AI-Driven Gamified Learning in Cultural Heritage Education: A Conceptual Framework for Sustainable Civilization

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ABSTRACT

Cultural heritage education plays an essential role in preserving collective memory, strengthening cultural identity, and transmitting values across generations. In the digital era, however, conventional heritage learning often struggles to engage contemporary learners who are more accustomed to interactive, adaptive, and technology-mediated learning environments. This article proposes a conceptual framework for AI-driven gamified learning in cultural heritage education as a pedagogical response to this challenge. Drawing on relevant literature on artificial intelligence in education, AI scaffolding, gamified learning, instructional design, and culturally grounded learning, this conceptual study examines how AI and gamification may be meaningfully integrated to support heritage learning. The discussion suggests that artificial intelligence can provide adaptive support, personalized feedback, and scaffolding, while gamified learning can strengthen motivation, participation, and sustained engagement through challenge-based and interactive learning structures. The proposed framework positions heritage learning input as the cultural foundation of instruction, AI-driven adaptive support and gamified learning design as complementary enabling mechanisms, transformative learning as the pedagogical core, and proximal educational outcomes together with cultural sustainability-oriented outcomes as the expected results. This article argues that AI-driven gamified learning offers a plausible conceptual pathway for making cultural heritage education more engaging, reflective, and relevant for digital-age learners, while indirectly supporting the preservation and transmission of cultural values as part of a broader sustainability-oriented educational practice.

Keywords: Artificial Intelligence, Gamified Learning, Cultural Heritage Education, Conceptual Framework, Sustainable Civilization

I. Introduction

Cultural heritage education plays a vital role in preserving collective memory, strengthening cultural identity, and transmitting values across generations. In the context of accelerating digital transformation, however, conventional approaches to heritage learning often struggle to engage contemporary learners, particularly younger generations who are more accustomed to interactive, adaptive, and media-rich learning environments. This challenge

suggests the need for pedagogical innovation that not only preserves cultural meaning but also recontextualizes it in forms that are relevant to digitally oriented learners. At the same time, current educational discourse increasingly emphasizes that technology integration should support not only access and efficiency, but also critical thinking, media literacy, ethics, and broader twenty-first-century competencies (Fedorov et al., 2016; Okojie et al., 2022; Sugihartini & Yudiana, 2018).

Recent scholarships indicate that artificial intelligence (AI) has begun to reshape education through personalized learning, adaptive support, intelligent tutoring, and data-informed pedagogical decision-making. In higher education, AI is increasingly associated with learner-centered instruction, scalable support, and more flexible digital pedagogies. Nevertheless, the literature also warns that AI adoption should not be treated as a purely technical intervention. Its educational value depends on pedagogical alignment, faculty readiness, institutional support, and governance frameworks that address privacy, integrity, fairness, and accountability (Ahmed & Tariq, 2025; Arunprakash et al., 2026; Panda et al., 2025; Zhuang, 2025). Thus, while AI offers significant opportunities for educational transformation, its integration into culturally sensitive domains such as heritage education requires careful conceptualization and ethical grounding.

Alongside AI, gamified learning has emerged as a promising approach for enhancing student motivation, participation, and positive attitudes toward learning. In higher education, gamification is commonly understood as the integration of game design elements such as points, challenges, feedback loops, levels, and interactive tasks into non-game learning contexts. Existing studies consistently report that well-designed gamified learning can strengthen engagement, increase willingness to participate, and improve learners perceived enjoyment and satisfaction. However, the same body of literature also emphasizes that gamification is not automatically effective; its contribution depends on meaningful alignment between game elements, learning objectives, instructional design, and contextual relevance (Chung et al., 2019; Henry et al., 2024; Muliani et al., 2024; Puspitasari & Arifin, 2023; Setiyanto, 2023; Wiggins, 2016).

For cultural heritage education, this issue is especially important. Heritage learning frequently involves historical narratives, local wisdom, artifacts, traditions,

and symbolic meanings that require not only content transmission but also interpretation, reflection, and emotional connection. If such content is delivered through static or purely expository methods, learners may perceive it as distant from their lived experiences. By contrast, the literature suggests that culturally grounded and interactive learning designs can make local content more meaningful for younger learners. This potential is reflected in studies such as Gamifying Balinese Local Story (Nitiasih et al., 2020) and the broader literature on gamification in history learning, which indicate that culturally embedded gamified approaches can increase learner interest and participation. In practical terms, cultural heritage education may include the learning of local stories, oral traditions, legends, and other value-laden narratives that reflect the identity of a community. In such contexts, AI-driven gamified learning may support adaptive storytelling, interactive quests, and reflective prompts that help learners explore cultural meanings in a more active and personal way. Even so, the available literature remains fragmented, as studies on AI in education, gamification, and culturally situated learning often develop in parallel rather than within an integrated conceptual framework.

A further relevant strand of literature concerns AI scaffolding. Recent studies describe AI-supported scaffolding as a form of adaptive assistance that can provide prompts, feedback, guidance, and metacognitive support during learning processes. Such scaffolding has been associated with improvements in motivation, self-regulated learning, reading comprehension, and cognitive support when designed with appropriate fading mechanisms, human oversight, and pedagogical alignment (Lin et al., 2025; Omar et al., 2025; Sharma & Khadka, 2026; Sun & Liu, 2025). Importantly, this literature also emphasizes that AI should complement, rather than replace, teacher expertise, and that AI-supported learning environments must be guided by ethical, transparent, and human-in-the-loop principles. These insights are highly relevant for heritage education, where interpretation, contextual sensitivity, and value formation remain central educational concerns.

Based on the literature above, a clear conceptual gap can be identified. Existing studies have separately demonstrated the pedagogical potential of AI for personalization and scaffolding, and the motivational potential of gamification for engagement and participation. Other studies have also highlighted the importance

of instructional design frameworks, curriculum alignment, media literacy, and ethical considerations in technology-enhanced learning (Begovic Yahya et al., 2023; Fadhilah Hamid & Sulistyaningrum, 2019; Fedorov et al., 2016; Okojie et al., 2022; Romero-Hall & Li, 2020). However, there remains limited conceptual work that systematically integrates AI-driven support, gamified learning mechanisms, and cultural heritage education within a sustainability-oriented educational perspective. In particular, the literature still lacks a coherent framework explaining how AI-driven gamified learning may foster deeper cultural understanding, meaningful engagement, and long-term value formation that contributes to sustainable civilization.

This article responds to that gap by proposing a conceptual framework for AI-driven gamified learning in cultural heritage education. The article makes three main conceptual contributions. First, it integrates AI-driven adaptive support and gamified learning design into a single framework for heritage education. Second, it distinguishes between proximal educational outcomes, such as engagement, reflective interpretation, cultural understanding, and heritage appreciation, and broader cultural sustainability-oriented outcomes. Third, it positions sustainable civilization not as an immediate instructional effect, but as a normative horizon that may be supported indirectly through culturally meaningful, ethically guided, and technology-enhanced learning practices.

Rather than reporting empirical findings, this paper is developed as a conceptual study grounded in literature synthesis and theoretical analysis. The proposed approach assumes that AI can function as an adaptive and personalized support system, while gamification can provide motivational structure, interaction, and sustained participation. When integrated thoughtfully within cultural heritage education, these elements may create learning experiences that are more engaging, reflective, and meaningful for digital-age learners, while also supporting the preservation and transmission of cultural values. In this sense, the article positions AI-driven gamified learning not merely as a technological trend, but as a pedagogical pathway toward culturally responsive and sustainability-oriented educational practice.

II. Discussion

2.1. Cultural Heritage Education in the Digital Era

Cultural heritage education is not limited to the transmission of historical facts or the introduction of cultural objects. More fundamentally, it functions as a pedagogical process through which learners develop cultural awareness, interpret inherited meanings, and connect the past with present and future civic life. In the digital era, however, this educational function faces a significant challenge. Many learners, especially younger generations, are more familiar with dynamic, interactive, and technology-mediated modes of engagement than with text-dominant or lecture-centered instruction. As a result, heritage education delivered through conventional methods may be perceived as distant, static, or insufficiently relevant to learners lived experiences. This condition underlies the need for instructional approaches that preserve cultural depth while also responding to the characteristics of contemporary learners.

The literature examined in this study suggests that technology-enhanced learning can help address this gap when it is designed with curricular alignment, media literacy, and ethical awareness in mind. Research on learning media and ICT-integrated course design emphasizes that digital learning should not merely add media tools to instruction, but should align learning outcomes, activities, media, and assessment in a coherent pedagogical structure (Begovic Yahya et al., 2023; Fadhilah Hamid & Sulistyaningrum, 2019; Fedorov et al., 2016; Okojie et al., 2022; Sugihartini & Yudiana, 2018). In the context of cultural heritage education, this implies that innovation should not reduce heritage into entertainment content alone; rather, it should support meaningful exploration, reflection, and value formation.

2.2. Artificial Intelligence as Adaptive Support in Learning

One of the most important findings from the reviewed literature is that AI offers strong potential to support learning through personalization, scalability, and adaptive assistance. In higher education, AI has been associated with intelligent tutoring, tailored feedback, automated support, smart classroom practices, and learner-centered digital pedagogies. These functions make AI particularly relevant for educational settings in which learners differ in prior knowledge, learning pace,

and engagement patterns (Ahmed & Tariq, 2025; Panda et al., 2025; Zhuang, 2025). For cultural heritage education, this means that AI may help present heritage content in ways that are more responsive to individual learner needs, interests, and levels of understanding.

More specifically, the literature on AI scaffolding provides a useful conceptual basis for the term AI-driven in the title of this article. AI scaffolding refers to AI-enabled support that accompanies learners during task performance through prompts, hints, adaptive feedback, question guidance, and metacognitive cues. Existing studies indicate that such scaffolding can foster self-regulated learning, motivation, and reflective engagement when it is aligned with learning goals and supported by appropriate fading mechanisms (Lin et al., 2025; Omar et al., 2025; Sharma & Khadka, 2026; Sun & Liu, 2025). Therefore, in the proposed framework, AI is not treated as a replacement for teachers or cultural interpretation, but as a support system that helps learners navigate cultural content more actively and meaningfully.

At the same time, literature also cautions that AI adoption must be guided by governance, ethics, and human oversight. Studies on AI in higher education repeatedly stress that pedagogical benefits will not be sustainable without attention to privacy, fairness, transparency, academic integrity, and institutional readiness (Anggi Fatmadiwi et al., 2025; Arunprakash et al., 2026). This caution is especially relevant in cultural heritage education because heritage content is closely tied to identity, values, and symbolic meaning. Accordingly, AI in this domain should be designed as a human-in-the-loop system that supports interpretation and participation while preserving educator agency and cultural sensitivity.

2.3. Gamified Learning as a Motivational and Participatory Strategy

The second major idea emerging from the literature is that gamified learning can serve as an effective strategy for increasing motivation, engagement, and participation. In higher education, gamification commonly involves the use of points, badges, levels, challenges, quizzes, leaderboards, feedback loops, and interactive tasks within non-game learning environments. Empirical and review-based studies consistently report positive effects on learners' interest, perceived enjoyment, and willingness to participate, although impacts on long-term

achievement are more variable (Chung et al., 2019; Henry et al., 2024; Puspitasari & Arifin, 2023; Setiyanto, 2023; Wiggins, 2016).

For the purposes of this article, gamification is important not because it makes learning entertaining in a superficial sense, but because it offers a motivational architecture that can sustain interaction with learning content. Cultural heritage topics often require sustained attention, interpretation, and emotional connection. Gamified structures such as missions, progress indicators, immediate feedback, and challenge-based exploration can make learners more willing to interact with cultural materials, narratives, and values over time. This is particularly significant when heritage education aims to move beyond memorization toward active participation and reflective understanding.

Literature also provides contextual support for linking gamification with culturally grounded learning. Studies such as Gamifying Balinese Local Story and literature on gamification in history learning indicate that culturally embedded content can be presented through gamified learning designs in ways that enhance learner interest and participation. Although these studies do not yet provide a complete AI-based framework, they demonstrate that local stories, historical content, and cultural narratives are compatible with gamified educational approaches. This supports the argument that gamification can be meaningfully extended into cultural heritage education.

Nevertheless, the literature is equally clear that gamification is not inherently effective in every context. Its success depends on design quality, alignment with learning objectives, instructor readiness, and contextual fit. If game elements are applied without pedagogical coherence, they risk producing only short-term excitement or shallow engagement. For this reason, the present article treats gamification as a strategic pedagogical component rather than as an end in itself.

2.4. Integrating Artificial Intelligence and Gamification in Cultural Heritage Education

The main conceptual contribution of this article lies in the argument that AI and gamification should not be viewed as separate innovations, but as complementary components of a more transformative learning design. Based on the literature reviewed, AI contributes adaptive intelligence, while gamification contributes

motivational structure. AI can personalize pathways, provide timely support, and respond to learner progress. Gamification can organize tasks into meaningful sequences, stimulate curiosity, and encourage continued participation. When combined, these two dimensions can create a learning environment that is both responsive and engaging. This integrated logic becomes particularly relevant in cultural heritage education, where learners may engage with local stories, historical events, cultural figures, heritage sites, or artifacts through challenge-based and interpretive tasks. In such settings, gamification can structure learning through missions, progress indicators, and interpretive challenges, while AI can provide adaptive prompts, personalized guidance, and reflective feedback to deepen learners' understanding of cultural and historical meaning rather than mere factual recall. In this way, heritage content can be transformed into a more interactive, reflective, and meaningful learning experience for digital-age learners.

In cultural heritage education, this integration can be understood as follows. Learners encounter heritage content through curated missions, narrative exploration, or challenge-based tasks. During this process, AI can adjust task difficulty, recommend content, generate adaptive prompts, and provide reflective feedback based on learner responses. Gamification keeps learners engaged through visible progress, recognition, and interactive structure. As a result, heritage learning becomes less static and more dialogic, exploration, and personalized. Instead of passively receiving information, learners actively construct meaning through guided interaction with cultural content.

This synthesis directly addresses the underlying problem identified in the Introduction, namely the mismatch between the importance of cultural heritage education and the limited engagement often produced by conventional approaches. The reviewed literature supports the idea that AI can strengthen responsiveness, while gamification can strengthen motivation. Their integration therefore offers a credible conceptual solution for improving the relevance and educational impact of heritage learning in digital contexts.

2.5. Theoretical Basis of the Proposed Conceptual Framework

The proposed framework is supported by several overlapping theoretical perspectives. First, the literature on AI scaffolding strongly aligns with theories of

self-regulated learning and metacognitive support, because AI can guide learners to plan, monitor, and reflect on their learning processes. Such support is especially relevant in heritage education, where learners are expected not only to know cultural facts but also to interpret and reflect on meanings and values.

Second, the design logic of gamification is compatible with motivational perspectives that emphasize participation, perceived competence, and sustained feedback. The literature repeatedly shows that game elements become educationally meaningful when they structure progression, make achievement visible, and provide timely responses to learner actions. In that sense, gamification supports the development of engagement and persistence, which are essential for deeper interaction with cultural materials.

Third, the instructional design literature provides an important methodological basis for integrating technology into learning. Studies on learning media, syllabus design, and ICT competence integration emphasize the need for alignment among learning outcomes, activities, media selection, and assessment. This principle is highly relevant here because the combination of AI and gamification must remain educationally coherent. The framework proposed in this article therefore assumes that technological elements must be selected and arranged according to cultural learning goals rather than novelty alone.

Fourth, the reviewed literature also supports a human-centered and ethical orientation. AI-driven learning environments must be transparent, equitable, and pedagogically accountable. This orientation is necessary in any educational context, but even more so in cultural heritage education, where issues of representation, identity, and authenticity are especially significant. For that reason, the framework advanced in this article is theoretically grounded not only in adaptive learning and motivational design, but also in ethical educational technology principles.

2.6. Proposed Conceptual Framework

Based on the synthesis above, this article proposes a conceptual framework for AI-driven gamified learning in cultural heritage education that explains how adaptive technology and motivational design may work together to produce meaningful and sustainability-oriented learning outcomes. Rather than viewing artificial intelligence and gamification as separate innovations, the framework

positions them as two complementary pedagogical mechanisms within a culturally grounded learning process.

The framework begins with heritage learning input, which includes cultural content, local narratives, historical materials, artifacts, symbolic meanings, and learner characteristics. This component serves as the epistemic and contextual foundation of the model. Cultural heritage education does not begin with technology itself, but with culturally meaningful knowledge that must be explored, interpreted, and connected to learners' contemporary experiences. For this reason, heritage content functions not merely as subject matter, but as the value-laden basis of the entire learning process.

The second component is AI-driven adaptive support. In this framework, artificial intelligence is understood as a pedagogical support system that can provide personalized prompts, adaptive feedback, recommendations, task adjustment, and scaffolding during the learning process. Its main role is to increase instructional responsiveness by helping learners engage with heritage content according to their needs, prior knowledge, pace, and level of understanding. In this sense, AI supports comprehension, reflection, and self-regulation, especially when learners encounter cultural materials that require interpretation rather than simple factual recall.

The third component is gamified learning design, which includes missions, challenge levels, progress indicators, badges, interactive quizzes, narrative sequencing, and immediate feedback. Within the proposed framework, gamification functions as a motivational and participatory structure rather than as a superficial entertainment device. It is intended to encourage persistence, curiosity, and active learner involvement in cultural heritage learning. Through meaningful challenges and visible progression, gamified design can make heritage content more approachable and engaging for digital-age learners while still remaining aligned with educational purposes.

These two components, AI-driven adaptive support and gamified learning design, are positioned as complementary enabling mechanisms. AI primarily strengthens adaptive, cognitive, and metacognitive support, whereas gamification primarily strengthens motivation, participation, and continuity of engagement. Their integration is important because meaningful cultural heritage learning

requires both guided interpretation and sustained learner involvement. When these mechanisms are pedagogically aligned, they can create a learning environment that is both responsive and engaging.

The fourth component is the transformative learning process, which functions as the pedagogical core of the framework. This process includes engagement, exploration, reflection, interpretation, and active participation in cultural meaning-making. The framework assumes that AI and gamification do not directly produce broad educational or civilizational outcomes on their own. Instead, their educational contribution is mediated through the quality of the learning process they help generate. In other words, technology becomes educationally meaningful only when it supports learners in interacting with cultural heritage more deeply, actively, and reflectively.

From this transformative process emerge a set of proximal educational outcomes, namely increased engagement, deeper cultural understanding, stronger heritage appreciation, and more reflective interpretation of cultural meaning. These outcomes are more immediate and pedagogically observable than broader claims about civilizational impact. They represent the direct learning effects that may result from the integration of adaptive AI support and gamified instructional design in heritage education.

The final component is cultural sustainability-oriented outcomes. In this article, these outcomes include the strengthening of learners' awareness, appreciation, and responsibility toward the continuity of cultural memory, values, and identity across generations. Such outcomes are understood as the most plausible long-term educational contribution of the framework. Therefore, the broader idea of sustainable civilization is positioned not as an immediate instructional result, but as a normative horizon supported indirectly through culturally meaningful, ethically guided, and sustainability-oriented learning practices.

In summary, the proposed framework can be understood as a relational process in which heritage learning input provides the cultural foundation; AI-driven adaptive support enhances responsiveness and reflective guidance; gamified learning design strengthens motivation and participation; both mechanisms jointly shape a transformative learning process; and this process produces proximal

educational outcomes that may contribute to cultural sustainability over time. Through this formulation, the framework offers a more analytically grounded explanation of how AI-driven gamified learning may support cultural heritage education in the digital era. To clarify the relationship among the main components of the proposed model, the framework is visually summarized in Figure 1.

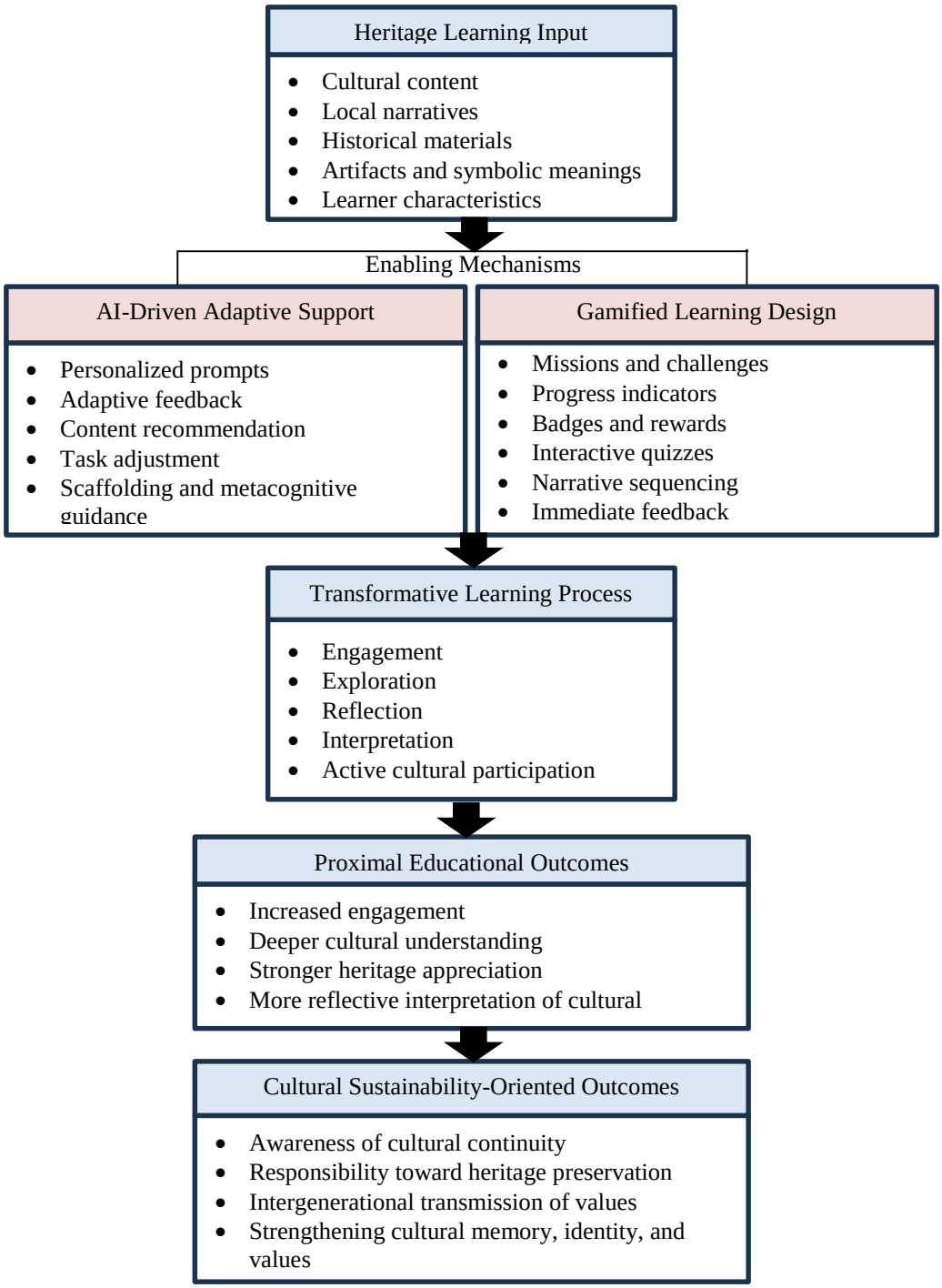

Figure 1. Conceptual Framework of AI-Driven Gamified Learning in Cultural Heritage Education

The framework assumes that proximal educational outcomes do not automatically guarantee cultural sustainability. Rather, they create the pedagogical conditions through which learners may develop a stronger sense of cultural responsibility, continuity, and preservation awareness over time. In this sense, cultural sustainability is understood as a cumulative and mediated outcome rather than an immediate result of a single instructional intervention.

2.7. Contribution to Sustainable Civilization

The phrase sustainable civilization in this article is understood as the continuity of human values, cultural memory, and civilizational identity across generations. From this perspective, educational sustainability is not confined to ecological awareness or resource management. It also includes the capacity of education to preserve, reinterpret, and transmit cultural knowledge in ways that remain meaningful in changing historical contexts. Cultural heritage education is therefore one of the foundations of sustainable civilization because it nurtures memory, identity, belonging, and ethical continuity.

The proposed framework contributes to this agenda in two ways. First, it offers a pathway for making heritage learning more relevant to digital-age learners through adaptive and participatory pedagogy. Second, it positions technology not as an agent of cultural displacement, but as a medium through which cultural continuity can be strengthened. When AI and gamification are used to support reflection, cultural understanding, and responsible participation, they may help connect heritage preservation with educational transformation. In this sense, the framework links digital innovation with cultural sustainability.

2.8. Practical and Academic Implications

Academically, this article contributes by offering a more integrated conceptual basis for understanding how digital innovation may support cultural heritage education. Rather than discussing artificial intelligence, gamification, instructional design, and culturally grounded learning as separate strands, the proposed framework brings them together into a relational model that explains how adaptive support and motivational structure may jointly shape a transformative heritage learning process. In this sense, the article contributes not only by combining concepts, but also by clarifying the pedagogical logic through which AI-driven

support and gamified design may lead to proximal educational outcomes and, over time, to cultural sustainability-oriented outcomes.

The framework also contributes to academic discussion by distinguishing between different levels of educational effect. In particular, it separates immediate learning outcomes, such as engagement, cultural understanding, heritage appreciation, and reflective interpretation, from broader and longer-term outcomes related to cultural continuity and sustainability. This distinction is important because it prevents overly deterministic claims about technology in education and provides a more realistic explanation of how learning processes may contribute indirectly to sustainable civilization.

Practically, the framework implies that educators, curriculum designers, and cultural institutions should approach heritage learning as a process that must be culturally meaningful, pedagogically coherent, and technologically responsible. First, heritage learning design should be learner-responsive, meaning that AI-supported prompts, feedback, and scaffolding are used to accommodate differences in learner needs, prior knowledge, and interpretive ability. Second, it should be motivationally structured, meaning that gamified elements are selected not merely to entertain learners, but to sustain participation, curiosity, and meaningful interaction with cultural content. Third, it should be reflective and culturally grounded, meaning that the learning process should encourage interpretation, dialogue, and appreciation rather than superficial completion of tasks. Fourth, it should remain ethically governed, meaning that AI use must be transparent, culturally sensitive, and subject to human oversight in order to avoid distortion, oversimplification, or inappropriate representation of heritage values.

For cultural institutions and educational practitioners, the framework suggests that the design of AI-driven gamified heritage learning should not begin with technological novelty, but with the identification of heritage content that is educationally meaningful and suitable for guided interpretation. In this regard, technologies should function as enabling tools that strengthen learners' engagement with cultural narratives, artifacts, and values, rather than as substitutes for cultural understanding itself. This implication is especially important in heritage education,

where authenticity, contextual sensitivity, and value transmission remain central concerns.

2.9. Limitations and Future Directions

Because this article is conceptual in nature, the proposed framework has not yet been empirically tested. Its current contribution therefore lies in providing a theoretically grounded model rather than demonstrating verified implementation outcomes. The framework should be understood as a reasoned proposition that requires empirical validation across different educational and cultural settings.

A further limitation is that the framework presents a general model and does not yet differentiate sufficiently among specific implementation contexts. Cultural heritage education may take place in schools, universities, museums, community learning environments, or digital public history platforms, each of which involves different learner characteristics, institutional goals, technological capacities, and forms of cultural engagement. As a result, the applicability and effectiveness of the framework may vary depending on context.

In addition, although the framework explains the complementary roles of AI-driven adaptive support and gamified learning design, it does not yet specify which forms of AI assistance or which gamification mechanics are most effective for particular heritage learning goals. Some forms of gamification may support engagement without necessarily fostering deep cultural reflection, while certain forms of AI support may improve responsiveness but still raise concerns regarding bias, interpretive authority, representation, or cultural authenticity. These issues indicate that the proposed framework remains a broad conceptual model rather than a detailed implementation guide.

Another limitation concerns the relationship between proximal educational outcomes and broader cultural sustainability-oriented outcomes. The framework assumes that increased engagement, cultural understanding, heritage appreciation, and reflective interpretation may contribute to cultural continuity over time. However, this contribution is likely to be mediated by broader curricular, institutional, social, and cultural factors. For this reason, cultural sustainability should not be interpreted as an automatic or immediate result of a single instructional intervention.

Future studies may therefore examine the framework in more specific and comparative ways. Researchers may test its implementation in school-based, higher education, museum-based, or community-centered heritage learning contexts. They may also investigate which AI functions are most effective for supporting heritage interpretation, which gamification elements best encourage reflective rather than superficial participation, and how ethical governance can be maintained in culturally sensitive digital learning environments. In addition, future research may develop measurable indicators for proximal educational outcomes and explore how these outcomes relate to longer-term dimensions of cultural sustainability. Such work would strengthen the empirical and analytical foundation of the conceptual model proposed in this article.

III. Conclusion

This article argues that the main challenge in cultural heritage education lies in the gap between the enduring importance of heritage transmission and the limited engagement often produced by conventional instructional approaches in digital-age learning environments. In response, it proposes a conceptual framework for AI-driven gamified learning in cultural heritage education that positions heritage learning input as the cultural foundation, AI-driven adaptive support and gamified learning design as complementary enabling mechanisms, transformative learning as the pedagogical core, and proximal educational outcomes together with cultural sustainability-oriented outcomes as the expected results.

The discussion suggests that artificial intelligence and gamification should not be treated merely as technological trends, but as pedagogically meaningful components that may support more responsive, participatory, and reflective forms of heritage learning. When aligned with cultural learning goals and ethical principles, their integration may help learners develop deeper cultural understanding, stronger heritage appreciation, and more meaningful engagement with heritage content.

The article further emphasizes that the broader contribution of this framework to sustainable civilization should be understood indirectly. Rather than functioning as an immediate instructional effect, sustainable civilization is positioned as a normative horizon that may be supported through culturally

meaningful, ethically guided, and technology-enhanced heritage learning. Although the framework remains conceptual and requires empirical validation, it provides a theoretically grounded basis for future research and practical development in culturally responsive and sustainability-oriented heritage education.

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