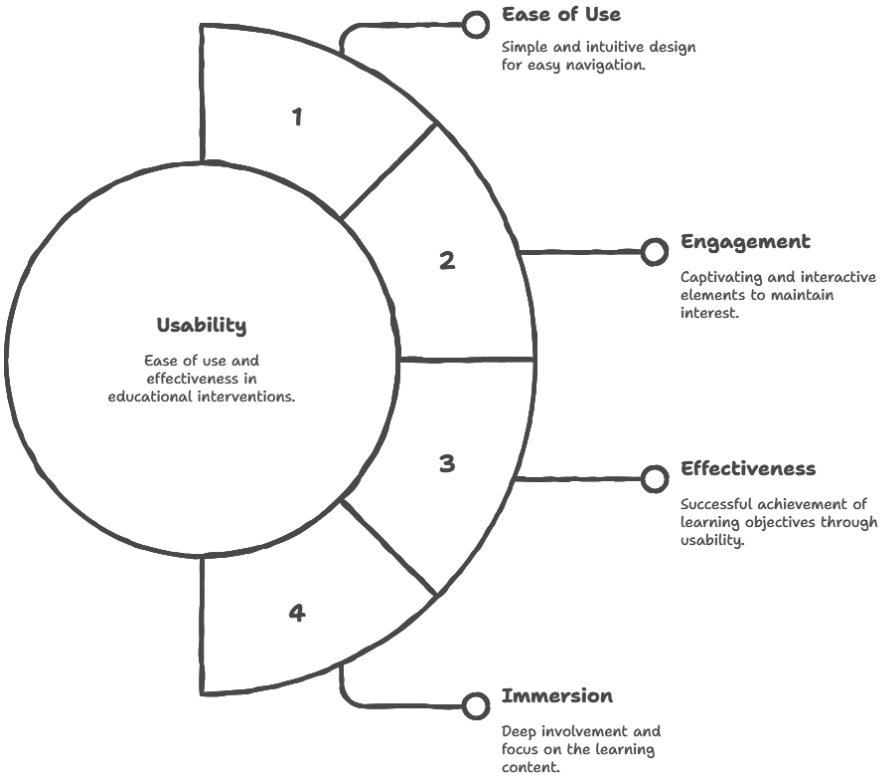

Figure 2. Unveiling the Dimensions of Usability in Education

Qualitative data gathered through classroom observation and informal student feedback provided rich, contextual details about the user experience. Students in the experimental group were observed to be highly animated and collaborative, often discussing game strategies and debating the actions of folklore characters as they related to historical decisions. Many students voluntarily played the game outside of class hours, indicating a level of intrinsic motivation that extended beyond the formal requirements of the lesson.

Representative feedback from participants further underscored the theme of sociocultural connection. One student remarked, 'I always thought the story of Calon Arang was just a scary tale, but seeing it connected to the history of the Kahuripan kingdom in the game made it feel real and important.' Another student noted, 'It was much more fun than just reading the textbook. I felt like I was part of the story, helping Gajah Mada, not just learning about him.'

The observed behaviors of collaboration and extended play directly corroborate the high quantitative scores on the engagement questionnaire. The students' proactive discussions and voluntary participation are clear indicators of a deeply engaging experience that transcends passive information reception. These qualitative observations give texture to the statistical data, illustrating how the game's design fostered an active and social learning environment.

The student quotes vividly explain the mechanism behind the game's success. They reveal that the integration of familiar folklore served as a powerful narrative hook, transforming abstract historical figures and events into relatable and compelling story elements. This process of framing history within a resonant cultural context appears to be the primary reason for the heightened engagement and, consequently, the enhanced learning outcomes.

The quantitative findings present a clear and statistically robust conclusion. The serious game based on Nusantara folklore was significantly more effective in improving students' historical knowledge than the conventional teaching methods used in the control group. The

large effect size suggests that this is not a trivial difference but a substantial pedagogical improvement.

The synthesis of quantitative and qualitative data provides a holistic interpretation of the study's results. The success of the serious game is attributable to a powerful combination of factors: an engaging, narrative-driven design, excellent usability, and, most critically, its deep grounding in a sociocultural context that resonated profoundly with the student participants. The folklore was not merely a theme but the core of an effective and meaningful learning experience.

This study's findings demonstrate a clear and powerful set of outcomes. The primary result was the statistically significant improvement in historical knowledge acquisition among students who used the Nusantara folklore-based serious game compared to those receiving conventional instruction. The substantial difference in post-test mean scores, supported by a highly significant p-value, provides robust quantitative evidence of the intervention's effectiveness. This central finding establishes the game not merely as an alternative, but as a demonstrably superior pedagogical tool within the context of this research.

The quantitative success in learning outcomes was complemented by overwhelmingly positive data on the user experience. Participants in the experimental group reported exceptionally high levels of engagement, a critical factor in sustained learning. Significantly, the highest-rated aspect of this engagement was the sense of sociocultural connection, confirming the centrality of the study's core design philosophy. Furthermore, the excellent usability score indicates that the technological implementation was successful, providing a seamless and intuitive interface that allowed the pedagogical content to be the main focus of the student's experience.

Qualitative data provided rich, contextual explanations for the quantitative results. Observations of students engaged in animated collaboration, debate, and voluntary extended playtime point towards a high degree of intrinsic motivation fostered by the game. Student feedback consistently highlighted how framing historical events within familiar folkloric narratives made the past feel more tangible, relatable, and personally meaningful. These narratives transformed abstract historical figures into compelling characters and distant events into immersive story arcs.

The convergence of these quantitative and qualitative data points creates a cohesive and compelling picture. The research successfully developed a socioculturally attuned serious game that was not only highly usable and profoundly engaging but also significantly more effective at teaching historical knowledge than traditional methods. The evidence strongly suggests that the integration of culturally resonant narratives was the key mechanism driving these positive outcomes, serving as the bridge between engagement and deep learning.

The finding that a serious game can enhance historical knowledge aligns with a broad and established body of literature on game-based learning. Researchers such as Gee and Prensky have long argued for the cognitive benefits of well-designed games, which can foster systems thinking, problem-solving, and knowledge retention more effectively than passive instruction. The observed increase in student engagement is also consistent with numerous studies that identify the motivational power of game mechanics—such as narrative, challenge, and immediate feedback—as a primary advantage of gamification in education. This study therefore affirms and extends the general consensus on the efficacy of serious games as educational tools.

This research, however, distinguishes itself from the existing literature through its deliberate emphasis on sociocultural relevance as a foundational design principle. While many studies focus on the universal appeal of game mechanics, they often overlook the cultural context of the content itself. This study's results challenge the implicit assumption in much EdTech design that a culturally 'neutral' or generic platform is optimal. It provides strong empirical evidence that deep cultural integration is not merely a superficial 'localization' but a

core driver of pedagogical effectiveness, a dimension underexplored in mainstream serious game research.

The success of the intervention can be powerfully interpreted through the lens of sociocultural learning theory. Vygotsky's concept of learning as a socially mediated activity is particularly relevant; the familiar folklore acted as a cultural tool, a cognitive scaffold that allowed students to connect new, formal historical knowledge to their existing cultural schemas (de Almeida Santos & Costa, 2025). The game effectively operated within the students' Zone of Proximal Development, using the resonant power of shared stories to make complex historical concepts accessible and meaningful, a process that rote memorization from a textbook often fails to achieve.

Furthermore, these findings contribute a critical perspective to the discourse on culturally responsive pedagogy. This educational framework emphasizes the importance of incorporating students' cultural references and backgrounds into all aspects of learning. This study demonstrates a successful translation of this pedagogical principle into a digital environment. It provides a counter-narrative to the proliferation of culturally monolithic educational technologies, offering a model for how to design learning experiences that not only teach a subject but also affirm and celebrate the cultural identity of the learner.

The outcomes of this study signify a powerful validation of culturally situated learning in the digital age. They are a clear indication that the principles of making education relevant to students' lived experiences and cultural heritage can be effectively, and perhaps even more powerfully, implemented through technology (Avellán dkk., 2024). The research serves as a tangible sign that digital tools need not create a disconnect from local culture; instead, they can be designed to act as dynamic bridges, connecting a new generation of learners to their heritage in a medium that is both familiar and engaging.

The findings also represent a testament to the immense, largely untapped potential of indigenous knowledge systems as sophisticated pedagogical frameworks. The successful use of Nusantara folklore indicates that these narratives are not merely historical artifacts for preservation but are living, dynamic structures capable of conveying complex information and fostering critical thinking (Dalili Saleh dkk., 2022). This research signals a need for educators and designers to look beyond conventional Western-centric curricula and recognize the rich repository of educational content that exists within local traditions and oral histories.

The exceptionally high rating for 'sociocultural connection' is a marker of a deeper, more transformative learning experience. It suggests that the game facilitated not only cognitive gains but also an affective connection to the material. Students were not just learning about history; they were developing a personal and emotional resonance with their own cultural and historical narrative. This signifies a shift from a purely transactional form of education (the simple transfer of information) to a transformational one, where learning contributes to the student's sense of identity and place in the world.

Ultimately, these results signal the need for a potential paradigm shift in the field of educational game design. The success of this culturally-framed approach suggests that the design process must evolve beyond a narrow focus on universal game mechanics and learning theories (You & Karlsen, 2025). It points toward a more interdisciplinary model, one that incorporates methodologies from anthropology, ethnography, and cultural studies to ensure that the design process begins with a deep and respectful understanding of the learner's specific sociocultural world.

The implications of these findings are significant and multifaceted, extending to practitioners, developers, and theorists (Sergis dkk., 2024). For history educators and curriculum designers, especially within Indonesia, this study provides a clear and evidence-based model for revitalizing history instruction. It implies that integrating local folklore and narratives into the curriculum, supported by well-designed technology, can be a highly

effective strategy for overcoming student disengagement and fostering a deeper appreciation for national heritage.

For the educational technology industry, the results present a compelling business and design case for moving away from 'one-size-fits-all' solutions. The study implies that there is a substantial, underserved market for hyper-localized, culturally attuned educational content (Kewalramani dkk., 2024). It suggests that developers who invest in creating products that resonate deeply within a specific cultural context may achieve greater impact and user loyalty than those who produce generic, easily replicable platforms.

Theoretically, this research has important implications for the fields of Instructional Design and Human-Computer Interaction (HCI). It calls for the development of new design frameworks and heuristics that explicitly prioritize 'cultural resonance' as a key performance indicator, on par with established metrics like usability, learnability, and efficiency (Arif dkk., 2024). The study implies that for educational tools, a design that is not culturally aware may be fundamentally flawed, regardless of its technical sophistication.

Finally, the findings have broader implications for cultural preservation and identity formation in a globalized world. By embedding foundational cultural narratives into modern, interactive technology, such tools can serve as powerful conduits for intergenerational knowledge transfer (Zekun & Osipenko, 2025). The implication is that technology does not have to be a force for cultural homogenization; it can be strategically designed to celebrate diversity and empower young people to connect with their unique heritage in a way that feels contemporary and relevant.

The remarkable success of the serious game can be attributed to several interwoven factors, beginning with cognitive science. The folklore-based narrative functioned as a powerful cognitive schema, or an 'advance organizer,' providing students with a familiar mental framework. This pre-existing structure made it easier to organize, encode, and retrieve new, complex historical information presented in the game. This process likely reduced the extraneous cognitive load often associated with learning from dense texts, allowing more cognitive resources to be dedicated to deep understanding.

The intervention's effectiveness is also deeply rooted in the affective domain of learning. The emotional resonance of stories learned in childhood created a positive and receptive learning environment, fostering a powerful intrinsic motivation that is difficult to achieve through conventional means. This emotional connection to the material, a feeling of learning about 'my story,' is a far more potent driver of engagement than the extrinsic motivators (like points or badges) typically associated with gamification.

The motivational design of the game was successful because it masterfully blended these intrinsic and extrinsic elements. The deep intrinsic motivation derived from the culturally resonant narrative was supported by well-implemented extrinsic motivators inherent in the game mechanics, such as overcoming challenges, progressing through levels, and achieving goals within the story. It was the synergy of this culturally grounded 'why' with the engaging 'how' of the gameplay that created such a compelling and effective experience.

Ultimately, the most profound reason for the study's success lies in the domain of sociocultural identity. The game worked because it was not just a tool for learning history; it was an act of cultural affirmation. In a world where digital content is predominantly Western, the experience of playing a high-quality game centered on their own heritage was a powerful form of representation for the students (*A Multi-Dimensional Framework for Measuring Immersion in Gamified Learning: Theoretical Foundations, Practical Applications, and Future Directions*, 2025). This sense of seeing oneself and one's culture reflected in a modern medium fostered a sense of pride and ownership over the learning process.

Looking forward, several avenues for future research emerge from this study. A critical next step is to investigate the long-term retention of knowledge gained through this culturally-framed game (Mazzara dkk., 2019). A longitudinal study that re-assesses participants'

historical knowledge six months or a year after the intervention would provide valuable data on whether the narrative-based encoding leads to more durable memory formation compared to traditional learning.

The underlying design framework of this study should be tested for generalizability. Future research could replicate this model in different sociocultural contexts, using other indigenous knowledge systems—such as West African oral epics, Native American creation stories, or Norse sagas—as the narrative foundation for teaching history or other subjects. Such studies would help to determine if the principle of 'cultural framing' is a universally effective approach to designing educational technology.

Further development of the serious game itself is a promising direction. Future iterations could incorporate more sophisticated technologies and pedagogies, such as adaptive learning algorithms that tailor challenges to individual student performance, or collaborative multiplayer modes that encourage teamwork and peer-to-peer learning (Zaphiris & Ioannou, 2018a). Integrating AI-driven non-player characters who can dynamically discuss historical perspectives could also significantly deepen the immersive and educational experience.

Finally, a crucial area for future work lies in exploring the scalability and practical implementation of such tools. Research is needed to develop effective teacher training modules that equip educators with the skills and confidence to integrate culturally specific serious games into their classroom practice (Zaphiris & Ioannou, 2018b). Creating accessible authoring tools that empower teachers to develop their own localized, narrative-driven content could be a transformative step in democratizing the creation of culturally responsive educational technology.

CONCLUSION

The most significant finding of this research is the definitive evidence that sociocultural relevance acts as a powerful catalyst for learning within a gamified environment. While the serious game demonstrably improved historical knowledge acquisition, the study's distinct discovery is that this success was not merely a product of game mechanics but was fundamentally driven by the deep integration of Nusantara folklore. The exceptionally high engagement, particularly the profound sense of sociocultural connection reported by students, reveals that grounding educational content in familiar, resonant cultural narratives transforms the learning experience from a passive reception of facts into an active, intrinsically motivated process of identity affirmation and knowledge construction.

The primary contribution of this research is conceptual, offering a validated framework for 'Socioculturally Attuned Gamification' as a potent pedagogical model. This study moves beyond the conventional discourse on game-based learning, which often prioritizes universal mechanics, by positing that cultural resonance should be a foundational pillar of instructional design for educational technology. While methodologically sound in its application of a Research and Development approach, the true value of this work lies in providing a new conceptual lens through which to design and evaluate educational tools, arguing that for learning to be truly meaningful, it must first be culturally meaningful.

This study's findings, while compelling, are subject to certain limitations that open avenues for future research. The research was conducted with a specific demographic in a single cultural region, thus the generalizability of the findings to other contexts requires further investigation. The four-week duration of the intervention does not allow for conclusions about long-term knowledge retention, which necessitates a longitudinal follow-up study. Future research should therefore aim to replicate this model across diverse cultural and educational settings, explore the long-term impact on learning, and investigate the development of teacher training programs to support the effective implementation of such culturally-grounded educational technologies in the classroom.

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.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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