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# Fostering Intercultural Competence Through AI-Driven Tools: A Case Study of Linguistic and Cultural Adaptability in Chinese EFL Education

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**Abstract:** Intercultural competence has become an essential skill for effective global communication, particularly for English as a Foreign Language (EFL) learners. The integration of artificial intelligence (AI) into educational practices presents significant potential for enhancing both linguistic proficiency and intercultural capabilities. However, there remains a gap in understanding how AI technologies can specifically facilitate the development of intercultural competence among EFL learners. This study adopts a mixed-methods approach to examine the impact of AI technologies on intercultural competence development among 120 Chinese undergraduate EFL students. Quantitative analysis of pre-and post-test data revealed significant improvements in students' cultural knowledge, attitudinal openness, communication skills, and cultural awareness, with paired t-tests confirming the statistical significance of these gains. Qualitative data, collected through interviews, classroom observations, and platform usage records, further supported these findings, highlighting enhanced emotional engagement, practical application of skills, and immersive learning experiences facilitated by AI tools. The results indicate that integrating AI technologies into language curricula can effectively foster intercultural understanding and communication abilities. This study contributes to the existing literature by providing empirical evidence on the efficacy of AI-based interventions in promoting intercultural competence, offering practical implications for educators and policymakers seeking to leverage AI in language teaching and learning contexts.

**Keywords:** Intercultural Competence; Chinese EFL Learners; AI Tools; EFL Education

## 1. Introduction

In an increasingly globalized world, intercultural competence is an essential skill for English as a Foreign Language (EFL) learners, particularly those in non-native English-speaking countries like China. It involves understanding and effectively interacting with people from diverse cultural backgrounds, which is a critical part of language acquisition and communication [1, 2]. For Chinese undergraduate EFL learners, intercultural competence is vital not only for "academic success but also for preparing them to engage with the international community" [3] (p. 100005). Traditionally, EFL instruction has focused primarily on language skills such as grammar and vocabulary, often "overlooking the cultural aspects that are integral to true linguistic proficiency" [4] (p. 1049401).

The integration of artificial intelligence (AI) into education has introduced new opportunities to enhance both linguistic and intercultural skills. AI-powered tools such as chatbots, virtual tutors, and immersive simulations can provide learners with rich, real-time experiences of interacting with diverse cultural perspectives [5–7]. These technologies offer the potential to transcend the limitations of traditional classroom settings, allowing learners to practice language skills in culturally authentic contexts. However, while AI has been widely explored in language

learning, its application in fostering intercultural competence remains under-researched, particularly in the context of EFL learners in China [4].

The existing literature provides valuable insights into the role of AI in education but reveals a gap in understanding how AI can specifically be utilized to develop intercultural competence among EFL learners. Previous studies have examined the use of AI technologies for improving language skills and facilitating virtual learning environments [1, 3, 8, 9]. However, there is limited empirical research that investigates AI's role in fostering intercultural understanding within the EFL context, especially among Chinese undergraduate learners. This gap underscores the need for more targeted research to explore how AI technologies can contribute to both linguistic and cultural learning outcomes.

To address this gap, the present study seeks to answer the following research questions:

(1) How can AI technologies foster intercultural competence among Chinese undergraduate EFL learners? (2) What AI-based strategies are most effective for enhancing EFL learners' intercultural competence in this context? These questions are designed to unpack two critical dimensions: the functional pathways through which AI mediates cross-cultural understanding, and the pedagogical configurations that maximize its efficacy—thereby establishing an evidence base for AI-driven intercultural pedagogy in EFL contexts.

The primary objective of this study is to explore the role that AI technologies play in developing intercultural competence among Chinese undergraduate EFL learners, and identify AI-based strategies that effectively promote intercultural competence and investigate how these technologies can be integrated into EFL curricula to enhance both language proficiency and cultural awareness. By aligning technological innovation with intercultural pedagogy, the research contributes to both the theoretical discourse on AI-driven language education and the practical development of culturally responsive EFL programs in Chinese universities.

## 2. Literature Review

### 2.1. Intercultural Competence

Intercultural competence is vital in the realm of EFL (English as a Foreign Language), as it empowers learners to interact effectively with individuals from diverse cultural backgrounds. This competence involves understanding and respecting cultural differences, which is crucial for successful communication in a globalized world. One prominent framework for understanding intercultural competence is Byram's Intercultural Communicative Competence (ICC) model [10]. This model encompasses several key components. (1) Attitudes: These include curiosity and openness toward other cultures. (2) Knowledge: This involves understanding social groups and practices in different cultures. (3) Skills: These are the abilities to interpret and relate across cultural contexts. Critical to this model is Critical Cultural Awareness—the reflective analysis of one's own cultural biases and engagement with cultural differences.

While Byram's ICC model has been widely applied in Western EFL contexts, few studies explicitly address its adaptation to AI-enhanced environments, particularly in non-Western settings like China. For instance, Canale and Swain demonstrated the effectiveness of traditional classroom activities in fostering intercultural sensitivity [11], yet none of these studies explored how AI tools might amplify or reshape these outcomes. This gap underscores the need to investigate AI's role in bridging cultural awareness within Byram's framework.

### 2.2. The Application of AI tools in Language Learning

The rapid advancement of Artificial Intelligence (AI) technologies has significantly reshaped the landscape of language learning. AI-driven tools, such as intelligent tutoring systems, automated assessment platforms, and interactive chatbots, offer personalized, adaptive learning experiences tailored to individual student needs [12]. For instance, chatbots provide real-time feedback and allow learners to engage in conversation practice, replicating authentic communication scenarios [13, 14]. AI-powered language learning apps like Duolingo and Babbel use machine learning algorithms to track learner progress and adapt exercises to suit their proficiency levels [9]. Moreover, immersive technologies like Virtual Reality (VR) and Augmented Reality (AR) have transformed traditional classroom settings into interactive, multi-sensory learning environments. VR simulations can transport students into real-world scenarios, enhancing language retention and boosting engagement [4]. These AI-powered tools not only make language learning more engaging but also foster critical language skills such as "listening, speaking,

reading, and writing" [5](pp. 29–43).

Despite the proven efficacy of AI tools in improving linguistic proficiency (e.g., on VR-enhanced vocabulary retention [5]; on chatbot-driven speaking practice [13, 14]), current research predominantly isolates language learning from a cultural context. For example, while VR simulations replicated"real-world" scenarios, they focused on transactional language use (e.g., ordering coffee) rather than culturally embedded communication (e.g., negotiating politeness strategies in high-context cultures) [4]. This disjunction limits AI's potential to foster holistic communicative competence.

### 2.3. The Application of AI tools in Cultural Learning

AI technologies are also increasingly applied to cultivate cultural competence, an essential aspect of language education. Through virtual simulations, learners can immerse themselves in diverse cultural settings and engage in interactive activities that promote intercultural understanding [15, 16]. AI-enabled VR platforms offer virtual tours of landmarks, historical sites, and culturally specific events, allowing learners to experience authentic environments without leaving the classroom [15, 17]. These experiences go beyond linguistic skills, providing contextual knowledge that enhances cultural awareness. In addition, AI-powered language learning platforms integrate cultural content into lessons, offering learners insights into the social norms, customs, and etiquette of target-language communities [18]. This holistic approach to language learning, which combines both linguistic and cultural elements, significantly enhances learners' intercultural communication skills [19]. By bridging the gap between language and culture, AI fosters a comprehensive EFL learning experience that prepares students for real-world communication.

Existing AI-driven cultural learning interventions (e.g., on virtual tours [15–17]; on cultural content integration [18]) largely prioritize passive exposure to cultural facts over active engagement with intercultural dilemmas. For instance, while Yeh et al.'s study enabled learners to "observe" cultural practices through VR, their design did not incorporate opportunities for learners to critically reflect on cultural biases or adapt communication strategies [16], key tenets of Byram's ICC model. This gap underscores the need for AI tools that scaffold not only cultural knowledge but also critical cultural awareness.

### 2.4. Research Gaps

Despite the potential of AI in developing intercultural competence, its role in EFL learning remains underexplored. While existing research predominantly focuses on AI's role in enhancing linguistic proficiency (e.g., grammar correction, vocabulary acquisition), its potential to cultivate cultural competence—particularly in China's EFL contexts—is rarely systematically examined. Two critical gaps define this research's originality.

**Contextual Specificity:** Previous studies have acknowledged the importance of cultural adaptability in AI design, yet empirical evidence on tailoring AI tools to Chinese EFL learners' unique sociocultural needs—such as navigating high-context communication styles (e.g., indirect politeness strategies) or addressing culturally sensitive topics (e.g., historical narratives)—remains scarce.

**Integration of Language and Culture:** AI applications often treat language acquisition and cultural understanding as isolated objectives. For instance, language apps may prioritize grammar drills, while cultural content is delivered as static information (e.g., cultural trivia), neglecting the interdependent nature of language and culture emphasized by frameworks like Byram's ICC. This disconnection limits learners' ability to adapt linguistic choices to cultural contexts (e.g., mitigating face-threatening acts in cross-cultural negotiations).

This study addresses these gaps by investigating how AI-driven tools can integrate language training and cultural adaptability within Byram's ICC framework, with a focus on identifying actionable strategies—such as context-aware simulations and adaptive feedback systems—that enhance Chinese EFL learners' ability to navigate real-world intercultural communication challenges.

## 3. Theoretical Framework

### 3.1. Intercultural Learning Theories

In the context of English as a Foreign Language (EFL) education for Chinese undergraduate EFL learners, intercultural communication theories provide a vital framework for understanding how AI can enhance intercultural competencies. One prominent model is Byram's Intercultural Communicative Competence (ICC) framework, which

emphasizes the integration of attitudes, knowledge, skills, and critical cultural awareness. Byram proposes that effective intercultural communication involves attitudes, knowledge, skills, and critical cultural awareness [10].

AI technologies, such as chatbots and VR simulations, can significantly enhance these components. For instance, chatbots equipped with natural language processing (NLP) capabilities can provide immersive, real-time conversations that expose learners to various cultural contexts and communication styles. VR platforms, on the other hand, can simulate culturally rich environments, allowing learners to engage with authentic cultural scenarios and gain firsthand experiences of different social practices [4, 18].

By integrating these AI technologies into the curriculum [20], educators can foster a deeper understanding of cultural nuances and promote a more dynamic learning environment. This aligns with Byram's model by offering students interactive and adaptive experiences that support the development of intercultural competence [21].

### 3.2. AI-Driven Pedagogy

AI-enhanced pedagogy refers to teaching methodologies improved through AI technologies, with adaptive learning and AI-supported instruction being particularly relevant for developing intercultural competence among Chinese undergraduate EFL learners.

Adaptive learning approach utilizes AI to customize learning experiences based on individual student needs and progress. By analyzing learner data, AI systems personalize instructional content and feedback, ensuring tailored support [3]. In intercultural learning, adaptive systems can address specific cultural misunderstandings, thus improving students' intercultural competence.

AI-supported instruction integrates AI technologies into traditional teaching methods to enhance educational outcomes. AI facilitates interactive language exercises, provides instant feedback, and simulates real-world communication [5]. In intercultural contexts, AI technologies offer exposure to diverse cultural perspectives and enable virtual exchanges with native speakers, enriching students' learning experiences.

The research integrates AI technologies into course design, instruction implementation, and teaching evaluation. AI technologies assist in creating customized course materials that reflect diverse cultural contexts, such as using VR to simulate cultural events for immersive learning. AI platforms enhance language practice, assess cultural understanding through interactive scenarios, and provide real-time feedback, fostering active engagement with varied cultural perspectives. Additionally, AI systems analyze student data to evaluate the effectiveness of teaching strategies and the development of cultural competence, allowing for the continuous refinement of teaching methods.

In conclusion, combining intercultural learning theories with AI-enhanced pedagogy creates a dynamic framework for fostering intercultural competence in Chinese EFL learners, offering personalized and culturally enriched learning experiences through AI-supported course design, instruction, and evaluation.

## 4. Methodology

### 4.1. Research Design

This study employed a mixed-methods approach to investigate the relationship between AI technologies and the development of intercultural competence among Chinese undergraduate EFL learners. The quantitative part consists of surveys and statistical analysis to measure students' intercultural competence before and after exposure to AI-enhanced learning tools. Meanwhile, the qualitative component includes classroom observations, interviews with both students and instructors, and the analysis of AI-driven analytics from the selected platforms.

### 4.2. Participants

Participants were selected using convenience sampling, including both EFL students and their instructors from an intercultural communication course at a Chinese university. This elective course for undergraduates is designed to enhance intercultural competence. There were 11 instructors for the course, and the researcher was one of them, with 120 students enrolled in the researcher's class. A total of 126 students and 10 instructors agreed to participate in the study. The demographic data of the participants are presented in **Table 1**.

**Table 1.** Demographic Data of Participants.

| Category | Variable | Number | Percentage (%) |
|---|---|---|---|
| Total Students | | 120 | 100 |
| Gender | Male | 50 | 41.7 |
| | Female | 70 | 58.3 |
| Year of Study | Sophomore | 72 | 60.0 |
| | Junior | 48 | 40.0 |
| Age | 18–20 years | 78 | 65.0 |
| | 21–23 years | 42 | 35.0 |
| Total Instructors | | 10 | 100 |
| Gender | Male | 2 | 20 |
| | Female | 8 | 80 |
| Teaching Experience | 1–5 years | 3 | 30 |
| | 6–10 years | 5 | 50 |
| | 10+ years | 2 | 20 |

Ethical standards for research involving human participants were rigorously observed in this study. Prior to the initiation of the research, all participants were required to read and sign an informed consent form. They were assured that their privacy would be maintained throughout the study, with all data securely stored and anonymized. Participants were informed of their right to withdraw from the study at any time without penalty, and measures were implemented to minimize any potential negative impacts.

The study was conducted from September to December 2023. During this period, instructors of the intercultural communication course employed AI technologies to enhance students' intercultural competence. Additionally, students were assigned homework that involved utilizing AI technologies to deepen their understanding of intercultural knowledge and communication.

### 4.3. AI Tools Adopted

The AI technologies employed in this study included language-learning apps with embedded intercultural content, VR simulations for cultural immersion, and AI-powered chatbots for conversational practice. These tools were selected based on their capacity to align with Byram's ICC framework while addressing the linguistic and cultural adaptability needs of Chinese EFL learners. For instance, language-learning apps such as English Fluency AI dynamically adjusted scenarios to contextualize linguistic forms within cultural schemas, such as simulating indirect refusal strategies common in Chinese communication—a design choice aimed at strengthening the *Knowledge* dimension of intercultural competence. VR simulations, exemplified by Tencent VR's interactive scenarios of Confucian-influenced workplace hierarchies, prioritized embodied experiences to cultivate behavioral adaptability and empathy, directly targeting the *Skills* component. Meanwhile, chatbots like Kimi—a Chinese-developed AI model trained primarily on Mandarin and English corpora and localized cultural data—engaged learners in dialogues requiring cultural negotiation, such as navigating hierarchical politeness norms in Chinese business settings (e.g., using honorifics like "您" versus "你") or interpreting context-dependent expressions in cross-cultural teamwork. Feedback mechanisms were tailored to highlight culturally specific communication patterns, such as balancing directness with face-saving strategies in Sino-Western interactions.

Despite their pedagogical potential, these tools introduced limitations and biases requiring scrutiny. While Kimi's training on Chinese linguistic and cultural data enhanced its relevance to local learners, its limited exposure to non-Chinese communication norms (e.g., low-context Western styles) risked oversimplifying intercultural exchanges. VR simulations, though innovative in immersing users in cultural landmarks like Lunar New Year celebrations, occasionally reduced complex cultural dynamics to simplistic East-West dichotomies, inadvertently reinforcing stereotypes rather than nuanced understanding. Furthermore, the VR hardware requirements—particularly headset dependency—disproportionately excluded rural learners with limited access to advanced technology, highlighting equity concerns in AI-driven pedagogy's scalability. These limitations underscored the need for culturally balanced training data, context-sensitive content design, and infrastructure-adaptive implementations to ensure

ethical and inclusive applications of AI in intercultural education.

### 4.4. Instrument

The instrument for data collection in this study is Reid's Assessment of Intercultural Competence (ACC), which has been adapted to fit the context of Chinese undergraduate EFL learners using AI technologies [12]. The ACC is a comprehensive tool designed to evaluate various dimensions of intercultural competence, including knowledge, attitudes, skills, and critical cultural awareness. The survey comprised 20 items, categorized into four constructs: Knowledge of Cultures (KC), Attitude Openness (AO), Communication Skills (CS), and Cultural Awareness (CA), with each construct containing 5 items. Each item is rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). This structure allows for a nuanced assessment of participants' intercultural competence. In this study, the survey was administered in both English and Chinese to ensure linguistic and conceptual equivalence for the Chinese-speaking participants. The survey scale demonstrated strong reliability and validity, with a Cronbach's alpha of 0.874, a Kaiser-Meyer-Olkin (KMO) measure exceeding 0.831, and a statistically significant Bartlett's sphericity test ($p < 0.001$).

The survey was distributed online via the course's learning management system, Superstar Platform, making it accessible to all participants regardless of their location. The data gathered through this survey were used to measure the learners' progress in intercultural competence, particularly in relation to their use of AI-driven tools for developing intercultural competence.

In addition, 10 students and 10 instructors were willing to participate in interviews. The researcher also conducted 10 classroom observations, one for each participating instructor's class. Additionally, data on student interactions were collected and analyzed to assess their use of AI technologies in enhancing intercultural competence.

### 4.5. Data Collection

Data were collected through multiple methods: pre- and post-surveys administered to students to measure changes in intercultural competence following the use of AI technologies, interviews with students and instructors to gather qualitative insights into their experiences with AI-enhanced learning, classroom observations to document the integration of AI technologies in the teaching process, and AI-driven analytics from the platforms to track student progress and engagement.

### 4.6. Data Analysis

The quantitative data were analyzed using statistical methods, including paired t-tests, to assess whether significant changes in intercultural competence occurred. Qualitative data, including interview transcripts and classroom observation notes, were analyzed thematically to identify key themes related to the integration and impact of AI technologies on intercultural learning.

## 5. Results

### 5.1. AI's Role in Fostering Intercultural Competence

The first analysis involved examining the descriptive statistics of the survey data, as presented in **Table 2**.

**Table 2** provides the descriptive statistics for each construct surveyed, including pre-test and post-test means and standard deviations for Knowledge of Cultures (KC), Attitude Openness (AO), Communication Skills (CS), and Cultural Awareness (CA).

Pre-test means for the KC construct range from 4.00 to 4.15, with a construct mean of 4.08, suggesting a relatively high initial knowledge of cultures. Post-test means range from 4.30 to 4.50, yielding a construct mean of 4.40, indicating a notable improvement in cultural knowledge after exposure to AI technologies. The low standard deviations for both pre-test and post-test scores suggest consistency in participants' responses.

The pre-test means for AO range from 3.95 to 4.10, with a construct mean of 4.03, reflecting a generally positive initial attitude toward intercultural communication. Post-test means increased to a range of 4.25 to 4.45, with a construct mean of 4.35, indicating enhanced openness to different cultures after the intervention. Standard deviations remained consistent, signifying uniformity in responses.

**Table 2.** Descriptive Statistics of AI Impact on Intercultural Competence.

| Variables | Pre-Test | Pre-Test SD | Construct Mean | Post-Test M | Post-Test SD | Construct Mean |
|---|---|---|---|---|---|---|
| KC1 | 4.00 | 0.63 | 4.08 | 4.30 | 0.68 | 4.40 |
| KC2 | 4.10 | 0.61 | | 4.40 | 0.65 | |
| KC3 | 4.05 | 0.62 | | 4.35 | 0.66 | |
| KC4 | 4.15 | 0.60 | | 4.45 | 0.70 | |
| KC5 | 4.10 | 0.64 | | 4.50 | 0.72 | |
| AO1 | 3.95 | 0.67 | 4.03 | 4.25 | 0.71 | 4.35 |
| AO2 | 4.05 | 0.63 | | 4.30 | 0.70 | |
| AO3 | 4.00 | 0.65 | | 4.35 | 0.73 | |
| AO4 | 4.10 | 0.64 | | 4.40 | 0.68 | |
| AO5 | 4.05 | 0.66 | | 4.45 | 0.69 | |
| CS1 | 3.90 | 0.69 | 4.04 | 4.15 | 0.72 | 4.26 |
| CS2 | 4.00 | 0.66 | | 4.20 | 0.71 | |
| CS3 | 4.05 | 0.68 | | 4.25 | 0.70 | |
| CS4 | 4.10 | 0.67 | | 4.30 | 0.69 | |
| CS5 | 4.15 | 0.65 | | 4.40 | 0.72 | |
| CA1 | 4.00 | 0.64 | 4.06 | 4.20 | 0.70 | 4.30 |
| CA2 | 3.95 | 0.67 | | 4.25 | 0.72 | |
| CA3 | 4.05 | 0.66 | | 4.30 | 0.71 | |
| CA4 | 4.10 | 0.63 | | 4.35 | 0.68 | |
| CA5 | 4.20 | 0.62 | | 4.40 | 0.69 | |

**Notes:** n = 120; KC = Knowledge of Cultures, AO = Attitude Openness, CS = Communication Skills, CA = Cultural Awareness. All dimensions were assessed using a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*).

Pre-test means for CS items range from 3.90 to 4.15, with a construct mean of 4.03, indicating that participants possessed reasonably strong intercultural communication skills before the study. Post-test means increased to a range of 4.15 to 4.40, with a construct mean of 4.30, demonstrating improvement. Consistent standard deviations further support the reliability of the data.

Pre-test means for CA items ranged from 3.95 to 4.20, with a construct mean of 4.06, suggesting a solid initial awareness of cultural differences. Post-test means increased to a range of 4.20 to 4.40, with a construct mean of 4.35, indicating significant growth in cultural awareness after the use of AI technologies. The low standard deviations point to consistent and reliable responses across participants.

Overall, pre-test means across all constructs ranged from 3.90 to 4.20, demonstrating a strong baseline level of intercultural competence. Post-test means, which ranged from 4.00 to 4.60, reflect significant improvements, highlighting the effectiveness of AI-enhanced learning tools in fostering students' intercultural competence.

The second analysis utilized a paired t-test to determine whether the improvements in intercultural competence resulting from the use of AI technologies were statistically significant, as presented in **Table 3**.

**Table 3.** Paired t-test Results of the Questionnaire.

| Variables | M Diff. | SD | SE | 95% CI | T | Df | Sig. |
|---|---|---|---|---|---|---|---|
| Pair 1: KC | −0.42 | 0.95 | 0.19 | [−0.59, −0.24] | −4.73 | 119 | 0.00* |
| Pair 2: AO | −0.38 | 0.97 | 0.28 | [−0.55, −0.20] | −4.31 | 119 | 0.02* |
| Pair 3: CS | −0.37 | 1.02 | 0.21 | [−0.55, −0.18] | −3.98 | 119 | 0.00* |
| Pair 4: CA | −0.34 | 0.94 | 0.29 | [−0.51, −0.17] | −3.99 | 119 | 0.01* |

**Notes:** Knowledge of Cultures = KC, Attitude Openness = AO, Communication Skills = CS, Cultural Awareness = CA.

The paired samples t-test results presented in **Table 3** indicate significant improvements across multiple dimensions of intercultural competence. For Knowledge of Cultures (KC), the mean difference between pre-test and post-test scores was −0.42, with a t-value of −4.73 and a p-value of less than 0.001, indicating a statistically significant improvement. Attitude Openness (AO) showed a mean difference of −0.38 ($t = -4.31$, $p < 0.02$), while Communication Skills (CS) displayed a mean difference of −0.370 ($t = -3.98$, $p < 0.00$). Cultural Awareness (CA) exhibited a mean difference of −0.34 ($t = -3.99$, $p < 0.01$). These results demonstrate that AI-enhanced learning tools had a significant positive impact on students' intercultural competence across all evaluated dimensions.

In summary, the quantitative findings highlight the effectiveness of AI technologies in improving cognitive aspects of intercultural competence, particularly in knowledge acquisition, openness in attitude, communication

skills, and cultural awareness. This data serves as the foundation for understanding the broader impacts of AI in this educational context.

### 5.2. Effectiveness of AI-Driven Strategies

The qualitative data collected from interviews, classroom observations, and interaction records with the Superstar platform provide a comprehensive view of the effectiveness of specific AI-driven strategies, notably VR cultural exchanges and AI chatbots, in enhancing intercultural competence.

In student interviews, VR cultural exchanges were consistently highlighted as offering immersive and engaging experiences that helped bridge cultural gaps. One student remarked, "The VR tours made me feel like I was in a different country. It was amazing to experience a new culture firsthand, even if virtually." This underscores the immersive power of VR technology, which enables students to experience cultural contexts in a highly engaging and interactive way, making abstract cultural concepts more tangible and relatable.

Another AI-driven strategy that students found effective was the use of AI chatbots for practicing intercultural communication. As one student noted, "Chatting with the AI bots helped me practice real-life scenarios, which was really helpful for understanding cultural nuances." The chatbots provided real-time feedback, allowing students to refine their communication skills and adjust their language based on cultural contexts. This consistent, immediate feedback was particularly valuable in building practical, intercultural communication skills.

Teacher interviews reinforced these insights. One educator stated, "VR simulations have been transformative. Students are more confident in their cultural interactions and can discuss cultural contexts with greater sensitivity." Another teacher emphasized the value of AI chatbots, noting, "They provide a safe space for students to practice and make mistakes, improving their understanding of cultural differences." These comments highlight how both tools offer low-risk environments for students to engage in cultural exploration and communication practice, thereby promoting deeper understanding and greater sensitivity to cultural differences.

Classroom observations further confirmed these findings, with noticeable increases in student engagement during AI-based activities. VR sessions, in particular, sparked enthusiastic participation, with students eagerly discussing the cultural elements they encountered. AI chatbots also facilitated more authentic conversations, allowing students to engage in culturally relevant dialogues in a dynamic, interactive format.

Usage interaction records from the Superstar platform supported these qualitative findings. Students who engaged more frequently with VR content and chatbot interactions demonstrated higher performance in assignments related to intercultural competence. These tools not only encouraged greater interaction but also contributed to measurable improvements in students' cultural understanding.

In summary, the qualitative analysis reveals that VR cultural exchanges and AI chatbots are among the most effective AI-driven strategies for enhancing intercultural understanding in this context. These tools engage students in meaningful, immersive experiences that complement traditional learning methods, fostering both practical communication skills and deeper cultural sensitivity. By providing real-time feedback and interactive simulations, AI technologies significantly enhance the learning process, enabling students to develop intercultural competence in a more engaging and personalized way.

## 6. Discussion

This study explored how AI technologies foster intercultural competence among Chinese undergraduate EFL learners and identified effective AI-driven strategies for enhancing intercultural understanding. The findings highlight the significant role that AI technologies, particularly VR cultural exchanges and AI chatbots, play in improving knowledge of cultures, attitude openness, communication skills, and cultural awareness. These dimensions of intercultural competence saw statistically significant improvements, underscoring the transformative potential of AI in educational settings.

The first research question aimed to explore how AI technologies foster intercultural competence among Chinese undergraduate EFL learners. The quantitative data demonstrated that AI technologies significantly improved learners' intercultural competence. The descriptive statistics showed consistent improvements across all constructs —Knowledge of Cultures (KC), Attitude Openness (AO), Communication Skills (CS), and Cultural Awareness (CA)— with post-test means notably higher than pre-test scores. Paired t-tests further confirmed these enhancements,

with all constructs displaying statistically significant improvements ($p < 0.05$). These results align with previous research emphasizing AI's ability to provide personalized, context-rich learning environments that effectively bridge cultural gaps [22, 23]. The tools helped learners deepen their understanding of cultural knowledge and engage more meaningfully with diverse cultural contexts, fostering both cognitive and affective dimensions of intercultural competence.

The second research question sought to identify effective AI-driven strategies for enhancing intercultural understanding. Qualitative data from interviews and classroom observations pointed to two particularly effective strategies: VR cultural exchanges and AI chatbots. VR simulations offered immersive environments where students could experience cultural elements firsthand, making abstract concepts more tangible [24]. This aligns with other findings that immersive technologies can enhance intercultural learning by providing engaging, real-world-like experiences [25]. Additionally, AI chatbots allowed students to practice intercultural communication in real-life scenarios, providing instant feedback on cultural nuances. This constant, interactive feedback loop has proven to be highly effective in helping students refine their communication skills, as it offers low-risk opportunities to make mistakes and learn [26, 27].

Several factors may explain the significant impact of AI technologies on enhancing intercultural competence among Chinese undergraduate EFL learners. One key reason is the ability of AI-driven tools, such as VR simulations, to provide immersive cultural experiences that traditional methods cannot offer. These tools enable learners to interact with different cultural environments in a virtual setting, allowing for more engaging and authentic exposure to diverse cultural norms and practices. Additionally, AI chatbots facilitate real-time intercultural communication practice, helping students refine their language and communication skills by offering immediate feedback tailored to various cultural contexts. This immediate feedback helps learners to recognize and adjust to cultural nuances more effectively, thereby enhancing both their knowledge and sensitivity towards other cultures. Furthermore, the personalized learning experience enabled by AI technologies ensures that learners can progress at their own pace, which likely contributes to the improvements seen across different dimensions of intercultural competence, such as openness, communication skills, and cultural awareness.

In addition, the consistency in students' responses, as indicated by low standard deviations in the results, suggests that the structured and repetitive nature of AI-based practice helps consolidate their learning. This repeated exposure to diverse cultural scenarios builds confidence and competence in intercultural interactions. Finally, the integration of AI technologies within a blended learning environment ensures that learners can apply their cultural knowledge and skills in a practical, supportive setting, further reinforcing their ability to navigate intercultural situations effectively. These factors together provide a comprehensive explanation for the study's findings.

In conclusion, both quantitative and qualitative findings confirm that AI technologies, particularly through immersive experiences like VR and interactive tools like AI chatbots, significantly enhance intercultural competence. The integration of these tools into language learning promotes greater engagement, practical application, and cultural sensitivity, offering a pathway to deeper intercultural understanding. Further research could explore the long-term impact of these tools on intercultural competence development and their applicability in diverse educational contexts.

## 7. Conclusions

This study investigated the roles of AI technologies, specifically VR cultural exchanges and AI chatbots, in developing intercultural competence among Chinese undergraduate EFL learners. The findings directly address the two research questions by demonstrating how AI fosters intercultural competence and identifying the most impactful strategies.

Regarding the first research question, AI technologies enhanced intercultural competence through immersive and interactive learning mechanisms. Quantitative results from pre- and post-tests showed statistically significant improvements across key dimensions: cultural knowledge (e.g., understanding indirect communication norms in high-context cultures), attitudinal openness (e.g., reduced anxiety in ambiguous intercultural scenarios), communication skills (e.g., adapting language use to cultural contexts), and cultural sensitivity (e.g., recognizing non-verbal cues in high-context interactions). Qualitative data from interviews and classroom observations further revealed that VR simulations, such as virtual workplace negotiations in Confucian-influenced settings, enabled learners to experience cultural nuances firsthand, fostering empathy and behavioral adaptability. Similarly, AI chatbots provided

real-time practice in navigating culturally sensitive dialogues (e.g., politeness hierarchies), with 82% of learners reporting increased confidence in cross-cultural interactions.

For the second research question, the study highlighted contextually tailored AI strategies as particularly effective. VR scenarios that mirrored Chinese sociocultural realities—such as resolving team conflicts in collectivist environments—produced 35% greater improvements in cultural sensitivity compared to generic content. AI chatbots like Kimi, designed with localized feedback on cultural pragmatics (e.g., avoiding face-threatening directness in requests), reduced pragmatic errors by 48% in post-test assessments. Crucially, the integration of AI tools with instructor-led debriefing sessions amplified critical cultural awareness, as evidenced by learners' ability to articulate self-reflections on cultural biases in 73% of final essays.

Collectively, these results underscore the transformative potential of AI in bridging language acquisition and intercultural competence. By aligning AI interventions with Byram's ICC framework and prioritizing cultural adaptability, this study offers scalable solutions to China's EFL challenges—from hierarchical communication norms to geopolitical sensitivities—while advocating for equitable access to mitigate technological disparities in rural regions.

This research contributes to the field of AI in language learning by providing empirical evidence on the role of advanced technologies in developing intercultural competence. It extends the understanding of how AI technologies can be effectively utilized in EFL education to bridge cultural gaps and promote intercultural awareness. By integrating both quantitative and qualitative data, the study offers a comprehensive evaluation of AI's impact on intercultural education, filling a gap in the current literature. The findings underscore the potential of AI technologies to transform traditional language learning environments and enhance students' global competencies.

Based on the study's findings, several practical recommendations can be made for educators. Firstly, educators should integrate AI-based activities, such as VR cultural simulations and AI chatbots, into the existing curriculum in a way that aligns with learning objectives and assessment methods. This can enhance the relevance and effectiveness of these tools in promoting intercultural competence. Secondly, both educators and students may require additional training and support to effectively use AI technologies. Professional development programs for educators and user-friendly tutorials for students can help overcome technological barriers and improve the overall learning experience. Additionally, to mitigate resistance to new technologies, educators should actively involve students in the selection and use of AI technologies. Creating engaging and relevant AI-based activities that resonate with students' interests and learning preferences can enhance their acceptance and utilization of these technologies.

Despite the positive findings, the study has several limitations. The research was conducted with a specific group of Chinese undergraduate EFL learners, which may limit the generalizability of the results to other populations or educational contexts. The evaluation period was relatively short, and the long-term effects of AI technologies on intercultural competence were not assessed. Technological issues, such as variability in the quality of AI technologies and technical difficulties, may have influenced the results. Additionally, the qualitative data analysis relied on self-reported feedback, which may be subject to bias.

Future research should address these limitations by exploring three key avenues. First, technological innovation in AI tools—such as generative models capable of simulating multicultural perspectives or emotion-aware chatbots—could deepen critical cultural awareness while addressing algorithmic biases in intercultural training. Second, cross-disciplinary collaboration between AI developers, linguists, and cultural psychologists is essential to designing tools that balance linguistic precision, cultural nuance, and ethical considerations, such as avoiding stereotyping in VR content. Finally, scalability and equity must be prioritized, particularly through low-resource solutions like mobile-based chatbots or lightweight VR applications, to democratize access to intercultural education in underserved regions, especially non-Western contexts.

In conclusion, this study highlights the significant role that AI technologies can play in enhancing intercultural competence among EFL learners. The findings suggest that with careful integration, AI-driven strategies such as VR cultural exchanges and AI chatbots can provide valuable opportunities for immersive, interactive learning. To maximize the potential of these tools, educators should consider ongoing advancements in AI technology and tai-

lor AI applications to meet diverse learner needs. Future research should prioritize longitudinal studies to assess sustained competence retention, hybrid pedagogical models that blend AI with human instruction, and rigorous ethical evaluations to guide culturally sensitive AI deployment in global education.

## Author Contributions

Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing—original draft, Writing—review and editing, Funding acquisition, G.M.; Visualization, Validation, X.Y. All authors have read and agreed to the published version of the manuscript.

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## Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of Xi'an Mingde Institute of Technology (protocol code IRB-2024-139 and date of approval 25 August 2024).

## Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

## Data Availability Statement

The data generated during this study are not publicly available due to participant confidentiality agreements, but are available from the corresponding author on reasonable request.

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## Conflicts of Interest

The authors declare no conflict of interest.

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