



# Cross-Cultural Learning to Promote Global Citizenship Using Immersive Technology: A Systematic Literature Review

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**Abstract.** This Academic Short Paper contains a literature review conducted to examine the theoretical foundations of cultural learning, how immersive technologies have been used for these purposes, and the challenges and opportunities in the future. This systematic literature review investigates how immersive technologies, such as virtual reality (VR), augmented reality (AR), and mixed reality (MR), can be leveraged for culturally immersive learning that promotes cultural competence, cultural intelligence, and a global mindset. Studies on immersive technologies for culturally immersive learning were selected using search terms within Google Scholar and Scopus like “cultural competence,” “virtual reality,” and “global citizenship,” excluding literature that did not address immersive technologies or cultural education. The research reflects diverse learners across educational settings, analyzing quantitative and qualitative outcomes. Key findings reveal theoretical foundations and recent frameworks for developing cross-cultural skills-based content. Along with great potential, there are challenges in access, ethics, and scalability. Future directions for research, policy, ethical considerations, and institutional support are discussed with insights for improving educational practices and policies to prepare learners for an interconnected world.

**Keywords:** Immersive Technologies, Cultural Competence, Global Citizenship.

## 1 Introduction

Promoting cross-cultural learning and global citizenship in education presents significant challenges due to financial, geographical, and logistical barriers that limit traditional international exchange opportunities. The complexity of developing cultural competence (CC), cultural intelligence (CQ), and a global mindset (GM) requires innovative approaches to create meaningful international experiences accessible to all students. Recent advancements in immersive technologies such as in virtual reality (VR), augmented reality (AR), mixed reality (MR), and extended reality (XR) offer promising solutions to democratize access to international education and facilitate meaningful cultural exchanges from anywhere in the world. This review investigates how VR, AR, MR, and XR technologies can be leveraged to create culturally immersive learning experiences, highlighting the complexities of integrating technological tools with cultural understanding. It examines the theoretical foundations of CC, CQ, and GM, along with the frameworks supporting the use of immersive technologies in promoting these competencies for global citizenship. Additionally, it explores the challenges, limitations, and future directions for using immersive technologies in cross-cultural education. This paper will include definitions of terms, an explanation of the methodological approach, discussion of the results, limitations, and conclusions drawn from the analysis.

### 1.1 Cross-Cultural Learning

Cross-cultural learning involves developing several key competencies that promote global citizenship, including cultural competence, cultural intelligence, and a global mindset, which are the focus of this study. Cultural competence, as described by Deardorff, refers to the ability to effectively navigate and interact within diverse cultural contexts [5]. Cultural intelligence, based on the framework by Ang et al., emphasizes the capability to

adapt and function effectively across various cultural settings [1]. A global mindset, as outlined by Javidan and Walker, broadens this perspective, enabling individuals to recognize, understand, and leverage cultural differences in an interconnected world [11].

Related frameworks, such as Bennett's Developmental Model of Intercultural Sensitivity and Shen's Model of Cultural Competence, inform these competencies by highlighting the progression from cultural awareness to intercultural adaptability [4,17]. The emerging concept of cultural humility, discussed by Lekas et al., adds a reflective dimension, encouraging lifelong learning in intercultural contexts [12].

Traditionally developed through study abroad and direct international experiences, these competencies face accessibility challenges due to financial, geographical, and logistical barriers. However, advances in immersive technologies offer alternative pathways for developing these skills. Through these technologies, learners can engage in cultural encounters and practice cross-cultural competencies in safe, controlled environments [13].

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## 1.2 Problem Statement

Traditional approaches to building CC, CQ, and GM, such as study abroad programs, face limitations due to financial and logistical barriers [14]. This systematic literature review investigates what the literature says about immersive technologies relationship to culturally immersive education and global citizenship without physical travel.

## 1.3 Research Questions

- What does the literature say are the theoretical foundations and frameworks for creating culturally immersive learning environments that enhance CC, CQ, and GM?
- What does the literature say about how VR, AR, MR, and XR technologies can be leveraged to design culturally immersive learning experiences?
- What are the challenges, limitations, and future directions for utilizing immersive technologies in cross-cultural education?

## 2 Applications of Immersive Tech in Cross-Cultural Learning

To evaluate the role of immersive technologies in promoting CC, CQ, and GM, it is essential to define and understand the specific applications of VR, AR, MR, and XR. The design of culturally immersive digital learning environments warrants as much care as student learning objectives. Therefore, understanding each of their unique features and affordances can lay the groundwork for selecting the appropriate tools for cross-cultural learning.

The COVID-19 pandemic has accelerated the digital transformation of education [13,15] and highlighted the crucial need for effective remote learning solutions. The increasing standardization of digital collaboration and remote work within international teams has made navigating diverse cultural contexts increasingly vital across industries. Recent developments in XR have expanded the application of immersive technologies across various fields, including healthcare, engineering, the arts, design, and business [8], demonstrating their potential for bridging physical distances and promoting cultural exchange.

In subject areas like the humanities, immersive learning brings history and cultural experiences to life, offering students an interactive way to learn about different cultures and historical events [8]. By establishing secure virtual environments, students can engage with diverse cultures, navigate intercultural challenges, and learn from these encounters without facing the tangible consequences of cultural missteps [13]. This experiential understanding of other societies can prepare learners to navigate the complexities of life in an increasingly globalized world [16].

Our previous systematic effectiveness evaluation and descriptive feature analysis of readily available AR and VR experiences that provided cultural or historical immersion to varying degrees revealed both promises and limitations [9]. Using Dede's seven criteria [6], we evaluated a sample of 12 diverse remote international experiences utilizing VR, AR, and 360° video, finding that highly immersive VR experiences excelled in overall effectiveness and knowledge transfer but often lacked customization capabilities. Conversely, more affordable and scalable AR experiences frequently fell short in interaction, knowledge transfer, and customization options [9]. These findings highlighted significant gaps in our understanding of how to optimize these technologies for cross-cultural education.

This systematic literature review investigates how immersive technologies can be leveraged for culturally immersive learning that promotes cultural competence, cultural intelligence, and a global mindset. Through

analysis of theoretical foundations and frameworks across diverse educational settings, outcomes related to access, ethics, and scalability are examined to offer insights for enhancing educational practices and policies that foster global citizenship.

### 3 Methodology

The following sections will describe the methodology that was used to conduct this research.

#### 3.1 Literature Identification Process

To answer these questions, this research undertook a literature review and critique to determine what has already been done in this area and explore the field. The following systematic search strategy was employed to identify relevant literature:

- **Database Selection:** The primary database used was Google Scholar, as it offers broad coverage across interdisciplinary research. Scopus was also included to ensure a focus on reliable, peer-reviewed studies for its indexing of high-quality research.
- **Search Terms:** The search terms were grouped by categories to align with systematic literature review practices.

**Table 1.** Dataset of Search Strings for Systematic Literature Review.

Database	Search String
Google Scholar	("Cultural Competence" OR "Cross-Cultural" OR "Cultural Intelligence" OR "Cultural Awareness") (intitle:"Immersive Systems" OR intitle:"AR" OR intitle:"Immersive Technology" OR intitle:"Virtual Reality" OR intitle:"XR")
Scopus	("Cultural Competence" OR "Behavioral" OR "Capabilities" OR "Cognitive" OR "Cosmopolitanism" OR "Cross-Cultural Competencies" OR "Cross-Cultural Training" OR "Cultural Empathy" OR "Cultural Exposure" OR "Cultural Intelligence" OR "Cultural Awareness" OR "Cultural Competence" OR "Emotion" OR "Empathy" OR "Expatriation" OR "Global Mindset" OR "Immersive Education" OR "Inclusion" OR "Inclusive Education" OR "Intercultural Awareness" OR "Intercultural Competence" OR "Internationalization in University Education" OR "Metacognitive" OR "Motivational" OR "Multicultural Awareness" OR "Multicultural Competence" OR "Openness" OR "Personality" OR "Psychological Capital" OR "Higher Education" OR "College" OR "University Students" OR "Immersive Systems" OR "AR" OR "Immersive Environments" OR "Virtual Reality" OR "XR" OR "International" OR "Multicultural" OR "Worldwide")

- **Time Frame:** The search focused on studies published between 2014 and 2024 to capture recent technological advancements and theoretical developments.
- **Inclusion Criteria:** Studies were included if they specifically explored the use of immersive technologies in fostering CC, CQ, GM, or global citizenship. Conceptual and empirical research contributing to theoretical or practical insights into these areas were also considered.
- **Exclusion Criteria:** The review excluded research that did not address immersive technologies or was unrelated to cultural education.

#### 3.2 Literature Critique and Data Extraction

The selected studies underwent a detailed critical appraisal:

- **Relevance Assessment:** Each study was evaluated based on specific inclusion and exclusion criteria, including its relevance to the research questions, alignment with the problem statement, and focus on immersive technology, cultural competence, and global citizenship, while those focused on unrelated impacts or outcomes were excluded.
- **Quality Evaluation:** The evaluation prioritized the research questions regarding the use of VR, AR, MR, and XR technologies in creating culturally immersive learning experiences, followed by an assessment of empirical studies for relevance. The focus was on the clarity of research design and the suitability of data collection and analysis methods for addressing "how" and "what" questions. Methodological details, including sample size, were considered only if they were directly related to

exploring theoretical frameworks for enhancing CC, CQ, and GM, as well as challenges and future directions for immersive technologies in cross-cultural education.

- **Theoretical Framework Analysis:** Conceptual papers were reviewed for the clarity and relevance of the proposed frameworks related to CC, CQ, GM, and immersive learning.
- **Technology Application:** The review examined how each study applied immersive technologies (VR, AR, MR, and XR) within cross-cultural learning contexts, focusing on their practical implementation and insights gained from their use.
- **Outcome Measurement:** The literature was evaluated based on the research questions, focusing on how immersive learning experiences contribute to discussions of CC, CQ, and GM.
- **Synthesis:** The results of the individual studies were synthesized to identify common themes, highlight contradictions, and reveal gaps in the current research landscape.

Additionally, tools like Parsifal were utilized for organization and workflow, Zotero for reference management, and Litmaps to visualize research connections and trends across studies.

### 3.3 Identification of Literature

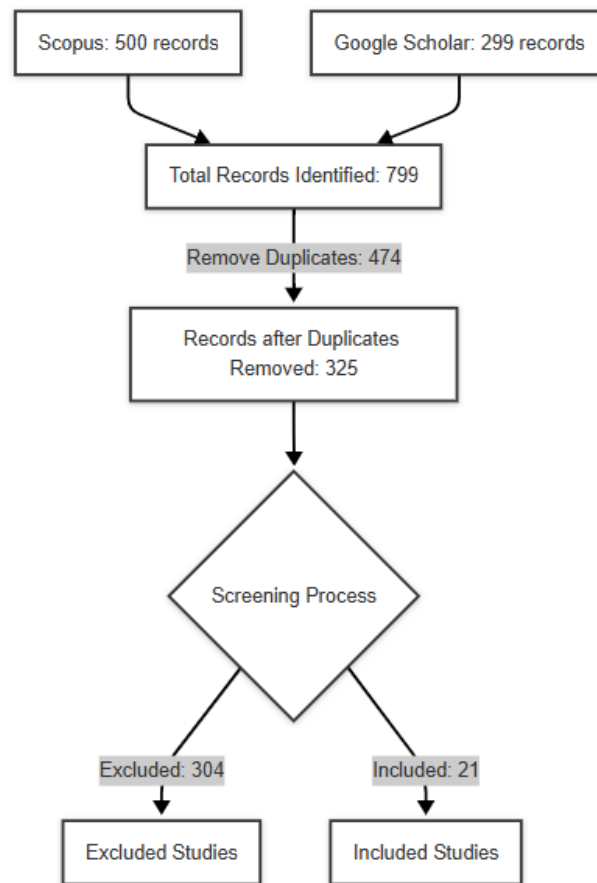


Fig. 1. Flow Diagram of Study Selection Process.

## 4 Results

Key findings regarding the use of immersive technologies in promoting CC, CQ, and GM were identified. Opportunities and challenges in designing and implementing these technologies were highlighted, including accessibility, ethical considerations, and scalability. These findings highlight the promise of immersive technologies in advancing global citizenship education while exposing the need for further investigation into their long-term impact and inclusive design. The following exploration of theoretical foundations and recent frameworks offers valuable insights into how these technologies can be effectively integrated into cross-cultural learning environments.

#### 4.1 Theoretical Foundations of CC, CQ, and GM

A solid theoretical foundation is essential for understanding how immersive technologies can promote cultural competence, cultural intelligence, and a global mindset. This foundation will support a framework that explores the interactions among these constructs. The aim is to enhance learners' cross-cultural competence and foster global citizenship. This section justifies the inclusion of this research question by examining the multifaceted nature of cross-cultural competence principles and their theoretical grounding as essential components in developing digital cross-cultural learning environments.

**Cultural Competence (CC).** CC is a dynamic and evolving concept essential for understanding and effective communication across diverse cultural contexts. Recent advancements in CC models distinguish that cultural competence is not a fixed trait but a continual development process shaped by experience, reflection, and ongoing learning [17]. Darla K. Deardorff, a leading voice in international education, emphasizes that cultural competence is the ability to adapt behavior based on a comprehensive understanding of diverse cultural norms, values, and practices [5]. Deardorff's framework, which integrates cognitive, affective, and behavioral dimensions, aligns well with immersive technology. For example, VR simulations can encourage behavioral adaptation in culturally sensitive situations, helping learners move from theoretical understanding to practical application. Combining Deardorff's framework with immersive learning strategies has the potential to cultivate CC in students [17], however, more research is needed to establish this connection definitively.

Zuwang Shen's Model of Cultural Competence which is widely applied in healthcare is equally relevant across educational contexts. Shen argues that competence involves acquiring factual knowledge about other cultures and developing the sensitivity and flexibility required to adapt behavior to various cultural contexts [17]. This process-oriented model supports immersive learning technologies, such as VR, that provide dynamic, scenario-based experiences, requiring learners to engage with and respond to culturally diverse environments.

Milton Bennett's Developmental Model of Intercultural Sensitivity (DMIS), first introduced in the 1980s, remains highly influential and has been recently updated to reflect digital cultural interactions [4]. The DMIS outlines six stages of intercultural sensitivity, progressing from ethnocentric stages (where individuals view their culture as central) to ethnorelative stages (where individuals accept and adapt to cultural differences). VR and AR can be mapped onto these stages, particularly in how they allow learners to simulate cultural experiences in a controlled environment. These technologies serve as tools for bridging the gap between cultural awareness (ethnocentric) and cultural competence (ethnorelative), offering learners low-risk opportunities to practice cross-cultural communication and conflict resolution.

**Cultural Intelligence (CQ).** CQ expands upon the concept of cultural competence by focusing on understanding, adaptation, and the ability to function effectively in diverse cultural settings. CQ is particularly relevant in a digitally connected world, where individuals are regularly exposed to different cultural contexts through in-person and virtual interactions. The framework of CQ encompasses four dimensions: cognitive (knowledge of cultural norms), metacognitive (awareness and regulation of cultural knowledge), motivational (the drive to engage with different cultures), and behavioral (the ability to adapt behaviors) [1].

Immersive technologies offer unique opportunities to enhance each dimension of CQ. For instance, cognitive CQ can potentially be developed through VR and AR environments that simulate culturally diverse settings [1, 16], providing learners with firsthand experience of different societal norms, traditions, and communication styles. This immersive exposure allows learners to build a cognitive framework for understanding cultural diversity more engagingly and memorably than traditional classroom methods.

Metacognitive CQ, the awareness and control over one's cognitive processes during intercultural interactions, is mainly supported by the reflective capabilities of immersive learning platforms [1]. While virtual simulations can potentially support intercultural learning, the effectiveness depends on intentional pedagogical design, including reflective components like debriefing sessions. This self-regulation and awareness may enhance the learner's ability to apply cultural knowledge more thoughtfully in real-world situations.

Motivational CQ, which refers to the individual's interest and motivation to engage in intercultural contexts, can be significantly impacted by immersive technologies. Research indicates that learners are more motivated and engaged when they feel personally connected to the content [1]. Preliminary research suggests immersive learning environments may increase learner motivation by presenting culturally authentic scenarios [16], though more empirical studies are needed to confirm this relationship.

Behavioral CQ, or the ability to modify verbal and non-verbal actions in response to cultural cues, is best developed through practice [1]. Immersive simulations allow learners to rehearse and refine their behavioral responses in culturally diverse scenarios. In this way, potential VR-based cultural training programs could allow learners to practice navigating cultural misunderstandings, though specific implementation studies are limited.

**Global Mindset (GM).** The GM concept emphasizes the importance of a broader perspective in navigating the complexities of a globalized world. GM extends beyond cultural competence to include strategic and technological adaptability, recognizing that success in global interactions requires cultural sensitivity and the ability to leverage technological tools in a cross-cultural context [11].

An update to the Global Leadership Mindset framework incorporates digital fluency as a core competency for global leaders, reflecting the increasing importance of technology in global communication and collaboration [11]. This expanded definition acknowledges the role of digital platforms, such as immersive technologies, in shaping how individuals perceive and interact with global issues. VR and AR technologies offer a virtual window into different parts of the world, enabling learners to experience global challenges and solutions in a way that cultivates a deeper understanding of international contexts.

Immersive technologies enrich a global mindset by allowing learners to participate in cross-border collaborations without travel. The combination of VR and AR in XR platforms creates environments where learners can work on projects with peers from different cultural backgrounds, mirroring the complexity of real-world global interactions. These experiences help learners develop a mindset that values diversity and promotes global citizenship.

#### 4.2 Leveraging VR, AR, MR, and XR for Culturally Immersive Learning: Recent Frameworks

**Cultural Humility.** Cultural humility is an emerging concept that complements cultural competence by emphasizing lifelong learning and self-reflection in intercultural interactions. Unlike cultural competence, which focuses on achieving specific skills, cultural humility involves an ongoing process of self-assessment and growth [12]. It is essential to acknowledge one's limitations in order to understand others' cultural experiences and perspectives.

Immersive technologies can be powerful tools for developing cultural humility. By placing learners in virtual environments where they encounter unfamiliar cultural practices and perspectives, immersive experiences challenge learners to confront their assumptions and biases. For instance, a VR simulation might expose learners to a scenario where cultural misunderstandings arise, prompting them to reflect on their preconceptions and develop greater humility in approaching intercultural interactions. Through guided reflection and feedback, immersive platforms can encourage learners to adopt a more humble, open-minded approach to cross-cultural engagement.

**Global Citizenship.** Global citizenship has become a critical framework for education, particularly in the context of globalization and increasing interconnectivity. UNESCO's Global Citizenship Education initiative focuses on cultivating learners who are knowledgeable about global issues and committed to taking action for social justice and sustainability [20]. Integrating immersive technologies in global citizenship education has been particularly transformative, offering learners immersive experiences that promote empathy, global awareness, and a sense of responsibility.

Immersive technologies like VR allow learners to "step into the shoes" of individuals from different cultural and socio-economic backgrounds, creating powerful emotional connections that enhance understanding and empathy. For example, VR simulations designed to raise awareness of global issues, such as poverty or climate change, allow learners to experience these challenges from the perspective of those affected. Researchers hypothesize that immersive experiences might encourage learners to develop a more profound sense of global responsibility [19], but longitudinal studies are needed to substantiate this claim.

**AI-Enhanced Cultural Intelligence.** Recent innovations in artificial intelligence (AI) have opened new avenues for developing cultural intelligence. AI-driven tools for cultural training, such as language models and personalized feedback systems, are being integrated into immersive learning platforms to offer real-time guidance and reflection on intercultural interactions [21]. These AI-enhanced platforms allow learners to engage in simulated cross-cultural dialogues, receiving personalized feedback on their communication styles and cultural sensitivity.

The use of AI in developing CQ is promising in its ability to adapt to individual learning needs. For example, AI systems can track a learner's progress and provide targeted feedback based on their specific challenges in cross-cultural communication. In an immersive VR environment, AI could monitor the learner's verbal and non-verbal cues during a simulated negotiation with a culturally diverse team, offering real-time suggestions for improving cultural alignment and understanding. These personalized, adaptive learning experiences reshape cultural intelligence development in educational and professional contexts.

### 4.3 Designing Culturally Immersive Experiences

Designing culturally immersive experiences using VR, AR, MR, and XR technologies requires a nuanced understanding of pedagogical principles, cultural sensitivity, and technological capabilities. The successful design of immersive learning environments hinges on three key elements: system immersion (the degree to which learners feel present in the virtual environment), narrative immersion (the extent to which learners are emotionally and cognitively engaged in the storyline), and challenge immersion (the alignment of tasks and challenges with learners' skills and learning goals) [3].

System immersion refers to how fully learners are enveloped in the immersive environment. VR and XR technologies, especially those with high-resolution visuals and 360-degree audio, enhance system immersion by making learners feel as though they are truly present in the simulated world. This immersive quality is crucial for cross-cultural learning, as it allows learners to experience culturally diverse environments in a way that traditional media cannot. The sense of presence in these environments makes learning more engaging and facilitates the internalization of cultural norms and behaviors, as learners are required to adapt to the virtual world as they would in real life [3].

Narrative immersion involves creating a compelling storyline or scenario that emotionally and cognitively engages the learner. In cultural competence training, narrative immersion can be achieved by designing scenarios that simulate real-world intercultural encounters, such as navigating a business negotiation in a different country, participating in a cultural festival, or addressing a conflict involving cultural misunderstandings. The emotional engagement encouraged by these narratives helps learners empathize with the perspectives and experiences of individuals from other cultures, which is essential for developing cultural competence and humility.

Challenge immersion refers to the degree to which tasks and activities within the immersive environment are aligned with the learner's abilities and learning goals [3]. Cultural competence training might gradually increase the complexity of intercultural interactions, requiring learners to apply their cultural knowledge and adaptability in more nuanced and challenging situations. For example, initial scenarios may involve simple tasks such as greeting someone from another culture, while more advanced scenarios may involve negotiating a complex business deal with multiple cultural stakeholders. By carefully calibrating these challenges, immersive learning environments can push learners to develop their cultural competence and intelligence in a structured, incremental way.

**Immersive Technology in Cross-Cultural Education.** The integration of immersive technologies in cross-cultural education has gained significant attention recently. VR, AR, and XR platforms offer unparalleled opportunities to create realistic, context-rich environments where learners can practice and enhance their intercultural skills. One of the critical advantages of immersive technologies in this field is their ability to provide learners with direct exposure to different cultural settings and social norms without requiring physical travel [6]. This has made immersive learning particularly valuable in global education, where institutions increasingly seek ways to provide students with international experiences despite geographical and financial constraints.

**Virtual Reality (VR) for Cultural Competence.** Virtual reality is a powerful tool for developing cultural competence by offering immersive, interactive experiences that expose learners to cross-cultural communication and collaboration complexities. VR platforms such as *ImmerseMe* and *Immerse* enhance cultural awareness and language learning by simulating intercultural encounters in various settings, while *Google Expeditions* offers immersive educational experiences that include cultural exposure through virtual tours of landmarks and cultural sites. In these simulations, learners are required to navigate cultural differences in real-time, making decisions that affect the outcome of the interaction.

VR's potential for cultural competence education is not limited to professional contexts; it has also been applied in K-12 and higher education settings to teach students about cultural diversity and global citizenship [19]. For example, a VR program developed by the Global Nomads Group takes students on virtual field trips to different parts of the world, allowing them to explore cultural landmarks and converse with local inhabitants. This type of immersive experience not only broadens students' understanding of global issues but nurtures empathy and respect for different cultures, laying the groundwork for more culturally competent global citizens [16].

**Augmented Reality (AR) in Cultural Learning.** While VR offers fully immersive environments, AR enhances the real world by overlaying digital content, providing learners additional context and information during cross-cultural interactions. AR applications such as *Google Lens* and *Culture Snap* can be used in real-world settings to help learners understand cultural symbols, customs, and languages in context. For instance, a student visiting a foreign country could use AR to identify cultural artifacts in a museum, learning about their significance in real time. AR also has the potential to be used in intercultural role-playing exercises, where learners can interact with

both virtual and real-world cultural elements simultaneously, further enhancing their understanding of cultural dynamics.

Studies have shown that AR can be particularly effective in teaching language and nonverbal communication skills, which are crucial components of cultural competence [10]. This suggests that AR can play a crucial role in developing the behavioral dimension of CQ by helping learners practice culturally appropriate body language, gestures, and expressions.

**Mixed Reality (MR) for Global Citizenship.** Mixed reality (MR), which blends the physical and digital worlds, offers unique opportunities for global citizenship education by allowing learners to engage in collaborative, cross-border projects without leaving their classrooms. MR platforms such as *Microsoft HoloLens* enable students to work alongside peers from other countries in a shared virtual space, where they can collaborate on problem-solving tasks related to global issues such as climate change, poverty, and human rights. This type of collaborative learning mirrors the real-world challenges that global citizens face, requiring learners to navigate cultural differences, communicate effectively, and work toward common goals.

#### 4.4 Designing Culturally Immersive Experiences

Incorporating immersive learning technologies into cross-cultural education has the potential to democratize access to global learning experiences, making them more equitable and inclusive. Historically, opportunities for developing cultural competence and global citizenship were limited to those with the financial means to travel or participate in international exchange programs. However, immersive technologies can bridge this gap by providing all learners virtual access to diverse cultural environments regardless of socioeconomic background.

**Accessibility of Immersive Technology.** While immersive learning technologies offer immense potential, it is essential to address the issue of accessibility to ensure that these tools benefit all learners. The digital divide, which refers to the gap between those with access to digital technologies and those without, remains a significant challenge in implementing VR, AR, and MR in educational settings.

To overcome this barrier, educational institutions and policymakers must prioritize investment in digital infrastructure and provide resources such as VR headsets and AR-enabled devices to underserved communities [7]. Partnerships with technology companies and non-profit organizations can also help reduce the cost of immersive learning technologies and make them more widely available. Developing lightweight, browser-based VR and AR experiences that can be accessed on mobile devices could help broaden access to immersive learning opportunities.

**Inclusivity in Immersive Learning Design.** Beyond technological access, the content and design of immersive learning experiences must also be inclusive and culturally sensitive. Immersive simulations that reinforce cultural stereotypes or present a one-dimensional view of certain cultures can do more harm than good, perpetuating bias and limiting learners' understanding of cultural diversity. Therefore, educators and instructional designers must work closely with cultural experts when developing immersive content, ensuring that the experiences accurately represent the complexity and richness of different cultures.

Inclusive design also involves creating immersive experiences that cater to diverse learning needs [18]. For example, learners with disabilities may require customized VR environments that are accessible to them, such as simulations that incorporate captioning, audio descriptions, or alternative input devices. By considering the diverse needs of learners from the outset, educators can create immersive learning experiences that are truly inclusive and equitable, helping to bridge the digital and cultural divides that often hinder access to global education.

#### 4.5 Limitations

While 3D technologies are best used for experiential learning approaches that augment real-world examples, some limitations must be addressed [14]. First, the high cost of developing and maintaining immersive learning platforms remains a barrier for many institutions, particularly in low-resource settings [18]. While prices for VR, AR, MR and XR technologies have decreased over time, they still represent a significant investment for schools and universities. Future research should explore cost-effective alternatives, such as mobile-based AR or web-based VR platforms, that provide similar learning benefits without expensive equipment.

Second, while immersive technologies offer valuable opportunities for experiential learning, they cannot fully replicate the complexity and nuance of real-world intercultural interactions. Learners may still require face-to-face experiences to develop their cross-cultural competences fully. Blended learning models that combine

immersive simulations with in-person intercultural experiences could offer a more comprehensive approach to developing these skills.

Third, the ethical implications of immersive learning technologies must be carefully considered [7]. As immersive simulations become more lifelike and emotionally engaging, there is a risk of causing unintended psychological distress, particularly when learners are exposed to traumatic or sensitive cultural content. Educators must ensure that immersive experiences are designed with empathy and care, providing appropriate support and debriefing mechanisms to help learners process challenging content. It is important to offer guided reflection and emotional support in immersive learning environments, mainly when dealing with sensitive cultural issues like conflict, discrimination, or historical trauma. Educators and designers must balance the need for authentic, immersive experiences with learners' emotional and psychological well-being.

Fourth, another critical limitation is the variability in learner response to immersive environments. While some students may thrive in these digital environments, others may experience discomfort or disorientation [14]. This can hinder the learning process and limit the effectiveness of immersive technologies for some individuals. Future research should focus on refining immersive technologies to reduce the incidence of VR sickness and explore alternative formats, such as augmented or mixed reality, that may offer similar benefits without physical discomfort.

#### 4.6 Future Directions

More longitudinal studies are needed to explore the long-term impact of immersive learning technologies on cross-cultural competence [13]. As noted by Lonne et al. [13], most current research is based on short-term interventions, making it difficult to assess the lasting effects of immersive experiences. Studies that track learners over extended periods will provide more robust data on the sustainability of immersive learning outcomes.

Additionally, further research should focus more specifically on the affordances of immersive technologies to begin, foster, and grow true cross-cultural interactions. Such research would focus on the use of these tools to facilitate connections between people from different cultures and study the resulting impacts of these types of interactions.

Furthermore, future research should investigate the integration of AI and machine learning into immersive learning environments to offer personalized learning experiences. AI-powered platforms could adapt simulations in real-time based on the learner's progress, providing individualized feedback and adjusting the difficulty of cross-cultural challenges. This level of personalization can significantly enhance the development of cultural competence and intelligence by catering to each learner's unique needs and abilities.

Another promising avenue for future exploration is using immersive technologies for intercultural collaboration [6]. While much of the current focus is on individual learning, immersive platforms also have the potential to connect learners from different cultural backgrounds in shared virtual spaces and afford real-time cross-cultural communication and teamwork. Immersive collaborative environments where students work together on global issues can enhance cultural competence and global leadership skills. Future studies should examine how immersive technologies can be used to build international partnerships and collaborative problem-solving skills.

**Policy and Ethical Considerations.** As immersive technologies become more prevalent in educational settings, it is essential to establish clear policies and ethical guidelines to ensure that these tools are used responsibly and inclusively [7]. The IEEE Global Initiative on Ethics of Extended Reality (XR) Report further highlights the need to protect learner data. Immersive learning platforms often collect extensive data on user interactions, movements, and behaviors, raising concerns about privacy and data security. Institutions must develop robust data protection policies to safeguard learner information and ensure transparency in how data is used.

Ethical considerations must also address the potential for cultural appropriation or misrepresentation within immersive simulations [10]. Educators and designers are responsible for ensuring that the artistic content presented in VR, AR, and MR environments is accurate, respectful, and created in collaboration with cultural experts. Additionally, immersive learning experiences should strive to present multiple perspectives, mainly when dealing with historically marginalized or underrepresented cultures, to avoid perpetuating dominant cultural narratives.

**The Role of Institutional Support.** Finally, successfully integrating immersive learning technologies in cross-cultural education requires strong institutional support. Schools, universities, and educational organizations must invest not only in the technology itself but also in professional development for educators. Teachers and instructional designers need specialized training to create and facilitate immersive learning experiences effectively [18].

Institutions must also prioritize equity in the distribution of immersive technologies, ensuring that all students, regardless of socioeconomic background, have access to these tools. This includes providing financial support for purchasing equipment, offering technical support for students and educators, and developing partnerships with technology providers to expand access to low-income communities. By addressing these institutional challenges, schools and universities can create more equitable and inclusive learning environments that leverage the power of immersive technologies to enhance cross-cultural education.

## 5 Limitations of the Study

This systematic review has several limitations that should be considered when interpreting its findings. First, the relatively small final sample size of 21 studies, while carefully selected through rigorous inclusion criteria, may not capture all relevant developments in this rapidly evolving field. Second, the review's timeframe (2014-2024) may have excluded earlier foundational works that could provide valuable historical context. Third, the focus on English-language publications potentially overlooks important contributions from non-English-speaking regions, particularly given the global nature of cultural competence research. Additionally, the search strings used, while comprehensive, may not have captured all relevant terminology used across different cultural and educational contexts. Finally, the rapid pace of technological advancement in immersive technologies means that some findings, particularly from earlier studies in the review period, may not fully reflect current technological capabilities and applications.

## 6 Conclusion

Based on the systematic review of 21 studies examining immersive technologies in cultural education, several key findings emerge regarding the development of CC, CQ, and GM. The literature reveals that immersive learning technologies offer promising alternatives to traditional approaches for cross-cultural education, particularly addressing the accessibility challenges noted by Pomerantz (2018) and building upon the theoretical frameworks established by Ang et al. (2020) and Javidan & Walker (2021).

The synthesis of findings demonstrates a clear evolution in both technological capabilities and pedagogical applications from early VR implementations to more sophisticated XR environments, as documented by Georgieva et al. (2024) and Hutson (2024). These advancements align with UNESCO's (2023) goals for global citizenship education while addressing the limitations of traditional cross-cultural learning methods. Recent studies by Shadieff et al. (2024) and Xia et al. (2024) particularly highlight the effectiveness of immersive environments in facilitating authentic cultural interactions and learning experiences. These affordances allow for synchronous and asynchronous interactions using these tools to build opportunities that were not available before (for example, virtual trips for students without the means to travel and simulations of cultural events at a distance).

However, significant challenges persist across the reviewed literature. Access inequities and technological barriers, as highlighted by Tawil & Miao (2024), remain substantial concerns. The ethical considerations raised by Fox & Thornton (2022) regarding cultural representation and content design require careful attention. Additionally, Lonne et al.'s (2023) findings on presence and effect in educational VR scenarios suggest the need for more robust assessment methodologies to evaluate learning outcomes.

Future research directions emerging from this review should focus on three key areas: (1) longitudinal studies examining the sustained impact of immersive cultural learning experiences, building on the frameworks discussed by Lekas et al. (2020); (2) investigation of hybrid approaches combining immersive technologies with traditional cultural education methods, as suggested by Beck et al. (2020); and (3) development of standardized assessment tools for measuring CC, CQ, and GM outcomes in immersive learning environments.

This systematic review indicates that while immersive technologies show considerable promise for cultural education, their effective implementation requires careful consideration of pedagogical frameworks, ethical guidelines, and accessibility factors. As these technologies continue to evolve, their role in preparing learners for global citizenship will likely expand, particularly when guided by established theoretical foundations and evidence-based practices identified in this review.

## References

1. Ang, S., Ng, K.Y., Rockstuhl, T.: Cultural Intelligence. In: Sternberg, R.J. (ed.) *The Cambridge Handbook of Intelligence*, pp. 820–845. Cambridge University Press, Cambridge (2020).
2. Bailenson, J.: *Experience on Demand: What Virtual Reality Is, How It Works, and What It Can Do*. W.W. Norton & Company (2020).

3. Beck, D., Morgado, L., O'Shea, P.: Finding the gaps about uses of immersive learning environments: A survey of surveys. *Journal of Universal Computer Science*, 26(8), 1043–1073 (2020).
4. Bennett, M.J.: Developmental model of intercultural sensitivity. *The International Encyclopedia of Intercultural Communication*, 1–10 (2017).
5. Deardorff, D.K.: Intercultural competence: Mapping the future research agenda. *International Journal of Intercultural Relations*, 48, 3–5 (2015).
6. Dede, C.J., Jacobson, J., Richards, J.: Introduction: Virtual, augmented, and mixed realities in education. In: Liu, D., Dede, C., Huang, R., Richards, J. (eds.) *Virtual, Augmented, and Mixed Realities in Education*, pp. 1-16. Springer, Singapore (2017). [https://doi.org/10.1007/978-981-10-5490-7\\_1](https://doi.org/10.1007/978-981-10-5490-7_1)
7. Fox, D., Thornton, I.G.: The IEEE Global Initiative on Ethics of Extended Reality (XR) Report--Extended Reality (XR) Ethics and Diversity, Inclusion, and Accessibility. *The IEEE Global Initiative on Ethics of Extended Reality (XR) Report*, pp. 1–25 (2022).
8. Georgieva, M., Nelson, J., LaFosse, R., Contis, D.: XR in higher education: Adoption, considerations, and recommendations. *EDUCAUSE Review* (2024). <https://er.educause.edu/articles/2024/1/xr-in-higher-education-adoption-considerations-and-recommendations>
9. Higgs, F., O'Shea, P.M.: Work-in-Progress—Global Citizenship: A Journey Through Immersive Education. In: 10th International Conference of the Immersive Learning Research Network, June 2024. <https://doi.org/10.56198/U6C0WUNNO>
10. Hutson, J. (2024). Combining Large Language Models and Immersive Technologies to Represent Cultural Heritage in the Metaverse Context. In: Geroimenko, V. (eds) *Augmented and Virtual Reality in the Metaverse*. Springer Series on Cultural Computing. Springer, Cham. [https://doi.org/10.1007/978-3-031-57746-8\\_14](https://doi.org/10.1007/978-3-031-57746-8_14)
11. Javidan, M., Walker, J.L.: *Developing Your Global Mindset*. Berrett-Koehler Publishers (2021).
12. Lekas, H.-M., Pahl, K., Lewis, C.F.: Rethinking Cultural Competence: Shifting to Cultural Humility. *Health Services Insights* 13 (2020). <https://doi.org/10.1177/1178632920970580>
13. Lonne, T.F., Karlsen, H.R., Langvik, E., Saksvik-Lehouillier, I.: The effect of immersion on sense of presence and affect when experiencing an educational scenario in virtual reality: A randomized controlled study. *Heliyon* 9(6), e17196 (2023). <https://doi.org/10.1016/j.heliyon.2023.e17196>
14. Pomerantz, J.: *Learning in Three Dimensions: Report on the EDUCAUSE/HP Campus of the Future Project*. ECAR research report, Louisville, CO (2018).
15. Pomerantz, J., Rode, R.: Exploring the future of extended reality in higher education. *EDUCAUSE Review*, <https://er.educause.edu/articles/2020/6/exploring-the-future-of-extended-reality-in-higher-education> (2020).
16. Shadiev, R., Wang, X., Shen, S.: Effects of immersion and interactive strategies on students' intercultural competence in virtual learning environments. *Educ. Inf. Technol.* (2024). <https://doi.org/10.1007/s10639-024-13030-1>
17. Shen, Z.: Cultural competence models and cultural competence assessment instruments in nursing: A literature review. *Journal of Transcultural Nursing*, 30(2), 169–187 (2019).
18. Tawil, S., Miao, F.: Steering the Digital Transformation of Education: UNESCO's Human-Centered Approach. In: *Theoretical Explorations in Digital Education*. Future of Learning and Innovation Division, UNESCO, Paris (2024). <https://doi.org/10.3868/s110-009-024-0005-6>
19. UNESCO: *Global Citizenship Education: A report on Sustainable Development Goal 4.7 and responsible global citizenship*. UNESCO (2023).
20. UNESCO: *Global citizenship education: preparing learners for the challenges of the 21st century*. UNESCO, Paris (2014). ISBN: 978-92-3-100019-5
21. Xia, Y., Shin, S.-Y., Kim, J.-C.: Cross-Cultural Intelligent Language Learning System (CILS): Leveraging AI to Facilitate Language Learning Strategies in Cross-Cultural Communication. *Appl. Sci.* 14, 5651 (2024). <https://doi.org/10.3390/app14135651>