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A Corpus-Driven Mixed-Methods Study of VR-Based Intercultural Attitude Development: Evidence from Students' Reflective Journals

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Developing intercultural attitudes is a central goal of higher education, yet traditional instruction often fails to produce sustained attitudinal change. This study examines students' intercultural attitudes after VR immersive simulations across six dimensions: Openness, Curiosity, Equality, Respect, Empathy, and Tolerance. Using a corpus-driven mixed-methods design, it analyzes 25 reflective journals from 100 university students who completed three VR-based multicultural banquet simulations. Quantitative lexical analysis via AntConc and qualitative thematic analysis reveal a comprehensive transformation: from ethnocentric judgment to cultural relativism, from passive reception to proactive exploration, and from abstract awareness to emotionally grounded empathy. The findings demonstrate VR's strong pedagogical potential for sustainable intercultural attitude development in higher education.

Keywords: virtual reality, intercultural attitude, reflective journals, corpus-driven

Introduction

Intercultural competence has become a crucial educational objective, and its affective component—intercultural attitude—is foundational for effective cross-cultural interaction (Shadiev, Wang, & Huang, 2020). Traditional pedagogy often emphasizes cognitive knowledge over experiential engagement, limiting students' internalization of attitudinal dispositions such as openness, empathy, and respect. Immersive technologies like virtual reality (VR) offer solutions by simulating authentic cultural encounters and prompting emotional responses that traditional methods may not elicit.

Recent research shows that VR-supported intercultural activities enhance cultural presence and authentic engagement (Shadiev et al., 2020), social VR supports motivation for cultural intelligence (Knutzen et al., 2025), and immersive VR evokes realistic emotions in conflict mediation (Taguchi, 2023). Yet empirical studies systematically investigating multi-dimensional intercultural attitudes following VR interventions remain limited.

To address this gap, the present study adopts a corpus-driven mixed-methods approach, drawing on the CAK model—communicative skills, cognitive skills, attitude, awareness, knowledge of self, and knowledge of

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others (Wu, Fan, & Peng, 2013; Peng et al., 2023)—with attitude further specified by six sub-dimensions: Openness, Curiosity, Equality, Respect, Empathy, and Tolerance (Peng et al., 2023). The study explores how VR immersive simulations influence these six attitudinal sub-dimensions through analysis of student reflective journals, guided by two research questions.

RQ1: What are the overall characteristics of students' intercultural attitudes across the six dimensions as reflected in their reflective journals after VR intercultural simulation?

RQ2: How does VR immersive simulation affect changes in students' intercultural attitudes in each of these six dimensions?

Literature Review

VR-based teaching enhances learner engagement and learning outcomes through immersion, presence, and interactivity (Makransky & Petersen, 2019; Radianti et al., 2020). It is divided into high-immersion and low-immersion forms, both reconstructing multimodal learning contexts (Li & Liu, 2023). In intercultural education, VR enables learners to experience culturally situated interactions that are difficult to access in conventional classrooms, promoting positive attitudes like openness and empathy (Shadiev et al., 2020).

Intercultural communicative competence (ICC) encompasses knowledge, skills, and attitudes (Byram, 1997; Deardorff, 2006). Building on these foundations, Wu, Fan, and Peng (2013) developed a multidimensional ICC assessment scale for Chinese university students, identifying six core factors. This framework was subsequently formalized as the CAK model (Peng et al., 2023), in which the attitude dimension is further elaborated into six sub-dimensions: Openness, Curiosity, Equality, Respect, Empathy, and Tolerance (Peng et al., 2023).

Empirical studies show that VR exposure significantly improves intercultural sensitivity and emotional empathy (Schutte & Stilinović, 2017), and social VR platforms enhance learner motivation and cultural intelligence (Knutzen et al., 2025). VR simulations have also been applied in professional education to develop cross-cultural communication skills (Barmaki & Hughes, 2018; Chae et al., 2023). However, important gaps remain: much research emphasizes short-term outcomes and relies heavily on self-report instruments, with limited investigation into how specific attitudinal dimensions evolve through immersive experience. The present study addresses these gaps through a corpus-driven mixed-methods design.

Method

Research Design

This study adopted a corpus-driven mixed-methods design, integrating quantitative corpus analysis using AntConc 3.2.2.1 and qualitative thematic analysis through close reading and coding of reflective journals.

Participants and VR Learning Context

Participants were 100 university students enrolled in a language and culture course. All took part in VR-based immersive intercultural simulations designed as virtual multicultural banquets, interacting with virtual characters from eight national backgrounds. After completing the VR activities, students wrote reflective journals addressing six attitudinal dimensions. From 100 collected journals, 25 analytically rich journals were purposively selected for in-depth analysis.

Data Collection and Corpus Construction

The 25 journals were compiled into a self-built corpus. Texts were manually segmented according to the six dimensions, creating separate sub-corpora for each dimension. Each sub-corpus was converted to plain text and imported into AntConc.

Quantitative Analysis

Word List and Key Word in Context (KWIC) functions were used to identify frequent lexical items and examine contextual usage. Frequency counts of core attitudinal keywords were recorded and compared.

Qualitative Analysis

All 25 journals were closely read and thematically coded, focusing on attitudinal changes, emotional responses, and intercultural understanding. Qualitative findings were interpreted in relation to quantitative results for triangulation.

Results

Quantitative Results

Table 1 summarizes the frequency distribution of key lexical items across six attitudinal sub-dimensions and the corresponding developmental patterns observed in students' reflective journals. Across dimensions, a consistent trajectory emerges: learners progress from passive reception to active engagement, from superficial curiosity to systematic inquiry, and from tolerance to active acceptance. These patterns suggest that VR simulation facilitates not only cognitive awareness but also emotional resonance and behavioral inclination, reflecting a holistic reshaping of intercultural attitudes toward greater openness, respect, and cultural relativism.

Table 1
Frequency Distribution of Core Keywords and Overall Attitudinal Characteristics Across Six Dimensions

Dimension	Core Keywords (Frequency)	Overall Attitudinal Characteristics
Openness	proactive/active (23), understanding (18), open (15), exploration (12), respect (6)	Shift from passive reception to active and self-directed intercultural engagement
Curiosity	interest (15), curiosity (13), exploration (10), historical background (8), understanding (7)	Transformation from surface-level interest to systematic and contextual cultural inquiry
Equality	culture (38), objective (12), superiority/inferiority (10), respect (8), equality (7)	Development of more balanced cultural perspectives and recognition of cultural relativism
Respect	respect (19), understand (14), cultural understanding (18), behavior (9), cultural relativism (8)	Development of respect as an interpretive and practice-oriented attitude
Empathy	empathy (23), perspective-taking (15), understanding (12), cultural context (11), behavior (9)	Strengthening of emotional engagement and ability to adopt others' cultural perspectives
Tolerance	tolerance (19), acceptance (16), cultural differences (15), active acceptance (12), habits (8)	Internalization of inclusiveness from passive tolerance to active acceptance

Qualitative Results

VR integration into multicultural education fundamentally reshapes students' learning dispositions across multiple dimensions. Openness emerges as a primary outcome: VR transforms students from passive recipients into active explorers who independently investigate cultural norms and social rules, with this proactive inquiry extending into daily life and fostering sustained self-directed learning. Complementing this openness is heightened curiosity, as immersive experiences stimulate deep-seated interest in art, religion, history, and

customs, prompting engagement with documentaries, academic materials, and real-world intercultural interactions.

Simultaneously, VR promotes equality by dissolving cultural hierarchies: students abandon superiority-inferiority notions, recognizing that each culture's uniqueness arises from its distinct geographical, historical, and social contexts, while also re-examining their own cultural frameworks from an outsider's perspective. This egalitarian stance cultivates respect, as students adopt cultural relativism and replace biases with an understanding of the historical and social logic underlying diverse practices—a respect that translates into tangible behavioral changes, such as avoiding sensitive topics in real-life peer interactions.

Moreover, VR functions as an immersive "emotional laboratory" fostering empathy through perspective-taking and role-playing. By experiencing cultural conflicts firsthand, students gain insight into others' confusion, adjust their communication styles, and become more attuned to emotional needs. These cumulative shifts culminate in tolerance, evidenced by students' transition from resistance to active acceptance of diverse dietary habits, taboos, and values—a mindset that extends into real-life settings, where they approach differences with open-mindedness and refrain from hasty judgments.

Discussion

The findings demonstrate that VR immersion fosters coherent development of intercultural attitudes across cognitive, affective, and behavioral components. A central finding is the shift toward relativistic thinking, particularly in Equality and Respect, as students' declining reliance on superiority-inferiority judgments indicates fundamental cognitive restructuring. This transformation enabled heightened Openness and Curiosity, with learners becoming proactive cultural explorers whose interest evolved from surface-level curiosity to historically and systematically grounded inquiry.

At the affective level, Empathy emerged as the emotional core of transformation, enabling students to emotionally connect with culturally different others and internalize intercultural knowledge. This emotional involvement culminates in Tolerance, where repeated VR exposure normalized difference and reduced anxiety, transforming acceptance into a stable disposition. Taken together, these findings suggest VR immersion initiates an interconnected developmental process in which cognitive restructuring encourages proactive engagement, which deepens emotional involvement, and ultimately consolidates inclusive behavior—explaining why VR-based interventions can produce sustained attitudinal change beyond short-term awareness.

Conclusion

This study examined the characteristics of students' intercultural attitudes following VR immersive simulations and explored how VR influences attitudinal development across six dimensions: Openness, Curiosity, Equality, Respect, Empathy, and Tolerance. Through corpus-driven analysis of reflective journals, the findings reveal a coherent transformation: students shifted from ethnocentric judgment to cultural relativism, from passive reception to proactive exploration, and from abstract awareness to emotionally grounded empathy. VR immersion initiated an interconnected developmental process in which cognitive restructuring—particularly in Equality and Respect—enabled heightened Openness and Curiosity, emotional engagement through Empathy facilitated internalization of intercultural knowledge, and repeated exposure consolidated Tolerance as a stable

disposition. Pedagogically, these findings suggest that VR simulations offer a powerful tool for fostering sustainable intercultural attitude development in higher education by bridging abstract knowledge with lived experience. However, the study is limited by its small corpus size and single-institution sample; future research should expand the participant pool, incorporate longitudinal designs, and include behavioral measures. Despite these limitations, this study contributes empirical evidence supporting VR's pedagogical potential for intercultural education.

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