

Game Literacy and Cultural Heritage: Serious Games and Storytelling as Transmedia Educational Tools

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Abstract: This article investigates how serious games and transmedia digital storytelling can enhance game literacy and cultural education. We define game literacy as the ability to interpret and critically engage with games, particularly in educational settings. Serious games, when designed with pedagogical and cultural goals, serve not only to inform but to immerse learners in dynamic, reflective experiences. Integrating storytelling with game mechanics allows users to make meaningful decisions and navigate content actively. We explore how narrative-driven games foster both emotional engagement and critical thinking and we propose a design framework for educational games that emphasizes learner agency, adaptive mechanics, and multimodal interaction. This approach positions the learner as a co-creator of knowledge and a participant in the cultural narrative. We argue that serious games can bridge generational gaps in heritage learning by translating content into the language of digital-native audiences, supporting both preservation and innovation.

Keywords: Game Literacy, Transmedia Storytelling, Cultural Heritage, Serious Games

1. Introduction

Game literacy, the ability to understand and interact critically with digital games, has become an increasingly relevant concept in educational discourse. As digital technologies permeate more cultural and pedagogical domains, particularly in museums and heritage institutions, games are emerging as powerful tools for engaging younger audiences with cultural content. In this context, museum education can evolve from passive information transmission into immersive, interactive, and personalized learning experiences that encourage active participation and critical thinking.

2. Serious Games and Digital Storytelling

The concept of the “serious game” refers to games that serve purposes beyond entertainment. These games integrate pedagogical content with engaging gameplay mechanics to foster learning and critical thinking. When enriched with digital storytelling, serious games transform into participatory environments where users explore, interact, and construct knowledge. In this context, users are not passive spectators but become co-authors of the educational experience, making decisions and solving problems that shape the narrative and deepen their understanding.



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This article explores how serious games can be designed to promote critical literacy, reflective thinking, and active user engagement. It outlines key principles of educational game design and digital storytelling and emphasizes the role of transmediality in contemporary cultural education. Transmediality, as discussed by scholars like Henry Jenkins, involves the extension of content across multiple media platforms, allowing users to explore narratives in multifaceted ways. In educational contexts, transmediality allows for deeper and more diversified engagement, enhancing the capacity of learners to connect knowledge across different formats. Research manuscripts reporting large datasets that are deposited in a publicly available database should specify where the data have been deposited and provide the relevant accession numbers. If the accession numbers have not yet been obtained at the time of submission, please state that they will be provided during review. They must be provided prior to publication. Interventionary studies involving animals or humans, and other studies that require ethical approval, must list the authority that provided approval and the corresponding ethical approval code.

3. Game Design for Heritage Education

Designing serious games for cultural heritage requires a deliberate integration of cultural and historical content with game mechanics that support exploration, decision-making, and problem-solving. Effective educational games must balance cognitive stimulation with emotional and social engagement. Game mechanics must therefore not only entertain but also provoke curiosity, ethical reasoning, and context-based learning. Digital storytelling plays a critical role in this integration. Stories provide emotional and cognitive scaffolding for users to engage meaningfully with cultural content. As noted by Calleja (2011), games transform storytelling into active participation: players become protagonists who influence the unfolding narrative. This interactivity is central to promoting agency and identity construction, allowing players to place themselves within historical or fictional frameworks and reflect on the meanings embedded in them. Well-crafted narratives must go beyond information delivery; they must offer users the opportunity to internalize knowledge through direct, contextualized experience. For example, a game set in a virtual museum may allow users to explore galleries, interact with historical artifacts, and access layered narratives that unfold based on user decisions. These experiences personalize learning, making abstract content tangible.

4. Critical Literacy and Reflective Thinking

Serious games also play a key role in developing critical literacy. By encouraging players to make meaningful choices and face consequences, these games foster metacognitive skills. Users reflect on their actions, reconsider decisions, and develop a deeper awareness of their learning processes. This reflection is essential for cultivating informed citizens capable of engaging critically with cultural and historical narratives. Moreover, the high level of user engagement inherent in games creates a motivational context that is often absent from traditional pedagogies. Players are not just engaged intellectually but emotionally and socially, through sustained interaction with complex, dynamic environments. As they solve problems and explore narratives, they become more invested in the learning journey. This leads to higher retention of knowledge and greater enthusiasm for cultural content.

5. The Role of the Educator

The role of educators in game-based learning environments is equally transformative. Rather than acting as the sole source of knowledge, teachers become facilitators who guide learners through inquiry-based experiences. This shift encourages students to pose questions, explore possibilities, and co-construct knowledge. Game-based pedagogy thus aligns with constructivist and socio-cultural theories of learning, promoting collaboration, critical thinking, and contextual understanding. In a classroom setting, serious games can be used not only as independent learning tools but also as collaborative experiences that foster dialogue, teamwork, and shared exploration. Educators can scaffold these experiences by preparing pre and post-game activities, encouraging students to reflect on their decisions and draw connections between gameplay and curricular content.

6. Design Principles for Effective Educational Games

To fully harness the potential of serious games, designers must adhere to rigorous pedagogical principles. These include:

- Embedding clear learning objectives into gameplay and ensuring they align with curriculum standards.
- Balancing challenge and accessibility so that learners remain motivated and do not experience cognitive overload.
- Designing for inclusivity, with adaptive mechanics to support diverse learners and ensure cultural sensitivity.
- Fostering narrative immersion, ensuring that story and gameplay are integrated and reinforce educational goals.
- Encouraging critical thinking, by incorporating decision-making, branching narratives, and open-ended problem-solving.

Games must also avoid oversimplification or trivialization of cultural topics. The content must be presented with care and depth, ensuring authenticity and respect for the communities and histories being represented.

7. Emerging Technologies and Future Possibilities

Looking ahead, the integration of emerging technologies like augmented reality (AR) and virtual reality (VR) holds significant promise for enhancing the impact of serious games. These technologies can create even more immersive experiences, enabling users to:

- Step inside historical reconstructions
- Engage with AI-generated historical figures
- Participate in role-playing simulations that bridge the gap between past and present

These innovations expand the potential for experiential learning, providing rich multisensory environments that engage both mind and body in the learning process. Projects such as immersive VR museum tours or AR-guided archaeological explorations illustrate the potential of these tools to turn cultural education into a lived, active experience. Coupled with adaptive AI systems, they can offer personalized learning.

8. Contextual Framework and Implementation Strategies

The design and development of interactive systems for accessing and interpreting cultural heritage (CH) is a pivotal step in the digital humanities, merging Artificial Intelligence (AI) technologies with methodologies from game design and digital archaeology. This extended framework introduces Intelligent Museum Assistants (IMAs), embedded within immersive environments and serious games, to transform cultural engagement from passive reception into active, data-informed participation. The approach situates digital interaction within the paradigm of ergodic experience, where meaning emerges through user agency and iterative exploration. Through this process, learners become co-authors of cultural narratives, engaging critically with symbolic representations while acquiring Game Literacy as a form of reflective, embodied learning.

8.1. Architecture and Knowledge Integration

The IMA architecture addresses typical constraints of conventional Large Language Models (LLMs), including limited contextual grounding and the risk of unverifiable responses. Using Retrieval-Augmented Generation (RAG), each user query is contextualized within a specialized heritage knowledge base before the model produces an output, ensuring precision and historical consistency (Barbagallo, Rizza et al.). This modular system operates through a Unity-based front end connected to a distributed backend infrastructure, ensuring scalability and accessibility for educational and museum contexts. Data can also be organized through Knowledge Graphs and Ontologies based on CIDOC CRM, promoting semantic interoperability and adherence to FAIR principles.

8.2 Ethical and Pedagogical Implications

The integration of serious games and IMAs establishes an ethical-pedagogical framework grounded in transparency, scholarly attribution, and cultural sensitivity. Archaeologist-produced 3D assets serve as verified datasets for training generative AI models, mitigating risks of historical distortion (Barbagallo, Stanco et al.). These assets provide ground-truth references that reinforce interpretative authenticity and support the ethical reuse of archaeological data in AI training (Barbagallo, Stanco et al.).

Pedagogically, the system fosters constructivist learning, encouraging learners to explore, hypothesize, and reinterpret heritage within dynamic digital environments. Evaluation metrics combine technical measures (accuracy, retrieval efficiency, response coherence) with user experience indicators (satisfaction, engagement, reflective thinking).

Ultimately, this model advances the role of Digital Humanist, a figure integrating technical literacy, historical expertise, and ethical responsibility, to ensure that cultural heritage in the digital age is both intellectually rigorous and experientially transformative. This convergence of AI, game design, and education thus provides a replicable model for inclusive, intelligent cultural learning ecosystems.

9. Conclusion

In conclusion, serious games and digital storytelling emerge as potent instruments for cultivating critical literacy within the domain of cultural heritage. Their

inherent capacity to promote reflective thinking, foster active engagement, and deliver immersive learning experiences makes them perfectly suited for modern educational environments. Crucially, however, game design must remain tightly focused on achieving meaningful learning outcomes and ensuring a respectful, non-trivializing representation of heritage content.

Looking ahead, the primary challenges involve developing games that are both culturally relevant and pedagogically robust enough to meet the varied needs of diverse learners. Achieving this will require essential collaboration among educators, cultural institutions, and professional game designers to create truly impactful experiences that resonate deeply with new generations.

Ultimately, investing in the design of serious games for heritage is more than just an educational opportunity; it represents a strategic imperative for preserving and actively reimagining our shared cultural legacy in a format, the language of the digital age, that ensures its continuity and relevance.

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