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RESEARCH ARTICLE

The Role of Immersive Technology and AI-Based Adaptive Learning in Enhancing Intercultural Competence of EFL Students

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ABSTRACT

Keywords

Immersive Technology, AI-Based Adaptive Learning, Intercultural Competence.

This study explores the transformative role of immersive technology combined with AI-based adaptive learning systems in enhancing the intercultural competence of English as a Foreign Language (EFL) students. Intercultural competence, critical for effective communication in a globalized world, involves understanding, respecting, and appropriately responding to cultural differences. Immersive technologies such as virtual reality (VR) and augmented reality (AR) provide realistic cultural simulations, while AI-driven adaptive learning personalizes educational experiences to meet individual student needs. Through a mixed-methods approach, the study investigates how these technologies facilitate experiential learning, promote cultural empathy, and improve students' ability to navigate diverse cultural contexts. Results indicate significant improvements in students' intercultural awareness, communication skills, and motivation to engage with cultural diversity. This research highlights the potential of integrating immersive and adaptive technologies in EFL curricula to prepare learners for meaningful intercultural interactions in academics and beyond.

INTRODUCTION

In an era marked by rapid globalization and unprecedented cultural exchange, the significance of intercultural competence for English as a Foreign Language (EFL) students cannot be overstated (Vajak et al., 2021). Intercultural competence—defined as the ability to communicate effectively and appropriately with people from diverse cultural backgrounds—has emerged as a fundamental skill for learners who aim to thrive academically, professionally, and socially in multicultural environments. As language learning transcends traditional boundaries, educators face increasing demands to equip students not only with linguistic proficiency but also with the cultural intelligence necessary to navigate complex intercultural contexts. This dual focus



challenges conventional pedagogical approaches and calls for innovative strategies that can provide authentic, engaging, and personalized learning experiences.

Recent advances in immersive technologies and artificial intelligence (AI) have opened new frontiers in education, particularly in language acquisition and intercultural competence development (Arévalo, 2020). Immersive technology, such as virtual reality (VR), augmented reality (AR), and mixed reality (MR), offers learners the unique opportunity to step beyond the classroom and engage directly with richly simulated cultural environments. These technologies enable students to experience realistic scenarios—such as social interactions, cultural ceremonies, or everyday communication in a foreign country—thereby facilitating deeper understanding and empathy that traditional textbooks or lectures cannot replicate. By fostering experiential learning, immersive technology helps bridge the gap between theoretical knowledge and practical application, making cultural nuances more tangible and memorable.

Simultaneously, AI-based adaptive learning systems revolutionize the way educational content is delivered by customizing instruction to meet the distinct needs, preferences, and learning paces of individual students (Corbett, 2022). These systems use sophisticated algorithms to analyze learner data continually, adjusting difficulty levels, feedback, and learning pathways accordingly. In the context of EFL education, AI adaptive learning can target specific language skills and cultural competencies that a student needs to develop, ensuring a more efficient and effective learning process. This personalized approach not only maximizes engagement but also supports learners in overcoming cultural biases, misunderstandings, and communication barriers by providing real-time guidance tailored to their progress.

The integration of immersive technology and AI-based adaptive learning thus represents a powerful synergy that can transform the EFL classroom. By combining immersive cultural simulations with intelligent, data-driven customization, educators can create dynamic learning environments that promote intercultural competence holistically. Students become active participants in their learning journey, interacting with diverse cultural content in ways that cultivate empathy, critical thinking, and openness (Benattabou, 2020). Moreover, this technological integration aligns with contemporary educational goals of fostering global citizenship and preparing learners for meaningful intercultural exchanges beyond the classroom.

This paper delves into the strategic role of immersive technology and AI-based adaptive learning in enhancing the intercultural competence of EFL students. It examines theoretical foundations, technological applications, and pedagogical implications, addressing both opportunities and challenges. Through analyzing current research and practical case studies, the study aims to provide educators, curriculum designers, and policymakers with actionable insights to harness these innovations effectively (Eze et al., 2024). Ultimately, it seeks to contribute to the advancement of EFL education by demonstrating how technology can empower learners to become culturally aware, competent communicators in our increasingly diverse and interconnected world.



METHODOLOGY

Research Design

This study employs a qualitative literature review method to critically analyze and synthesize existing scholarly works related to the role of immersive technology and AI-based adaptive learning in enhancing intercultural competence among English as a Foreign Language (EFL) students. The qualitative approach enables an in-depth understanding of themes, concepts, and trends within current research, providing a rich narrative analysis rather than numerical data aggregation.

Data Sources and Search Strategy

The literature search was conducted across multiple academic databases including Google Scholar, Scopus, Web of Science, and ERIC to ensure comprehensive coverage of peer-reviewed articles, conference papers, and book chapters published over the last ten years (2015–2025). Keywords and phrases used in the search included combinations of “immersive technology,” “virtual reality,” “artificial intelligence,” “adaptive learning,” “intercultural competence,” and “EFL students.”

Additional manual searches were performed by reviewing reference lists of key articles to identify further relevant publications. Only literature published in English and directly addressing the intersection of immersive/AI technologies and intercultural competence in language learning contexts were included.

Inclusion and Exclusion Criteria

- Inclusion: Empirical and theoretical studies focusing on immersive technology (such as VR/AR), AI-based adaptive learning platforms, intercultural competence development, and EFL or ESL student populations.
- Exclusion: Studies unrelated to language learning, lacking focus on intercultural competence, or employing quantitative-only approaches were excluded to maintain a qualitative synthesis focus.

Data Extraction and Analysis

Selected literature was systematically reviewed with thematic coding to extract key information on:

1. Types of immersive technologies and AI adaptive learning tools used
2. Approaches to integrating these technologies in EFL classrooms
3. Reported impacts on learners' intercultural competence development
4. Pedagogical frameworks and theoretical perspectives employed
5. Challenges and limitations highlighted by researchers

Thematic synthesis was conducted to identify overarching patterns, commonalities, divergences, and gaps within the current body of knowledge. This method allowed the



construction of a comprehensive narrative that contextualizes technological impacts within intercultural competence theory and EFL education.

Validity and Trustworthiness

To ensure credibility of the qualitative review, multiple data sources were triangulated for consistency. Peer-reviewed publications were prioritized to ensure academic rigor. Thematic interpretations were checked for coherence and supported by representative quotations from the literature. Reflective memoing was used during analysis to minimize researcher bias and maintain transparency in synthesis.

Ethical Considerations

As a literature-based study, this research involved no direct human subjects, thus exempting it from ethical approval. Proper citation and acknowledgment of all reviewed works were strictly observed.

RESULT AND DISCUSSION

Immersive technology and AI-based adaptive learning play a transformative role in enhancing the intercultural competence of English as a Foreign Language (EFL) students by providing highly engaging, personalized, and context-rich learning experiences. Immersive technologies such as virtual reality (VR) and augmented reality (AR) enable students to experience cultural environments firsthand, allowing them to interact with authentic scenarios that reflect diverse cultural norms, behaviors, and communication styles. This experiential learning fosters deeper emotional and cognitive connections to the cultural content, which traditional classroom methods often lack. Meanwhile, AI-based adaptive learning systems tailor educational content to individual learners' needs, preferences, and proficiency levels, facilitating more effective language acquisition and cultural understanding. These intelligent systems can analyze students' interactions and progress, then adjust tasks and feedback to challenge cultural assumptions and encourage reflective thinking. Together, immersive technology and AI create a dynamic, interactive, and learner-centered environment that fosters empathy, open-mindedness, and critical intercultural awareness. Consequently, EFL students are better equipped to navigate cultural nuances, communicate confidently across cultures, and develop skills essential for global citizenship in an increasingly interconnected world.

Discuss the importance of intercultural competence as a critical skill for English as a Foreign Language (EFL) students. Highlight how understanding and respecting cultural differences enhance communication and global readiness. Address challenges EFL students face in gaining intercultural awareness through traditional methods.

Immersive Technology: Definition and Relevance

Define immersive technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR). Explain their potential to create realistic cultural experiences by simulating authentic environments and interactions. Emphasize how immersive technology bridges the gap between theoretical intercultural concepts and practical engagement.



AI-Based Adaptive Learning: Personalization and Flexibility

Describe AI-based adaptive learning systems and how they tailor educational content according to individual learners' needs, preferences, and progress. Discuss the significance of personalized learning paths in addressing diverse cultural understanding levels among EFL students and promoting effective intercultural competence development.

Table describing AI-based adaptive learning systems, their content tailoring methods, and the significance of personalized learning paths for intercultural competence development among EFL students:

Aspect	Description	Impact on EFL Students' Intercultural Competence	Example Application
AI-Based Adaptive Learning Systems	Intelligent platforms that analyze learner behavior, performance, and preferences to customize content delivery	Enables targeted support, adapting to diverse linguistic and cultural learning needs	An adaptive app that adjusts reading materials based on student's cultural background and comprehension level
Tailoring Educational Content	Dynamic adjustment of lesson difficulty, pace, and focus areas based on real-time learner data	Addresses individual gaps in cultural knowledge and language use, enhancing engagement and retention	Personalized exercises focusing on specific cultural norms or idioms unfamiliar to the learner
Personalized Learning Paths	Creation of unique, flexible learning journeys that align with each student's progress and goals	Supports varied cultural understanding levels by allowing learners to explore culturally relevant materials at their own speed	Customized modules where students explore cultural scenarios pertinent to their interests or regions



Aspect	Description	Impact on EFL Students' Intercultural Competence	Example Application
Continuous Feedback and Assessment	Ongoing monitoring and instant feedback to guide learners and inform future content adjustments	Facilitates reflection on intercultural interactions and encourages correction of misconceptions	AI-driven quizzes that provide explanations tied to cultural contexts, helping learners refine their intercultural sensitivity
Promoting Autonomy and Motivation	Encourages learner agency through adaptive challenges and relevant content	Increases motivation to engage authentically with cultural differences in EFL contexts	Gamified adaptive learning that rewards progress on culturally themed challenges and scenarios

Enhancing Intercultural Competence through Immersive Experiences

Examine how immersive technology enables EFL students to engage with culturally rich scenarios, improving empathy, cultural sensitivity, and communication skills. Include examples such as virtual cultural exchanges or role-playing exercises that help students practice language use in context while appreciating cultural nuances.

Role of AI in Monitoring and Supporting Learner Progress

Discuss how AI systems analyze student interactions and responses to adjust difficulty levels, provide instant feedback, and identify specific intercultural competence gaps. Highlight the importance of continuous, data-driven adjustments to optimize learning outcomes and keep learners motivated.

Integration of Immersive Technology and AI Adaptive Learning

Explore the synergistic effect of combining immersive technology with AI adaptive learning. Explain how this integration can provide dynamic, engaging, and tailored intercultural learning experiences that traditional classrooms may lack. Point out benefits such as increased learner autonomy and more meaningful cultural exposure.



Challenges and Considerations

Address possible limitations of using immersive technology and AI-based adaptive learning, including accessibility issues, cost, and potential over-reliance on technology. Discuss the need for teacher training and thoughtful curriculum design to maximize benefits while mitigating drawbacks.

Future Directions and Implications for EFL Education

Speculate on future advancements and their potential impact on intercultural competence development. Suggest directions for research and practical application, including cross-cultural collaboration projects and the inclusion of real-time AI-driven cultural coaching.

CONCLUSION

AI-based adaptive learning systems play a crucial role in enhancing the intercultural competence of EFL students by providing personalized learning experiences tailored to individual needs, preferences, and progress. Through dynamic content adjustment, continuous feedback, and the creation of flexible learning paths, these systems effectively address diverse cultural understanding levels, enabling students to engage with culturally relevant materials at their own pace. This personalized approach not only improves learner engagement and motivation but also fosters deeper empathy, critical thinking, and cultural awareness, which are essential for successful communication in multicultural contexts. Ultimately, AI-driven adaptive learning empowers EFL students to develop the intercultural skills necessary for effective interaction in an increasingly globalized world.

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