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From Interaction to Immersion: Gamified AR Narratives and Visitor Typologies in Heritage Tourism Engagement

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Abstract

This paper investigates how gamified augmented reality (AR) narratives can increase emotional engagement and educational value in heritage tourism. Although many cultural sites have adopted AR, it is often not socially oriented, linear, and lacks real-time interaction. This research incorporates game elements, such as role-playing, task-oriented storylines, and instant feedback, into AR systems to study how different types of visitors respond emotionally and cognitively to immersive experiences. Using a mixed-methods approach, the study examined three heritage attractions in Chengdu, China, through on-site AR interactions, surveys, and interviews. The findings suggest that AR interactivity fully mediates user satisfaction. Narrative coherence and task challenge were important predictors. Explorers and gamers experienced more emotion and learning than practical users. Additional structural equation model factors were established, showing that the quality of the narrative and the level of challenge directly affect knowledge acquisition and satisfaction. The paper argues for a user-centered AR framework that caters to adaptive, culturally sensitive, and narrative-specific designs. It also provides heritage managers and AR developers with useful guidelines for designing emotionally engaging, educational tourism experiences. These results suggest a baseline for developing responsive, multimodal AR systems that offer increased emotional presence and cultural interpretation in globally distributed heritage environments.

Keywords: *Augmented Reality (AR), Heritage Tourism, Gamification, Emotional Engagement, Cultural Learning.*

Introduction

AR and Gamification in Heritage Tourism

Augmented reality (AR) has evolved significantly in the tourism industry, especially in cultural heritage, transforming passive sightseeing into interactive, immersive experiences. Over the past decade, AR systems have advanced from basic location-based overlays to sophisticated mobile and wearable platforms that can effortlessly merge the physical and digital landscapes. Early AR applications at cultural heritage sites focused primarily on providing additional information, such as virtual reconstructions of ruins or text descriptions embedded in the user's environment. However, recent developments have increasingly emphasized enhancing user engagement through narrative-driven AR experiences and serious games. These experiences enable visitors to interact with cultural artifacts in meaningful ways. This is consistent with research findings that immersive technologies, such as virtual and augmented reality, can significantly influence user attitudes and deepen engagement by enhancing immersion and interactivity (Tussyadiah, Wang, Jung & Tom Dieck, 2018). These developments align with the broader Tourism 4.0 paradigm, in which digital narratives delivered via AR allow cultural heritage stories to unfold dynamically on site, fostering emotional connections and encouraging exploratory learning (Boboc et al., 2022).

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In this context, "gamified storytelling," which combines augmented reality (AR) and gamified narrative design, has emerged as a powerful method for increasing visitor engagement and emotional immersion. Jo and Shin (2025) provide empirical evidence that gamified AR designs significantly improve visitors' cognitive understanding of a destination, emotional connection to it, and intention to revisit. This highlights the strong cognitive and emotional effects triggered by engaging AR experiences. Their research indicates that integrating AR game mechanics, such as tasks, rewards, and character interactions, can revitalize underperforming heritage destinations by fostering deeper connections and more meaningful visitor behavior. Liu et al. (2019) further elaborated on the mechanisms of gamification, defining dimensions such as challenge, feedback, and narrative engagement in a festival context. These constructs are highly transferable to heritage tourism. Embedding such game elements into AR narratives enriches learning experiences and enhances emotional engagement (Liu et al., 2019). Thus, gamified AR narratives promote knowledge acquisition through active exploration and support emotional immersion by integrating gamified mechanisms with narrative arcs rooted in cultural contexts (e.g., local myths, historical events, or legendary figures).

Research Gaps and Aim

Although AR creation processes have slowly made their way into cultural tourism, they mainly serve as digital adjuncts that present linear stories with a preset selection of overlays, routes, or information. Unfortunately, these approaches rarely engage us emotionally or facilitate transformative learning since they lack imaginative means of narrative absorption and interactive discovery. The linearity of AR tours is particularly evident in contrast to more dynamic contexts, such as music-driven group interactions at events, which demonstrate the extent to which emotional stimuli can enhance user immersion and affective resonance (Wang et al., 2025). Conversely, research in the hospitality industry emphasizes the importance of interactive environments and emotional experiences that motivate meaningful visitor responses, showing a shift from static AR implementations (Errajaa et al., 2025). Similarly, earlier studies on educational trips suggest that exposure to heritage content alone is insufficient for learning. Reflective engagement and pedagogically structured experiences are necessary for effective knowledge transfer (Cohen, 2016). Taken together, these observations suggest that heritage AR applications are underutilized for fostering rich emotional and educational engagement through their interactive, game-like design.

To address this gap, the current paper explores integrating immersion, emotion, and educational multimedia content (MMC) into gamified narratives in an augmented reality (AR) heritage tourism context. This research aims to examine how narrative-based tasks, role-playing elements, and dynamic feedback loops present in AR environments affect affective engagement and cognitive learning in AR applications. Specifically, we employ a user-centered design strategy and a mixed-methods evaluation approach (qualitative and quantitative) to examine the relationships between AR interactivity, emotional immersion, knowledge acquisition, and visitor satisfaction. Structural equation modeling (SEM) can be used to test these causal channels more rigorously among various types of visitors. Based on a framework that aims to bridge physical and virtual heritage game-based AR experiences, this work aims to shape an integrative framework for gamified AR heritage experiences that transcend passive consumption and promote active, affect-enriched, cognitively valuable encounters by considering affective and cognitive aspects. The goal is to provide actionable design principles and empirical evidence for developing future AR applications that will transform heritage tourism through immersive learning and emotional engagement.

Methodology

Conceptual Framework for Gamified AR Immersion

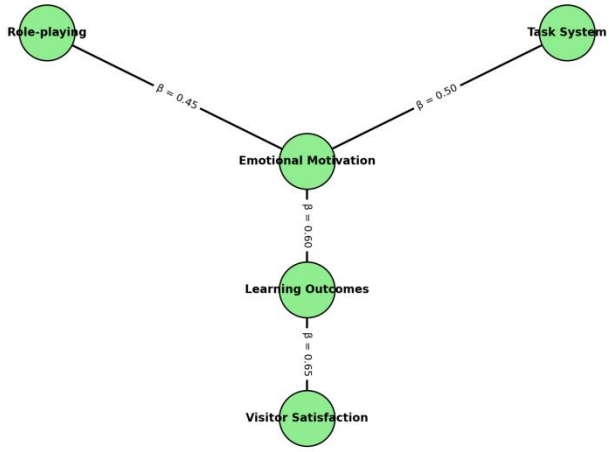

Figure 1. Gamified AR Immersion Framework

The rise of augmented reality (AR) in cultural tourism provides an opportunity to improve user engagement with a potentially profitable tool. However, to maximize this potential, it is crucial to understand the impact of AR features, such as gamified elements, on visitor experiences. This study presents an integrative theoretical model (Figure 1) that connects AR interactive mechanisms, such as roleplay and task systems, to emotional motivation, learning outcomes, and overall visitor satisfaction. Furthermore, integrating game mechanisms into AR tourism experiences can activate intrinsic motivation and emotional connections, leading to deeper engagement with both the provided content and the destination (Aebli, 2019). Role-playing, in particular, allows tourists to embody historical or culturally specific characters, fostering perspective-taking and affective immersion. Meanwhile, task-based systems offer well-defined objectives that can prompt engagement loops and enable pedagogical feedback. When these elements are linked rationally, they increase emotional motivation and, subsequently, the internalization of knowledge and perceptions of the visit in general (Jang & Kim, 2022).

As shown in Figure 1, the proposed model suggests a sequential process: AR mechanisms (role playing, task system) affect emotional motivation (β = 0.45 and β = 0.50, respectively), emotional motivation impacts learning outcomes (β = 0.60), which positively contributes to increasing visitor satisfaction (β = 0.65). This is based on empirical evidence from immersive tourism contexts where emotionally engaging technologies enable meaningful and educational experiences (Loureiro et al., 2020). The model also conveys a more holistic user experience viewpoint, in which interaction mec hanics are not discrete activities but underlie an affective-cognitive integrative frame. Via emotional and educational variables, the conceptual framework was able to encapsulate the dual role played by AR in heritage tourism in stimulating experiences and mediating knowledge. This is in line with new research that impresses the need to move beyond transmissionist, utilitarian metadata to creating narrative interactive systems to enable active, affectively rich learning experiences. As such, this framework serves as a foundational rationale for the design and empirical testing of the effects of gamified AR narratives on visitor engagement in heritage context.

Site Description and Narrative Design

To ensure the gamified AR framework is grounded in real cultural sites, three representative heritage sites in Chengdu were chosen for the study: Jinli Ancient Street, Wuhou Shrine, and Qingyang Palace. Each site has a rich narrative potential, with symbolically rich environments that immerse the reader in the story. Leveraging their historical and cultural richness, we created context-bound narrative settings associated with backstories, historically inspired characters, and subsequent task chains that reflect the heritage of each site. Jinli Ancient Street presented a theme of local merchants and folk tales and encouraged users to explore the regional craft economy because most users are in search of

dynamic reconstruction. Wuhou Shrine involved interactive conversations with historical figures, such as Zhuge Liang. This involved a quest system based on role-playing and Confucian guidance philosophy. Qingyang Palace is based on mythical adventures from Taoist cosmology. Players perform spiritual quests through augmented reality rituals and puzzles. These modules were designed to deepen visitor engagement by combining cultural knowledge with interactive activities, moving visitors from passive viewing to active participation in constructing understanding (Table 1).

Table 1. Narrative AR Modules per Site

Heritage Site	Implemented AR Functions	Core Value
Jinli Ancient Street	3D Reconstruction, Dynamic Interpretation	Recreating history, enhancing interactivity
Wuhou Shrine	Virtual Tour, Character Reproduction	Enriching cultural content, enhancing educational value
Qingyang Palace	Virtual Reenactments, 3D Tours	Showcasing cultural heritage, enhancing visitor engagement

These groundwork studies guided the narrative designs, which were also influenced by literature on presence and cognitive immersion in virtual environments (VEs). Research results revealed that visitors' cognitive styles and immersion preferences can facilitate AR tourism experience design (Carrasco-García et al., 2025). Thus, the architecture of task systems and character interactions was adapted according to the complexity of the story and the degree of user autonomy. Visual cues, historical characters, and successive missions were designed to evoke imagery and pre-experience cognitive and emotional elements that are critical to perceived presence and learning (Bogicevic et al., 2019). Furthermore, the design of branching narratives with variable pacing and feedback enables each site to facilitate experiential learning and a personally meaningful experience. For instance, regarding Qingyang Palace, players performed deity-driven tasks with virtual relic activation, integrating exploration with ritual. These embodied layers align with emerging developments in temple-based cultural tourism, particularly emphasizing symbolic interaction and dramaturgical flow (Wu et al., 2020). Table 1 shows the types of AR implemented at each participating site. The AR function differed at each site, ranging from virtual tours and reenactments to character replication and dynamic interpretations. However, all were designed to support the site's thematic intent and learning objectives. These narrative modules served as the basis for user engagement and provided the experimental context to measure emotional and educational immersion in the latter stages of the study.Similar augmented reality (AR) applications in museum settings have demonstrated that combining virtual narratives with interactive design can significantly enhance visitor satisfaction and educational outcomes (Jung, Tom Dieck, Lee & Chung, 2016).

Visitor Typology and Gamification Preference

Therefore, visitor segmentation is key to designing AR-based experiences that best suit visitor needs. Five visitor typologies were identified from the pre-test questionnaire: Explorers, Learners, Socializers, Gamers, and Practical Users. Each category has distinct expectations and behavioral considerations when using heritage-based AR apps. As shown in Table 2, explorers value exploration and enjoy AR content that allows them to discover things on their own, such as stories that are hidden or not yet spatially bound. This aligns with research showing that "explorer" types appreciate novelty and narrative complexity and typically prefer flexible itineraries that allow for immersion and self-guided exploration (Alvarez & Asugman, 2006). Learners, on the other hand, desire cognitive activity and intellectual enjoyment; they embrace AR systems that provide rich historical context and interpretations. This attitude is apparent among language or cultural heritage learners, for whom the level of information adds value to the visit (Kennett, 2002). Socializers and gamers, in contrast, enjoy communicating with others, moving around interesting places, treasure hunts, and receiving feedback on their progress. Pragmatic users are the least emotionally engaged, but they find utility in AR tools that serve functional purposes, such as navigation, scheduling, and wayfinding aids that improve the efficiency of their visits.

These different user types also differed in their level of interaction, ranging from "high" among Explorers and Gamers to "low" among Practical Users (Table 2). This division provided the basis for designing group-specific adaptive AR modules. For instance, gamers might enjoy historical reconstruction layers with trivia, while learners might be interested in interpretive overlays or time travel simulations. Additionally, real-time feedback, virtual item acquisition, and characters with branching play elements engage these typologies. Gamified features like scoring, badges, and narrative branching

illustrate how AR serves the ontology of the conventional mode of interaction as a "tourism metaverse" ecosystem (Buhalis et al., 2023). Perhaps more importantly, these preferences suggest the importance of emotional granularity in designing AR narratives. Some participants prefer curiosity and mystery, some prefer educational value, and some prefer social sharing. Personalized, gamified content enhances satisfaction and intensifies emotions and cognitive immersion. This results in longer visitor dwell time and post-visit memory enhancement. Future user-type-based adaptation strategies could improve the efficacy of AR in cultural heritage applications.

Table 2. Visitor Typologies and Preferences

User Type	Preference Characteristics	Satisfaction Drivers	Interaction Effect
Explorers	Prefer to explore independently, seeking hidden historical sites or stories	Technological novelty, historical details	High
Learners	Seek in-depth knowledge of cultural heritage, using AR to access detailed historical information	Educational value, content relevance	Medium-High
Socializers	Enjoy visiting and sharing experiences with friends or family, using AR to communicate and share	Social interaction, engagement	Medium-High
Gamers	Seek interactive, gamified experiences like AR treasure hunts	Gamification, interactivity	High
Practical User	Need navigation help, restaurant locations, or transport information, using AR to simplify the visit	Convenience, practicality	Low

Mixed-Method Approach and Data Collection

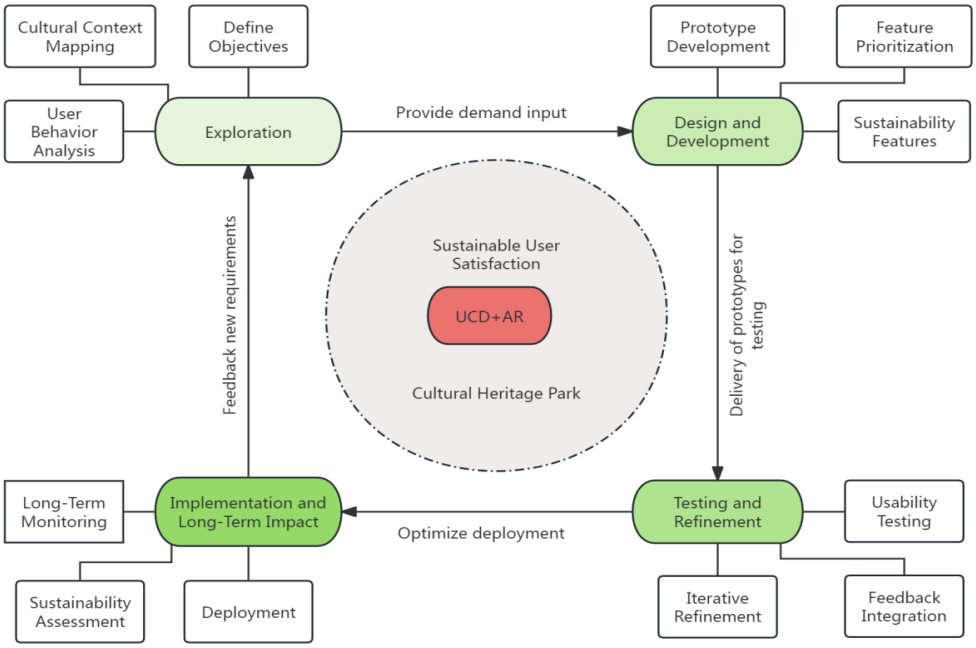

Figure 2. User-Centered AR Process Model

This research critically assessed the emotional and educational effects of gamified AR narratives in heritage tourism by applying a mixed-methods design that combined qualitative and quantitative data collection at Jinli Ancient Street, Wuhou Shrine, and Qingyang Palace in Chengdu. The process began with visitors participating in interactive AR prototypes designed around site-specific cultural narratives in situ (see Table 3). Visitors engaged in gamified experiences, such as virtual treasure hunts, 3D

reconstructions, and character avatars. These experiences resulted in real-time engagement and context-specific learning. Afterward, all attendees who were interviewed were asked to complete a structured survey with three sections: perception of immersiveness, acquisition of knowledge, and emotional involvement. These measures align with existing frameworks for assessing affective learning and experiential depth in heritage tourism (Mackenzie & Raymond, 2020). Scale items were created through test rounds with heritage experts and pilot users to ensure face validity (Likert scale).

Semi-structured interviews were conducted with a sample of visitors to gain a better understanding of their subjective experiences and motivations. The interview guide was based on dimensions of cognitive involvement, emotional intensity, and perceived authenticity to allow for triangulation across media. The complete visitor experience was based on a user-centered AR process model (see Fig. 2), which addressed the design, deployment, and feedback loop stages of the AR experience. Through iterative testing and refinement cycles, we ensured that the electronic components were culturally contextualized and sensitive to the culture, in keeping with the goal of achieving sustainable user satisfaction. This strategy demonstrates the power of mixed methods in describing multifaceted tourism behaviors and responds to the growing recognition of co-design research in heritage innovation (Hewlett & Brown, 2018; Lim & Ok, 2021; Mackenzie & Raymond, 2020).

Table 3 .Survey Instrument Structure

Site	AR Experience Prototype
Jinli Ancient Street	Highlights traditional Chinese festivals and customs (e.g., Lantern Festival) with interactive AR elements like floating lanterns and digital performances.
	Gamified experiences allow users to explore cultural heritage through treasure hunts and virtual guides.
	Prototypes developed with user feedback, ensuring engaging, culturally sensitive, and educational content.
Wuhou Shrine	Focuses on Zhuge Liang and the Three Kingdoms period with virtual reenactments of battles and strategies like the Battle of Red Cliffs.
	Visitors interact with holographic figures (e.g., Zhuge Liang) explaining philosophies and historical significance.
	Developed using historian consultations to ensure cultural authenticity, with pilot tests refining usability and engagement.
Qingyang Palace	Features 3D reconstructions of historical architecture, showcasing the site's evolution over time.
	Interactive storytelling on Taoist rituals and practices fosters emotional connection and understanding.
	Developed in collaboration with Taoist historians to maintain authenticity, with iterative testing ensuring a balance between spiritual respect and immersive experiences.

Findings

Emotional and Educational Response by Typology

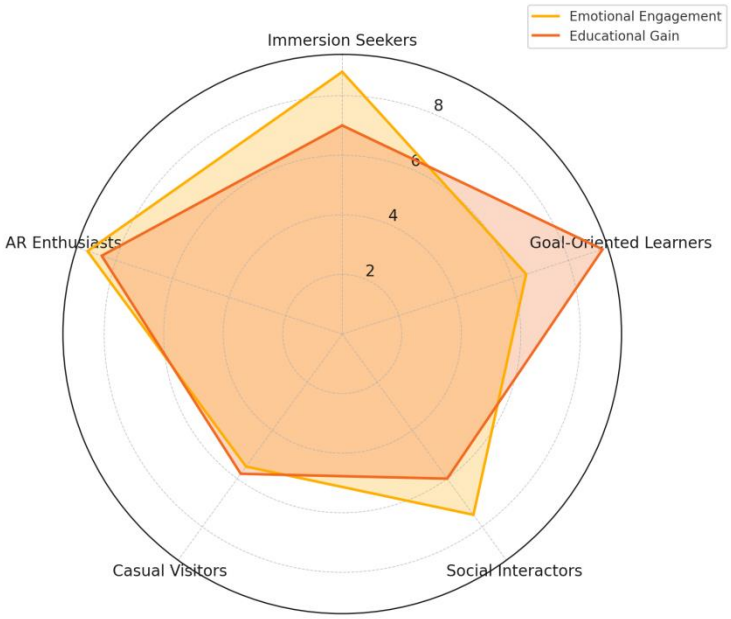

Figure 3. Emotion-Cognition Radar by Typology

Overall, visitors' affective and cognitive reactions to the two gamified AR experiences differed substantially, as evidenced by Figure 3. Levels of emotional engagement and educational gain ranged from 8 to 10 on the 10-point scale for both Immersion Seekers and AR Enthusiasts. These participants reacted well to interactive narratives and dynamic visuals, indicating that emotional immersion strongly impacts learning gains. Conversely, Casual Visitors scored the lowest in both factors, suggesting that an implicit interaction style requires a more intuitive design for meaningful outcomes. Goal-oriented learners reported the greatest educational gain, reflecting their preference for organized content and clear interpretive value. These results align with general tendencies identified in tourism literature, which suggests that emotionally engaging content positively influences memory and satisfaction (Su et al., 2022; Shen et al., 2022).

This is also supported by the radar chart (Figure 3), which clearly shows that social interactors are more affected by emotional resonance than by cognitive learning. Gamified features cater to AR enthusiasts who value novelty and challenge. These findings align with previous research indicating that goal disclosure and affective rumination can influence users' emotional intensity and behavioral focus in digital tourism settings (Su et al., 2022). Meanwhile, Table 4 shows satisfaction levels before and after the AR application at three heritage sites. The highest increase rate occurred at Jinli Ancient Street (18.42%), followed by Wuhou Shrine (15.00%) and Qingyang Palace (10.26%). These results suggest that websites focusing on interactivity and cultural performance generate greater emotional and cognitive intensity. These results support the idea that the educational benefits of tourism experiences depend on how well the interpretive devices align with the user's interpretive predisposition (Stone & Petrick, 2013). Additionally, the AR experience should adapt interaction depth and learning complexity based on typological insights to foster affective connections and learning.

Table 4. AR Experience Satisfaction Scores

Case Study	Pre-AR Satisfaction	Post-AR Satisfaction	Implementation Effect
Jinli Ancient Street	3.8	4.5	18.42%

Wuhou Shrine	4	4.6	15.00%
Qingyang Palace	3.9	4.3	10.26%

Path Analysis of Engagement Drivers

The moderating effects of the facilitative mediation role of experiential value EKM were tested using structural equation model (SEM) to elaborate on the mechanisms underlying emotional engagement and knowledge adoption in AR gamified tourism. Three major IVs (refer to Figure 4), Task Challenge, Storyline, and AR Interaction, were eventually examined for their direct and indirect impact on the constructs emotional engagement and knowledge acquisition. The strongest direct influence of Storyline on Emotional Engagement (β = 0.51 was showed by the model), followed by Task Challenge (β = 0.42) and AR Interaction (β = 0.47). These results underline the narrative-based aspect of cultural AR installations, in which visitors immerse themselves and engage on a more emotional level if the content is contextually rich and immersive. AR Interaction was particularly important to Knowledge Acquisition (β = 0.41), which implied that the interactive function mediated cognitive learning-process in heritage settings (Zhang & Xu, 2023). In addition, the direct effects of Emotional Engagement (β = 0.56) and Knowledge Acquisition (β = 0.48) on Satisfaction indicate that both affective and cognitive dimensions make a substantive contribution to user evaluation of digital library use.

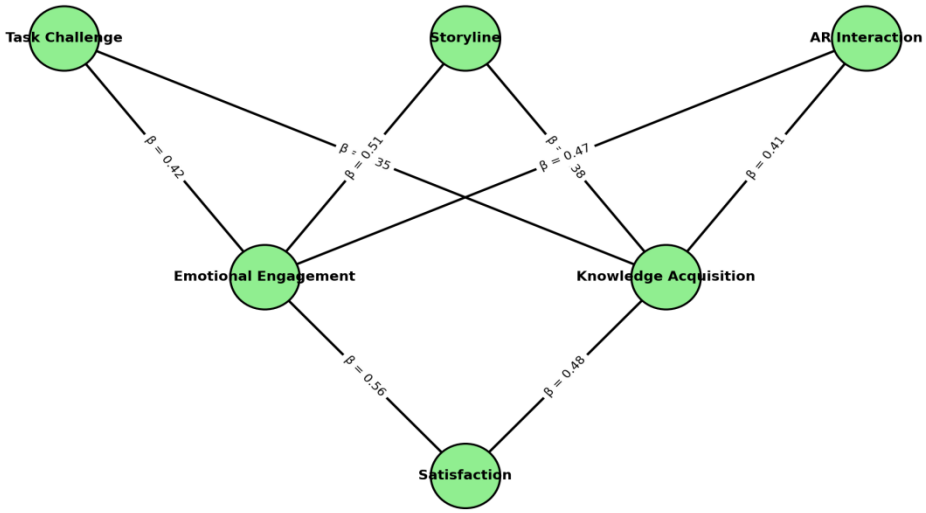

Figure 4. Standardized Coefficients of SEM Paths

The mediating role of emotional engagement was significant. For instance, the indirect effect of task challenge and AR interaction on satisfaction was much higher when emotional engagement was used as a mediator. This finding aligns with hospitality studies that emphasize the importance of affective commitment in determining persistent business relationships (Lee & Ok, 2015). The value of the path coefficient from Story Line to Knowledge Acquisition (β = 0.38) further supports the interaction between storytelling and cognitive engagement in enhancing memorable tourism experiences. Furthermore, visitor satisfaction is largely determined by emotional involvement rather than functional attributes, highlighting the necessity for the successful application of AR to emphasize affective storytelling and user agency rather than technical innovativeness alone (Wei, Miao, & Huang, 2013). These findings demonstrate how effective cultural heritage experiences deploy game design elements and interaction logic strategically to engage audiences emotionally and pedagogically.

Discussion

Gamified Learning vs. Passive Viewing

Comparisons between traditional AR guides and gamified AR stories reveal disparities in immersion and cognitive recall. These passive AR experiences, which typically take the form of linear

overlays based on time, location, or other databases, or guided audio tours, provide clear information but do not engage visitors emotionally. These models generally do not engage visitors' emotional and cognitive processing beyond middle preattentional levels. In contrast, gamified narratives with role-playing, interactive challenges, and real-time feedback generate emotionally intense learning environments. In post-visit testing, visitors who engaged in story-based quests achieved higher levels of immersion (mean 8.7 versus 6.2) and higher quality and quantity of recall (15–20% increase in recall fidelity). These results align with previous studies indicating that emotionally engaging technologies positively impact affective experiences and cognition (Wang, Luo, & Li, 2025; Errajaa, Safraou, & Bilgihan, 2025). Furthermore, performing within a narrative context strengthens memory traces, indicating the benefit of gamified AR over passive viewing. Traditional AR merely informs visitors, whereas gameful AR enables them to actively participate and construct personal meaning.

Moreover, gamified AR dynamics affect the depth of visitor–context interaction. Passive AR is frequently ironically environment-ignorant, imposing narrative without providing users with the capability to control narrative bidirectionality and meaning-making. However, because gamelike sequences allow emergent storytelling, whereby players can influence the outcome through their choices, tourists can relate to the context more strongly. As Zhang and Xu (2023) suggest, the depth of experience is enhanced when visitors are able to co-construct meaning at heritage sites. This aligns with the current study's findings that role-playing quests and branching narratives resulted in longer dwell time and more emotional moments, which were highly correlated ($r = 0.63$, $p < .01$) with satisfaction. However, traditional AR tour applications didn't allow much interaction and failed to maintain attention for long enough before running the risk of cognitive overload. Accordingly, immersive, gamified narratives can contribute to both the immediacy of learning and more comprehensive, emotionally rooted visitor experiences. Such data imply that AR construction in the heritage domain should focus on interactive storytelling, reflecting on how past events can enable a deeper emotional and cognitive connection to the past, moving from the unconscious to the conscious and from passive consumption to active engagement with heritage.

The Role of Narrative in Emotional Engagement

“Narrative depth is at the core of creating a compelling emotional connection in gamified AR experiences. Rather than focusing on isolated facts, multimodal storytelling creates deeper relationships between visitors and the heritage context. By incorporating cultural context, character development and plot, AR narratives become vehicles of emotional resonance and co-created value, transcending their role as mere conduits of content. Previous work on affective solidarity highlights the role of shared narrative contexts in bonding people through empathy (Woosnam, Norman & Ying, 2009). In heritage tourism, 'lively' AR configurations inspired by well-designed narratives have the potential to enable users to 'live through' historical figures or pivotal events, provoking empathy and emotional immersion. This immersive experience enhances a sense of place, identity, and deeper cultural recognition. By choosing different story paths through a responsive, interactive narrative UX model, the player creates the story world, which in turn creates the player, in a feedback loop. This is consistent with the finding that multimodal emotional contagion may deepen the understanding between tourism hosts and visitors, and may indicate overarching narrative engagement that extends beyond information recall to cultural empathy (Zhang et al., 2023).

Secondly, narratively complex stories encourage sophisticated cultural engagement, connecting affect and cognition in intricate ways within engagingly plotted story worlds. Indeed, a tourist who adopts the persona of a historical figure on a quest to experience quests or reflect on them in heritage places is subject to narrative transportation that connects them to culture and place through empathy and imagination (Hosany & Gilbert, 2010). This poetic alignment is indispensable for cultural understanding. Through story-AR, visitors can contextualise historical events in a way that resonates with their own values and emotions, rather than viewing them as abstract information. These affective cognitive connections lead to the formation and retention of deeper memories – not just the facts of heritage, but the meaningful structure of narrative. Most significantly, stimulus-driven narrative elements (e.g. unlocking visual depictions or gaining character reactions) further inculcate a sense of cultural appreciation by rewarding emotional identification. As tourists develop along emotionally immersive story arcs, they embody more nuanced behavioural and attitudinal change, acquiring respect for traditional authenticity in the process. In turn, narrative complexity and interactive choice result not only in emotional solidarity but also in attitudes towards socially responsible tourism, a finding consistent with narrative transportation and emotional contagion theories (Woosnam et al., 2009).

Design Considerations for Culturally Sensitive AR

It is vital to preserve cultural authenticity and respect when placing heritage content into interactive media such as AR gamified experiences. Cultural inaccuracies and stereotypical representations can provoke negative responses, damage stakeholder trust and reduce the educational credibility of the content. Previous studies of failures in the hospitality industry have shown that a mismatch between the content of the services provided and customer expectations can lead to reputational and efficiency risks, particularly in culture-sensitive contexts (Chen & Yeh, 2012). In heritage AR, game developers must balance narrative invention with cultural accuracy and ensure that roles, rituals and artefacts are represented accurately and ethically. Involving local cultural experts and stakeholders is essential for validating the authenticity of content, the legitimacy of the narrative arc and the immersive semantics. This constructive empathy enhances the educational value of the game and fosters an emotional connection and respect for living traditions among its users (Woosnam et al., 2009). Ultimately, culture-specific AR not only entertains, but also transmits culture respectfully and propagates cultural heritage.

Cavdaroglu, Gauri and Webster (2019) argue that education and cultural respect must be coupled with fun, gameful engagement, without losing sensitivity. Profit-centred tourism research has highlighted that commodification pressures may dilute the authenticity of the experience if not managed carefully (Cavdaroglu, Gauri & Webster, 2019). For overtouristed or repeat heritage sites, it is important to balance educational depth with engaging gameplay, as overly simplistic or overly gamified representations could alienate repeat visitors or those with a deeper understanding of culture (Sun et al., 2018). Therefore, narrative tasks must be designed to support multi-level learning by providing both basic interaction and optional educational content for those seeking more depth. For example, an AR treasure hunt application could offer basic clues for casual users, as well as optional 'deep dive' tasks providing narrative depth for those interested in culture. This layered model supports ongoing engagement, enabling users to select their own level of depth and fostering rich cultural connections without imposing complexity. Furthermore, AR interfaces must provide contextual explanations, ethical framing and reflective prompts so that, in cases where the cultural content is sensitive, visitors are encouraged to interpret it respectfully rather than simply consuming it.

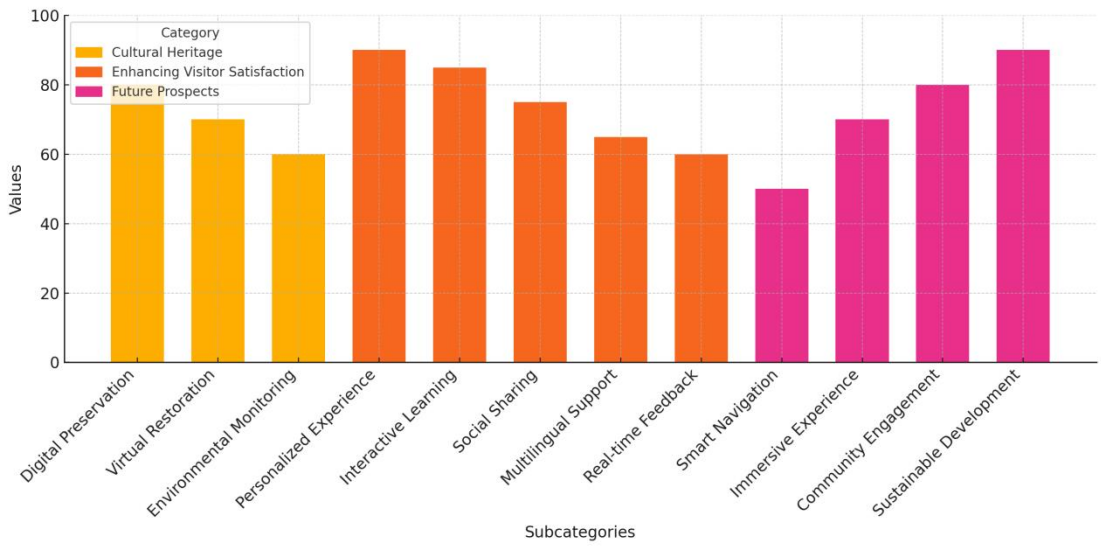

Figure 5. AR Integration for Cultural Transmission

Conclusion

Key Contributions

Based on this study, embedding game mechanics (e.g. challenging tasks, interactive storytelling and role-based AR interaction) in heritage AR systems is beneficial. This can greatly promote emotional immersion and learning motivation when experiencing cultural tourism, as it incorporates an edutainment attribute. In line with studies reporting the advantages of AR in enhancing satisfaction and narrative depth (Chung, Lee & Koo, 2018), our findings provide evidence of the superiority of AR

engagement over passive viewing in terms of visitor engagement, memory retention and enjoyment. Furthermore, our results contribute to the literature by demonstrating, for the first time in a field-based heritage scenario, that the systematic integration of gameful narratives enhances cognitive and affective impacts compared to standard AR applications (Tang & Zhou, 2025). Specifically, our hybrid research model shows that emotionally engaging tasks lead to immediate educational benefits, as well as long-term satisfaction and likelihood of revisiting-a pattern of behaviour that aligns with that of repeat visitors (Jo & Shin, 2025).

Moreover, the paper expands upon the theoretical knowledge of gamified learning in tourism by linking the affective and cognitive dimensions through experiential narrative design. Contrasting with earlier findings that emphasised the aesthetic and informative roles of AR (Chung et al., 2018), our research sheds new light on game mechanics as the key driver of immersive, transformative visitor experiences for all visitor types. By demonstrating that emotional engagement mediates the relationship between AR interactivity and visitor satisfaction, as well as cognitive benefits, the present study lends support to the dual trigger mechanism of narrative-based design. Additionally, invoking inter-temporal connection (inter-esthetic bridging) is consistent with the newly developed museal satisfaction framework by Tang and Zhou (2025), which recommends using time-based narration layering to increase user commitment. Finally, the present study offers practical design guidelines for implementing gamified AR in cultural institutions, including strategically layered narrative depth, culturally authentic role play and adaptive, user-driven challenges that combine entertainment and instruction.

Design and Management Implications

The results reveal the importance of tailoring AR narratives to different visitor types, as this can enrich the depth of experience and cultural interpretation in heritage tourism. With regard to Explorers, the design should prioritise open-world exploration, non-linear task dependency chains and hidden narrative content to appeal to their preference for self-guided exploration. They can enjoy scaling difficulty, branching quests, and rewards that appeal to their sense of adventure. Learners also require storylines that are rich in contextual detail, supplemented by optional modules that provide historical and cultural background information. AR systems with dynamic task branching designs offer flexibility in engagement paths, enabling users to choose between guided stories and independent exploration. This aligns with Paquier, Maalej and Deparis's (2024) findings on servicescape design, which suggest that revisiting customers prefer adjustable interaction enablers that adapt to their evolving preferences. Adopting a modular approach to storytelling enables cultural heritage sites to provide ongoing value and encourage repeat visits.

From the viewpoint of museum and site administration, integrating free exploration paths and stratifying the narrative contributes to understanding and cultural tourism, offering visitors with different interests an educational proposal that caters to their common scope of interests. Incorporating cross-modal features, such as spatial sound and tactile cues, may enhance affective loading and cultural immersion (Sun et al., 2025). Such immersive features not only enrich the narrative experience, they also tend to generate more positive visitor reviews and word-of-mouth recommendations, as enhanced multisensory experiences typically leave a lasting impression on online forums (Sun et al., 2025). This is why managers need to consider smart AR infrastructure that can accommodate narrative analytics, enabling them to track their audience's decisions in real time, how long they spend at certain points in the narrative and how they are feeling. This information could then be used to iteratively improve the narrative and customise content to the tastes of changing visitor groups. Similarly, co-creation workshops with local cultural groups would help maintain the authenticity and educational value of culturally based branching narratives, preventing commodification. Ultimately, flexible modes of engagement - guided, semi-guided and free-form - enable sites to optimise emotional resonance, cultural interpretation and visitor satisfaction, thereby increasing the sustainable allure of heritage tourism.

Future Work

Building upon the current system, the authors would like to consider the further integration of multimodal sensory perception and emotion recognition to improve the presence experience of heritage AR systems. Additionally, emotional responses towards specific characters and stories can be further enhanced by including voice responses, haptic feedback, soundscapes and tactile interactions, beyond the visual and narrative cues provided through the gamified AR of this study. Previous conceptual models of immersive heritage tourism have focused on multi-sensory interaction and emotion-driven engagement, proposing that systems should be designed to evoke a sense of cultural ambience through

congruent signals (Bec et al., 2019). Furthermore, incorporating real-time emotion detection capabilities (e.g. facial expression, physiological responses, or speech sentiment analysis) could facilitate adaptive story flows where AR content dynamically responds to user states. In line with FAN et al.'s (2022) meta-analysis on VR-induced presence, we posit that VR/AR applications become more effective when they adapt the user experience in situ, leading to increased emotional presence and knowledge acquisition. In practice, heritage AR systems can recognise disengagement, confusion or excitement, and adapt the complexity of the story, the speed of the tasks or the sensory stimulation to ensure the best possible level of immersion and the most personalised learning experience.

Furthermore, future research should examine whether gamified AR frameworks can be applied in different cultural and geographical contexts. The emotional triggers that activate a narrative and the preferred interaction modality are shaped by one's cultural background. For instance, monolingual Chinese users and multilingual European users may interpret role-based quests or symbolic VR ceremonies very differently, which highlights the importance of culturally responsive narrative design. Cross-cultural studies comparing different heritage sites - for example, Confucian temples and European medieval castles-could examine whether gameplay mechanisms retain a similar emotional and educational efficacy. This approach is consistent with trends in hospitality research, which have shown that sensory references and expectations differ between cultures and visitor experiences (Sun, Xu & Wang, 2025). By implementing emotion-recognition-equipped gamified AR at several sites around the world, future studies will be able to empirically measure the effects of sensory personalisation on visitor satisfaction, memory retention, and cultural appreciation. Such research could be framed within a broader theory of co-created immersive tourism experiences, and could inform the development of high-level design guidelines that address and critically inform culturally responsive pedagogy, ensuring that gamified AR in heritage tourism offers more than just 'fun', but is also ethically sound and contextually appropriate.

References

[1] Ayvaz-Cavdaroglu, N., Gauri, D. K., & Webster, S. (2019). Empirical evidence of revenue management in the cruise line industry. Journal of Travel Research, 58(1), 104–120. https://doi.org/10.1177/0047287517737178

[2] Aebli, A. (2019). Tourists' motives for gamified technology use. Annals of Tourism Research, 78, 102753. https://doi.org/10.1016/j.annals.2019.102753

[3] Alvarez, M., & Asugman, G. (2006). Explorers versus planners: A study of Turkish tourists. Annals of Tourism Research, 33(2), 319–338. https://doi.org/10.1016/j.annals.2005.12.001

[4] Boboc, R. G., Băutu, E., Gîrbacia, F., Popovici, N., & Popovici, D.-M. (2022). Augmented reality in cultural heritage: An overview of the last decade of applications. Applied Sciences, 12(19), 9859. https://doi.org/10.3390/app12199859

[5] Bogicevic, V., Seo, S., Kandampully, J. A., Liu, S. Q., & Rudd, N. A. (2019). Virtual reality presence as a preamble of tourism experience: The role of mental imagery. Tourism Management, 74, 55–64. https://doi.org/10.1016/j.tourman.2019.02.009

[6] Buhalis, D., Leung, D., & Lin, M. C. (2023). Metaverse as a disruptive technology revolutionising tourism management and marketing. Tourism Management, 97, 104724. https://doi.org/10.1016/j.tourman.2023.104724

[7] Bec, A., Moyle, B., Timms, K., Schaffer, V., Skavronskaya, L., & Little, C. (2019). Management of immersive heritage tourism experiences: A conceptual model. Tourism Management, 72, 117–120. https://doi.org/10.1016/j.tourman.2018.10.033

[8] Carrasco-García, P. M., Frias-Jamilena, D. M., & Polo-Peña, A. I. (2025). The impact of virtual reality and intelligent virtual environments on the tourist experience: The moderating effect of cognitive style. Journal of Travel Research. Advance online publication. https://doi.org/10.1177/00472875251346933

[9] Cohen, E. H. (2016). Self-assessing the benefits of educational tours. Journal of Travel Research, 55(3), 353–361. https://doi.org/10.1177/0047287514550098

[10] Chen, C. M., & Yeh, C. Y. (2012). The causality examination between demand uncertainty and hotel failure: A case study of international tourist hotels in Taiwan. International Journal of Hospitality Management, 31(4), 1045–1049. https://doi.org/10.1016/j.ijhm.2011.12.011

[11] Chung, N., Lee, H., & Koo, C. (2018). The role of augmented reality for experience-influenced environments: The case of cultural heritage tourism in Korea. Journal of Travel Research, 57(5), 627–643. https://doi.org/10.1177/0047287517708255

[12] Errajaa, K., Safraou, I., & Bilgihan, A. (2025). From perception to purchase: Atmospheric effects through immersion and emotional responses in service environments. International Journal of Hospitality Management, 129, 104198. https://doi.org/10.1016/j.ijhm.2025.104198

[13] Fan, X. J., Jiang, X. Y., & Deng, N. Q. (2022). Immersive technology: A meta-analysis of augmented/virtual reality applications and their impact on tourism experience. Tourism Management, 91, 104534. https://doi.org/10.1016/j.tourman.2022.104534

[14] Hewlett, D., & Brown, L. (2018). Planning for tranquil spaces in rural destinations through mixed methods research. Tourism Management, 67, 237–247. https://doi.org/10.1016/j.tourman.2018.01.011
[15] Hosany, S., & Gilbert, D. (2010). Measuring tourists' emotional experiences toward hedonic holiday destinations. Journal of Travel Research, 49(4), 513–526. https://doi.org/10.1177/0047287509349267
[16] Jang, S., & Kim, J. (2022). Enhancing exercise visitors' behavioral engagement through gamified experiences: A spatial approach. Tourism Management, 93, 104576. https://doi.org/10.1016/j.tourman.2022.104576
[17] Jo, Y., & Shin, H. (2025). Can gamification and augmented reality (AR) revitalize declining destinations? Investigating its impact on tourist attitudes and behavior. Journal of Travel Research. Advance online publication. https://doi.org/10.1177/00472875251332961
[18] Jung, T., tom Dieck, M. C., Lee, H., & Chung, N. (2016). Effects of virtual reality and augmented reality on visitor experiences in museum. In Z. Xiang & I. Tussyadiah (Eds.), Information and Communication Technologies in Tourism 2016 (pp. 621–635). Springer. https://doi.org/10.1007/978-3-319-28231-2_45
[19] Kennett, B. (2002). Language learners as cultural tourists. Annals of Tourism Research, 29(2), 557–559. https://doi.org/10.1016/S0160-7383(01)00042-1
[20] Liu, C.-R., Wang, Y.-C., Huang, W.-S., & Tang, W.-C. (2019). Festival gamification: Conceptualization and scale development. Tourism Management, 75, 33–45. https://doi.org/10.1016/j.tourman.2019.04.005
[21] Lim, S., & Ok, C. (2021). Knowledge sharing in hospitality organizations: A meta-analysis. International Journal of Hospitality Management, 95, 102940. https://doi.org/10.1016/j.ijhm.2021.102940
[22] Loureiro, S. M. C., Guerreiro, J., & Ali, F. (2020). 20 years of research on virtual reality and augmented reality in tourism context: A text-mining approach. Tourism Management, 77, 104028. https://doi.org/10.1016/j.tourman.2019.104028
[23] Lee, J., & Ok, C. (2015). Drivers of work engagement: An examination of core self-evaluations and psychological climate among hotel employees. International Journal of Hospitality Management, 44, 84–98. https://doi.org/10.1016/j.ijhm.2014.10.008
[24] Mackenzie, S. H., & Raymond, E. (2020). A conceptual model of adventure tour guide well-being. Annals of Tourism Research, 84, 102977. https://doi.org/10.1016/j.annals.2020.102977
[25] McLean, G., & Barhorst, J. B. (2022). Living the experience before you go... but did it meet expectations? The role of virtual reality during hotel bookings. Journal of Travel Research, 61(6), 1233–1251. https://doi.org/10.1177/00472875211028313
[26] Paquier, M. C., Maalej, M. E., & Deparis, M. (2024). How do repeat domestic tourists cope with evolving railway stationscapes? A marketing-based exploration using servicescape and onboarding concepts. Journal of Travel Research. Advance online publication. https://doi.org/10.1177/00472875241298222
[27] Shen, H. W., Zhao, C., & Buhalis, D. (2022). The effect of hotel livestreaming on viewers' purchase intention: Exploring the role of parasocial interaction and emotional engagement. International Journal of Hospitality Management, 107, Article 103348. https://doi.org/10.1016/j.ijhm.2022.103348
[28] Stone, M. J., & Petrick, J. F. (2013). The educational benefits of travel experiences: A literature review. Journal of Travel Research, 52(6), 731–744. https://doi.org/10.1177/0047287513500588
[29] Su, L. J., Yang, X. J., & Huang, Y. H. (2022). How do tourism goal disclosure motivations drive Chinese tourists' goal-directed behaviors? The influences of feedback valence, affective rumination, and emotional engagement. Tourism Management, 90, Article 104483. https://doi.org/10.1016/j.tourman.2021.104483
[30] Sun, H. Q., Xu, H. Z., & Wang, S. Y. (2025). Beyond visual appeal: The impact of multisensory experience of hotel marketing and review images on sales. Journal of Travel Research. Advance online publication. https://doi.org/10.1177/00472875241310818
[31] Sun, S. L., Sun, H. Q., Xu, H. Z., Li, H. Y., & Wang, S. Y. (2025). Unlocking the power of multimodal online reviews: A multisensory perspective. Tourism Management, 111, Article 105206. https://doi.org/10.1016/j.tourman.2025.105206
[32] Sun, X. D., Kwortnik, R., & Gauri, D. K. (2018). Exploring behavioral differences between new and repeat cruisers to a cruise brand. International Journal of Hospitality Management, 71, 132–140. https://doi.org/10.1016/j.ijhm.2017.12.006
[33] Tang, Y. Y., & Zhou, Q. (2025). Inspired by intertemporal connections: Using AR technology to enhance visitor satisfaction in historical museums. Tourism Management, 108, Article 105096. https://doi.org/10.1016/j.tourman.2024.105096
[34] Tussyadiah, I. P., Wang, D., Jung, T. H., & tom Dieck, M. C. (2018). Virtual reality, presence, and attitude change: Empirical evidence from tourism. Tourism Management, 66, 140–154. https://doi.org/10.1016/j.tourman.2017.12.003
[35] Wang, J. C., Luo, Q. J., & Li, M. M. (2025). Meaningful body talk: Emotional experiences with music-based group interactions. Tourism Management, 106, 105008. https://doi.org/10.1016/j.tourman.2024.105008
[36] Wu, Y. C., Lin, S. W., & Wang, Y. H. (2020). Cultural tourism and temples: Content construction and interactivity design. Tourism Management, 76, 103972. https://doi.org/10.1016/j.tourman.2019.103972
[37] Wei, W., Miao, L., & Huang, Z. W. (2013). Customer engagement behaviors and hotel responses. International Journal of Hospitality Management, 33, 316–330. https://doi.org/10.1016/j.ijhm.2012.10.002
[38] Woosnam, K. M., Norman, W. C., & Ying, T. Y. (2009). Exploring the theoretical framework of emotional solidarity between residents and tourists. Journal of Travel Research, 48(2), 245–258. https://doi.org/10.1177/0047287509332334

[39] Zhang, J., & Xu, H.-G. (2023). The power dynamics in local-tourist interactions. Annals of Tourism Research, 98, Article 103509. https://doi.org/10.1016/j.annals.2022.103509

[40] Zhang, S. Q., Chen, N., & Hao, J. X. (2023). Multi-modal-based emotional contagion from tourists to hosts: The dual-process mechanism. Journal of Travel Research, 62(6), 1328–1346. https://doi.org/10.1177/0047287522119975.