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Analysis of the Experience of Using Augmented Reality Applications for Educational Tourism

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Abstract

This study aims to systematically examine how Augmented Reality (AR) technology influences user experience in the context of educational tourism. The study was conducted using the Systematic Literature Review (SLR) method based on the PRISMA 2020 protocol, reviewing 13 selected scientific articles obtained from the Scopus database over the past ten years. The analysis was conducted using a thematic analysis approach, focusing on the dimensions of interactivity, perceived authenticity, user engagement, and learning effectiveness. The study findings indicate that the use of AR generally enhances the quality of educational experiences for tourists through immersive visual interfaces, integration of contextual narratives, and personalized content. Several theories, including TAM, SOR, UTAUT, and Perceived Authenticity, were consistently applied to explain the relationship between technology and user behavior. However, this study also identified significant challenges, including infrastructure limitations, low digital literacy, and the lack of integration of local cultural values in AR content development. Therefore, it is recommended to develop cross-sectoral strategies and more adaptive methodological approaches to the local context so that AR technology can be applied more widely and inclusively in supporting learning and cultural preservation in the educational tourism industry.

Keywords

Augmented Reality, Educational Tourism, User Experience, Interactivity

1. Introduction

The development of digital technology in the last decade has triggered significant transformations in various sectors, including tourism and education. One technology that has seen increased adoption and exploration is Augmented Reality (AR), which can integrate digital elements into the user's physical environment in real time (Wisnujati et al., 2024). AR has been widely applied in the fields of entertainment, e-commerce, cultural preservation, and specifically in educational tourism, which is a form of tourism that integrates recreational objectives with educational values (Marques & Marques, 2023; Sangadi & Handriana, 2023; Sangadji et al., 2025). In the context of educational tourism, AR enables visitors to interact directly with educational objects and narratives at tourist sites, creating an immersive experience that is not only informative but also enjoyable (Bozzelli et al., 2019). Changes in the behavior of digital tourists, the increasing demand for more personalized tourism experiences, and the growing accessibility of smart devices are external factors driving the increased use of AR. Internally, the need for tourist destinations to maintain their appeal, enhance visitor engagement, and deliver educational content more effectively is driving the integration of this technology as a learning and marketing strategy for destinations.

The main concepts underlying this study include user experience, AR technology interactivity, and learning effectiveness in the context of educational tourism (Istiqlal et al., 2024; Özturan et al., 2024). User experience refers to users' affective and cognitive perceptions and evaluations of a system or application, including ease of use, comfort of interaction, and the level of emotional engagement generated (Berni & Borgianni, 2021). Interactivity is at the core of user experience in AR applications, where users are not merely recipients of information but active actors who explore and manipulate digital information elements (Ramaswamy & Ozcan, 2018). In the context of educational tourism, AR integration enables the delivery of historical, cultural, or scientific narratives in a more vivid manner, enhancing visitors' memory and understanding of the presented material (Spadoni et al., 2022). Therefore, the relationship between these three concepts is the focus of this study, as it influences the overall quality of the learning-based tourism experience.

The increasing use of AR in educational tourism is influenced by various factors, including technological, social, cultural, and economic dimensions. From a technological perspective, advancements in mobile computing, real-time visual processing, and broader internet connectivity have made AR more accessible and usable at tourist locations (Wei, 2019). Socially, changes in information consumption patterns and the expectations of millennial and Generation Z tourists toward engaging and interactive digital content have also been key drivers of AR adoption (Harefa & Nastiti, 2024; Purboyo et al., 2021). Culturally, there is a need to convey local heritage values in a more contextual (Iswanto et al., 2024) and immersive manner, as explored by Leow and Ch'ng, (2021) in the application of AR at cultural heritage sites in Iraq. From an economic perspective, AR serves as a strategic tool to enhance the competitiveness of tourist destinations, expand promotional reach, and improve visitor satisfaction and loyalty (Giaoutzi & Nijkamp, 2017). These factors interact complexly and influence how AR is perceived, utilized, and evaluated by users in the context of educational tourism.

Most studies have focused on the technical aspects of application development or short-term impacts on user engagement, but few have evaluated the overall user experience, including perceptions of content authenticity, cultural relevance, and long-term learning retention. There is a lack of studies that integrate an interdisciplinary approach between technology theory, user behavior, and tourism pedagogy. Additionally, there are geographical limitations in the existing literature, as most studies have been conducted in developed countries with well-established

digital infrastructure, leaving the social and cultural contexts of developing countries largely unexplored. In this context, this study plays a crucial role in addressing these gaps by systematically reviewing the literature on user experiences in the use of AR for educational tourism and identifying the factors influencing the quality of such experiences. This study aims to systematically analyze user experiences in the use of Augmented Reality (AR) applications for educational tourism, using the PRISMA 2020-based Scoping Review method. This study was conducted to understand the key dimensions that shape the quality of user experiences and to identify best practices in the application of AR in the context of educational tourism.

2. Literature Review

2.1. The Rise of Augmented Reality in Tourism

The rapid advancement of digital technologies has transformed the tourism industry, with Augmented Reality (AR) emerging as a powerful tool to enhance visitor experiences (Wei, 2019). AR integrates digital content with the physical environment in real-time, enabling immersive and interactive experiences that combine entertainment with education (Bozzelli et al., 2019). In the context of educational tourism, which emphasizes learning through travel, AR has been increasingly adopted to deliver contextual narratives, historical insights, and cultural knowledge at tourist sites (Marques & Marques, 2023). Studies have shown that AR can enhance the appeal of destinations by offering personalized and engaging experiences, particularly for digitally savvy millennial and Generation Z travelers (Harefa & Nastiti, 2024). However, the application of AR in educational tourism remains varied, with significant differences in adoption across geographical and cultural contexts.

2.2. Theoretical Foundations of AR User Experience

Several theoretical frameworks have been employed to understand user interactions with AR technologies in tourism. The Technology Acceptance Model (TAM) posits that perceived ease of use and usefulness are critical determinants of technology adoption (Wei, 2019). In AR applications, TAM has been used to evaluate how intuitive interfaces and relevant content influence user satisfaction (Wu et al., 2021). Similarly, the Stimulus-Organism-Response (SOR) model explains how AR stimuli, such as interactive visuals, trigger emotional and cognitive responses that shape user behavior (Wang et al., 2022). The Unified Theory of Acceptance and Use of Technology (UTAUT) extends these insights by incorporating social influence and facilitating conditions, which are particularly relevant in tourism settings where peer recommendations and infrastructure play significant roles (Wu et al., 2021). Additionally, Perceived Authenticity Theory highlights the importance of aligning AR content with cultural and historical contexts to maintain the authenticity of the tourism experience (Xu et al., 2022; Hussein et al., 2024). These theories collectively provide a robust framework for analyzing the multifaceted nature of AR user experiences.

2.3. Empirical Evidence on AR in Educational Tourism

Empirical studies have demonstrated AR's potential to enhance educational tourism experiences across various dimensions. Interactivity, a core feature of AR, enables users to actively engage with digital content, resulting in higher levels of engagement and satisfaction (Kim et al., 2022; Chiang et al., 2022). For instance, Spadoni et al. (2022) found that AR applications in science museums increased visitors' understanding of complex concepts through interactive simulations. Similarly, Tongpaeng et al. (2024) highlighted the role of gamified AR in boosting motivation and learning outcomes in museum settings. Perceived authenticity is

another critical dimension, with studies indicating that AR content grounded in local cultural narratives enhances visitors' emotional connection to heritage sites (Hussein et al., 2024; Xu et al., 2022). However, the effectiveness of AR in delivering educational content depends on factors such as interface quality, content relevance, and technological accessibility (Pierdicca et al., 2019).

Geographically, much of the existing research has focused on developed countries with advanced digital infrastructure, such as the United States, South Korea, and European nations (Kim et al., 2022; Müller et al., 2023). In contrast, studies in developing countries, such as India and Iraq, have emphasized challenges related to limited internet connectivity and low digital literacy (Thangavel et al., 2025; Hussein et al., 2024). Methodologically, quantitative approaches dominate the literature, with surveys and experiments used to measure user perceptions and behavioral intentions (Wang et al., 2022; Wu et al., 2021). Qualitative studies, while fewer, have provided deeper insights into the subjective aspects of AR experiences, particularly in cultural preservation (Leow & Ch'ng, 2021).

3. Methods

This study uses a Systematic Literature Review (SLR) approach with reporting guidelines from PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to systematically review literature relevant to the topic of user experience in the use of Augmented Reality (AR) in educational tourism. This approach was chosen because it provides a systematic, transparent, and replicable framework for identifying, screening, and synthesizing available scientific evidence. The use of this method aims to obtain a comprehensive understanding of trends, challenges, and previous research contributions to the use of AR in educational tourism. The literature search was conducted using the Scopus database, which was selected for its broad coverage, high-quality articles, and international recognition in the fields of technology, education, and tourism. The keywords used include a combination of terms in English: ("Augmented Reality" OR "AR") AND ("Interactive" OR "Features") AND ("Data" OR "Information") AND ("Tourism" OR "Experience") AND ("Trust" or "Technology"), combined using the Boolean operator AND to narrow the search to relevant articles, and OR to broaden the scope to include synonyms of related concepts. The search was conducted systematically to find articles that are conceptually and methodologically relevant to this study (Siregar & Selwendri, 2024).

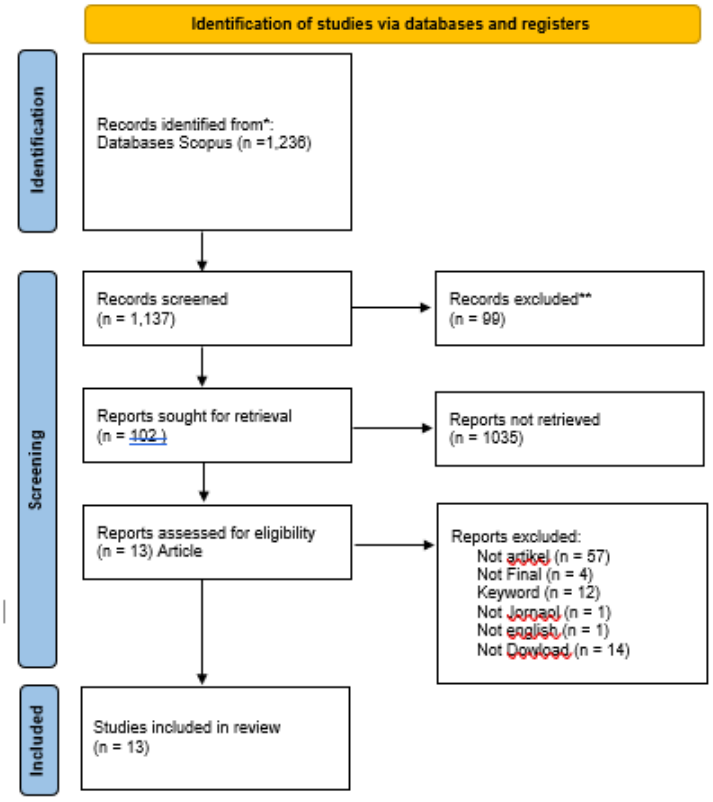

Figure 1. PRISMA Diagram of Study Selection

4. Results

The article selection process was conducted based on the PRISMA 2020 protocol. In the identification stage, 1,236 articles were found through the Scopus database. After the initial screening process to eliminate duplicates and irrelevant articles, 1,137 articles were further selected. Of these, only 102 articles were fully accessible for content review. During the eligibility evaluation stage, 89 articles were excluded for the following reasons: not scientific articles (n = 57), not final versions (n = 4), not relevant to the keywords (n = 12), not contextually appropriate (n = 1), not in English (n = 1), and unable to be downloaded (n = 14). Thus, a total of 13 articles meeting the inclusion criteria were analyzed in this study. The entire selection process was systematically presented using the PRISMA diagram to ensure transparency and accuracy in literature selection.

The extraction results show that research on the use of Augmented Reality in the context of educational tourism has been conducted in various countries with different cultural and technological backgrounds, such as India, China, Iraq, Brazil, and European countries. Most studies adopt diverse theoretical approaches, ranging from constructivism and experiential learning theories to user behavior models such as SOR, TAM, UTAUT, and TOE Framework. Frequently emerging themes include interactivity, perceived authenticity, user engagement, and the effectiveness of information conveyed through AR technology. Common findings indicate that AR has a positive contribution to improving understanding, user satisfaction, and the attractiveness of tourist destinations, especially when combined with visual elements, location, or (Putri & Purnawarman, 2024).

Table 1. Literature Analysis Results

Author	Research Title	Theory Used	Research ocation
Thangavel et al. (2025)	Revolutionizing Education Through AR and VR: Innovations, Challenges, and Future Prospects	Constructivism Theory, Experiential Learning, Cognitive Load	India
Wang et al. (2022)	AR App Use in the Beauty Product Industry and Consumer Purchase Intention	Model SOR (Stimulus-Organism-Response)	Korea and China
Poushneh & Vasquez-Parraga, (2024)	The Effect of Semiautonomous AR on Customer Experience and Augmentation Experience	User Experience Theory	United States
Hussein et al. (2024)	AR as a Tool for Improving Perception of Authenticity of Built Heritage Sites	Theory of Spatial Perception and Digital Technology	Iraq
Kim et al. (2022)	How AR Can Improve E-commerce Website Quality Through Interactivity and Vividness	Theory of Interactivity and Vividness	South Korea and the United States
Wu et al. (2021)	The Acceptance of AR Tour App for Promoting Film-Induced Tourism	UTAUT (Unified Theory of Acceptance and Use of Technology)	China
Pierdicca et al. (2019)	eTourism: ICT and Its Role for Tourism Management	No specific theory mentioned	Italy
Chiang et al. (2022)	AR Interactive Technology and Interfaces: A Construal-Level Theory Perspective	Construal-Level Theory (CLT)	Taiwan and New Zealand
Pandey & Pandey (2025)	Unveiling the Transformative Power of AR in Retail	No specific theory mentioned.	India
Xu et al. (2022)	When Historically Cultural and Creative Products Meet AR	Perceived Authenticity Theory	China
Wei (2019)	Research progress on VR and AR in tourism and hospitality: A critical review of publications from 2000 to 2018.	Technology Acceptance Model (TAM)	Brazil
Tongpaeng et al. (2024).	Comparison of Gamified and Non-Gamified Mixed Reality in Enhancing Museum Visitor Engagement	No specific theory mentioned.	Thailand
Müller et al. (2023)	Development of an AR Remote Maintenance Adoption Model	TOE (Technology–Organization–Environment) Framework	United Kingdom and Germany

In terms of methodology, most articles use a quantitative approach based on surveys or experiments, with a primary focus on user experience and its influence on

perceptions, behavioral intentions, and engagement. Some articles combine qualitative approaches to explore the subjective aspects of AR use, particularly in the context of cultural preservation and museums. Factors frequently identified in these studies include interface quality, ease of use, clarity of digital narratives, and integration of authentic local content. There is also attention to technical and cultural challenges in AR implementation, such as limitations in digital infrastructure and the risk of diminishing the authentic value of cultural heritage. These results provide an understanding that AR in educational tourism is not merely a visual tool, but also an educational and interactive medium capable of shaping richer and more immersive user experiences (Putri & Purnawarman, 2024).

5. Discussion

A systematic review of 13 articles analyzed shows that the use of Augmented Reality (AR) technology in educational tourism has significant potential to enhance user experience. Several studies emphasize the role of AR in creating more immersive and interactive learning experiences, particularly through interfaces that integrate visual elements and real-time location context Tongpaeng et al., (2024) ; Poushneh & Vasquez-parraga, (2024) . This technology not only presents information statically but also allows users to interact directly with digital objects embedded in the real environment. In this context, the application of constructivism theory and experiential learning has proven effective in explaining how users construct meaning during the exploration process at educational tourism destinations (Thangavel et al., 2025). This is further supported by study results indicating that high interactivity, intuitive interface design, and gamification elements can enhance motivation, engagement, and user satisfaction during the use of AR applications in a tourism context (Chiang & Chung, 2022).

Further analysis indicates that the quality of the user experience is significantly influenced by several technical and contextual factors. Factors such as visual realism, content personalization, and location-based navigation are key elements in creating meaningful and enjoyable experiences (Wang et al., 2022). Research by Wu et al., (2021) and Kim & Park, (2023) suggest that when AR interactive features are developed with consideration for user expectations and behavior, the adoption rate and intention to continue using the technology increase significantly. Additionally, studies by Xu et al., (2022) and Hussein et al., (2024) emphasize the importance of presenting content that is sensitive to local cultural and historical values, as inconsistencies in the narrative context can reduce perceptions of authenticity and even lead to biases toward cultural heritage. Therefore, the integration of technology, local narratives, and participatory approaches is an important aspect that needs to be considered in designing AR applications for educational tourism (Arevin, 2024).

Although findings from various studies indicate numerous benefits of AR usage, there are still significant implementation challenges. Research by Maria & Costa, (2023) and Pandey, (2024) suggests that limited technological understanding and low digital literacy among certain segments of the population pose barriers to widespread AR adoption. Additionally, infrastructure factors such as limited internet connectivity and reliance on high-tech devices further restrict the penetration of this technology, particularly in tourist destinations that are not yet digitally integrated. A study by Müller et al. (2023) emphasizes the importance of organizational readiness and external environmental support, as outlined in the TOE Framework, to ensure the successful adoption of AR technology. Therefore, adaptive strategies are needed through cross-sector collaboration, the development of multiplatform content that is compatible with low-specification devices, and training for destination managers to effectively utilize AR (Pierdicca et al., 2019). This approach

is expected to expand the benefits of AR technology not only in the educational aspect but also in cultural preservation and sustainable tourism development.

6. Conclusion

This study confirms that Augmented Reality (AR) contributes significantly to enhancing user experience in educational tourism, particularly through increased interactivity, perceived authenticity, and learning effectiveness. Findings from the 13 reviewed articles indicate that interface design, cultural contextualization, and integration of interactive features are key factors in creating immersive and meaningful experiences. However, challenges such as limited digital infrastructure, low technology literacy, and lack of integration of local values remain obstacles to the optimal implementation of AR. Therefore, the development of more inclusive methodologies, interdisciplinary approaches, and collaboration between developers, academics, and tourism destination managers is needed to ensure that AR can be implemented effectively, adaptively, and sustainably in various contexts.

The findings of this study have important implications for stakeholders in educational tourism, including destination managers and technology developers, by highlighting the need for culturally sensitive and user-centric AR applications to enhance visitor experiences. However, this study is limited by its reliance on literature from the Scopus database, which may exclude relevant studies from other sources, and its focus on articles published in English, potentially overlooking valuable research in other languages. Additionally, the geographical scope of the reviewed studies is predominantly centered on developed countries, limiting insights into developing regions. Future research should adopt a more inclusive approach by incorporating diverse databases, multilingual studies, and contexts from developing countries to provide a more comprehensive understanding of AR's global applicability. Furthermore, longitudinal studies exploring the long-term impact of AR on learning retention and cultural preservation are recommended to address the current gap in sustained user experience evaluation.

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