

AI Literacy and Intercultural Competence among English Majors: Current Levels, Possible Pathways and Pedagogical Implications

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Abstract. This study explores whether English majors' AI literacy is associated with their intercultural competence as measured through established self-report scales. By applying an AI literacy scale and an intercultural competence scale, this study collected questionnaire data and analyzed them through descriptive statistics, Pearson correlation analysis, median-based group comparison, and an independent-samples t-test. After excluding invalid responses, 40 of the 101 collected questionnaires were retained as valid responses for analysis. The results show that both AI literacy and intercultural competence were at moderately high levels but showed uneven patterns across dimensions. In terms of AI literacy, AI ethics scored highest, whereas AI knowledge was relatively lower. In terms of intercultural competence, attitudes received the highest score, while knowledge of foreign cultures and intercultural cognitive skills were comparatively lower. Moreover, a significant positive correlation was observed between AI literacy and intercultural competence ($r = 0.57$, $p < 0.001$), and the high-AI-literacy group scored higher in overall intercultural competence than the low-AI-literacy group, especially in knowledge of foreign cultures and attitudes. Hence, the positive correlation between AI literacy and intercultural competence suggests that higher AI literacy may be associated with higher scores in knowledge of foreign cultures and more positive intercultural attitudes; however, the relatively limited difference in intercultural cognitive skills indicates that AI tool use does not automatically lead to deeper intercultural understanding. Accordingly, the study calls for integrating AI literacy education with intercultural competence training in foreign language education.

Keywords: AI literacy; AI tools; intercultural competence; English majors; foreign language education.

1. Introduction

With the rapid development of generative artificial intelligence, generative AI tools, represented in this study by applications such as ChatGPT, ERNIE Bot (Wenxin Yiyan), Doubao, and Kimi, have increasingly entered university learning contexts, reshaping foreign language learning, knowledge access, and classroom practices. For undergraduates majoring in English, AI tools may not only improve language learning efficiency but also influence how students access cultural information, interpret intercultural phenomena, and prepare for intercultural communication. Meanwhile, intercultural competence has become a key objective of foreign language education and an important indicator of educational quality. However, existing studies on AI-assisted foreign language education have mainly focused on language skills and pedagogical models, whereas research on intercultural competence has largely examined traditional factors such as language proficiency, intercultural contact, and overseas experience. The role of AI tools as an emerging factor remains underexplored.

Therefore, using an established intercultural competence self-assessment scale and an AI literacy scale, this study examines the current levels and dimensional characteristics of students' AI literacy and intercultural competence, the correlation between the two constructs, and the possible ways in which AI tools may be related to different dimensions of intercultural competence, thereby providing empirical evidence and pedagogical implications for cultivating intercultural competence in foreign language education.

2. Literature Review

2.1. The Concept of Intercultural Competence and Research on Foreign Language Learners.

In foreign language education, intercultural competence is generally understood as the capacity to communicate and interact effectively and appropriately across cultural contexts. Byram proposed an influential model of intercultural communicative competence, arguing that foreign language learners need not only linguistic knowledge but also attitudes, cultural knowledge, skills of interpreting and relating, skills of discovery and interaction, and critical cultural awareness required for intercultural engagement [1]. Deardorff further conceptualized intercultural competence as the ability to communicate effectively and appropriately in intercultural situations on the basis of attitudes, knowledge, and skills [2]. Fantini also emphasized that intercultural competence is not a single skill but a dynamic construct comprising knowledge, attitudes, skills, and awareness [3]. In the Chinese context, Wu et al. operationalized Chinese college students' intercultural competence into several dimensions, including knowledge of one's own culture, knowledge of foreign cultures, attitudes, intercultural communication skills, intercultural cognitive skills, and awareness, thereby providing a localized measurement framework for empirical research [4]. Overall, these studies suggest that intercultural competence involves not only cultural knowledge and comparison, but also communicative adjustment, reflective judgment, and appropriate meaning negotiation across cultural differences.

Research on foreign language learners' intercultural competence has gradually established a shift from concept clarification to empirical research and influencing factor analysis. Wu et al. conducted an important study on Chinese college students' intercultural competence and laid the groundwork for its localized measurement. A teaching reference framework for intercultural competence in foreign language education was proposed by Zhang and Wu, indicating a change from competence assessment to competence development [5]. Peng et al. analysis of Chinese college students' intercultural competence on the international scene is multi-dimensional and uneven in their development across dimensions [6]. Peng and Wu also investigated the relationship between intercultural contact and intercultural competence. They noted that intercultural contact is not only an important learner background variable but also an important factor in intercultural competence development. [7] More recent research has integrated language proficiency and the quality of intercultural interaction into one framework of analysis. According to Li et al., self-perceived foreign language proficiency significantly predicted intercultural competence based on a sample of Chinese college students, and quantity and quality of intercultural interactions played mediating roles [8]. The development of intercultural competence is not just a result of knowledge but is significantly connected to the learners' communication resources, interactional quality and experience. Intercultural competence doesn't come naturally, but is gradually constructed through language training, cultural exposure and intercultural practice.

2.2. AI Tools in Foreign Language Education and Their Relevance to Intercultural Competence Development

With the rapid integration of generative artificial intelligence into education, the role of AI tools in foreign language teaching and learning has become increasingly prominent. Law shows that generative AI is no longer a peripheral aid in language education; rather, it is becoming embedded in learners' access to resources, task completion, and feedback processes [9]. Li, a Chinese scholar, argues that ChatGPT, with its capacities for information retrieval, machine translation, and dialogic text generation, has created new pedagogical scenarios for foreign language teaching while also reshaping teachers' roles and classroom organization [10].

A related issue concerns learners' AI literacy. Ng et al. suggest that AI literacy involves not only using AI but also understanding, evaluating, and ethically engaging with AI systems [11]. Wang et al. developed and validated an AI literacy scale, emphasizing that competence in using AI includes understanding, identifying, and evaluating AI products rather than merely operating them [12]. Wu

et al. further proposed an AI literacy evaluation framework for college students, consisting of four dimensions: AI attitude, AI knowledge, AI capability, and AI ethics [13]. Above all, the educational value of AI tools depends not only on the tools but also on learners' ability to understand, evaluate, and use them responsibly.

Compared with the growing body of research on AI-assisted writing, translation, speaking practice, and feedback, studies directly linking AI tools to intercultural competence development remain relatively limited. Nevertheless, recent work has begun to explore this intersection. Zhai et al. examined AI dialogue systems in English language learning and found that culturally sensitive, humorous, and empathetic responses could enhance learners' engagement, willingness to interact, and understanding of communicative contexts [14]. Lee et al. investigated the use of AI chatbots in three-dimensional metaverse environments and found that such tools helped strengthen pre-service teachers' Global Englishes awareness, including their understanding of English diversity, international communication contexts, and intercultural realities [15]. Lo further argues that generative AI can support the incorporation of multicultural materials and the redesign of Global Englishes-oriented teaching, although such use requires teachers' critical mediation [16]. Shadiev et al. highlights the role of contextualization, personalization, and socialization in AI-enhanced cross-cultural learning in authentic contexts [17].

In conclusion, AI tools should not be understood merely as technical aids for language learning. Rather, they may function as resources for contextual support, task scaffolding, and interactive feedback in intercultural learning. Hence, AI tools may function not only as language-learning aids but also as mediating resources for intercultural understanding, communication, and reflection.

2.3. Research Gaps and the Focus of the Present Study

Overall, the research on intercultural competence in foreign language education and the use of AI tools in language education has developed a relatively mature theoretical framework and some measurement instruments. However, their connection has not been quite explored. In the first place, existing studies on intercultural competence have essentially examined (mostly) traditional variables like proficiency in a foreign language, overseas experience, intercultural contact, and course-based interventions. But they have paid limited attention to AI tools as a new variable. In contrast, studies in the field of AI-assisted foreign language education have predominantly focused on writing, translation, speaking practice, feedback and pedagogical models. Empirical studies which take intercultural competence as the main outcome variable account for a small percentage.

The present study integrates an intercultural competence self-assessment scale with an AI literacy scale and uses quantitative evidence to examine how AI tools may connect with the different dimensions that make up intercultural competence. This design acknowledges the rising presence of AI tools in foreign language learning, extending the existing studies in a more focused manner. This study, in particular, focuses on undergraduates knowledgeable in English and explores the relationship between AI literacy and intercultural competence from three perspectives which are the current state, statistics-relationship, and way forward. By doing so, it aims to provide evidence and pedagogical implications for the development of intercultural competence in foreign language education in the age of AI.

3. Research Questions

Based on the above review, this study addresses the following three research questions:

1. What are the current levels and dimensional characteristics of AI literacy and intercultural competence among undergraduates majoring in English?
2. Is there a significant positive correlation between AI literacy and intercultural competence among undergraduates majoring in English?
3. Through what possible pathways may AI tools be related to different dimensions of intercultural competence among undergraduates majoring in English?

4. Methodology

4.1. Participants

Of the 101 questionnaires that were collected, there were 40 that were valid and used in the study. The other responses were not valid or were excluded as they were patterned, not complete, or invalid. Undergraduate English majors from Southwest Petroleum University in Sichuan Province, China, consisting of 34 females and 6 males, were the valid subjects. A total of 40 respondents were involved in the study, most of whom were level three students that is 24 respondents. This study examined the connection between AI literacy and intercultural competence, so the questionnaire collected data not only on variables such as gender, grade and major but also intercultural development variables such as overseas experience and frequency of contact with different cultural people. Whenever available the IELTS or TOEFL scores gave information on English proficiency. Participation was voluntary for all, and responses were taken anonymously.

4.2. Instruments

Two questionnaires were employed in this study.

The first instrument was a pre-established intercultural competence self-assessment scale that was adapted from Wu et al. [4]. The 28 items which were pulled together into a scale involved six different dimensions which in fact were knowledge of own culture, knowledge of foreign culture, attitudes, intercultural communication skills, intercultural cognitive skills and awareness. On a five-point Likert scale, all items were assessed whereby higher scores indicated a higher level of intercultural competence.

The second instrument employed for the study was intended to measure AI literacy and was mainly based on Wang et al. [12] and Wu et al. [13] work. This scale consists of 31 items capturing four dimensions: attitude towards AI, knowledge of AI, capability with AI, and ethics of AI. A fivepoint Likert scale was also used, and higher scores represented a higher level of AI literacy. In the AI literacy scale, generative AI products (ChatGPT, ERNIE Bot (Wenxin Yiyao), Doubao, Kimi) were provided as illustrative examples to help participants appreciate the breadth of AI tools examined in this study and were not treated as a separate variable for tool-specific frequency analysis. Given that both of these are established self-reported scales, we should read the findings as to the participants' perceived levels and not as actual observations of performance.

4.3. Data Analysis

The quantitative data were analyzed from three aspects.

First, descriptive statistics were used to examine the overall scores of the participants on both the intercultural competence scale and the AI literacy scale. For each participant, total scores were calculated for the two scales. In addition, the mean scores of each dimension were computed to provide a more detailed description of the participants' strengths and weaknesses in different aspects of intercultural competence and AI literacy.

Second, Pearson correlation analysis was conducted to examine the relationship between AI literacy and intercultural competence. Specifically, the total score of the AI literacy scale and the total score of the intercultural competence scale were used to determine whether a significant correlation existed between the two variables.

Third, to compare students with different levels of AI literacy, the valid sample was divided into a high-level group and a low-level group according to the median score of the AI literacy scale. Participants whose AI literacy scores were equal to or above the median were classified as the high-level group, whereas those below the median were classified as the low-level group. Based on this grouping, the researcher further calculated and compared the mean, standard deviation, maximum, and minimum values of the two groups on the intercultural competence scale. Moreover, the mean scores of each intercultural competence dimension were compared between the two groups to identify the dimension with the highest score and the dimension showing the largest gap. Finally, an

independent-samples t-test was conducted to examine whether the difference in intercultural competence between the two groups was statistically significant.

5. Results and Discussion

5.1. Current Levels and Dimensional Characteristics of AI Literacy and Intercultural Competence among English Majors

To address the first research question, descriptive statistics were conducted for both the AI literacy scale and the intercultural competence scale. As shown in Table 1, the participants' overall AI literacy was at a moderately high level. The mean total score of the AI literacy scale was 127.43, with a standard deviation of 14.57 and a variance of 212.35; the scores ranged from 95 to 155, indicating a certain degree of individual variation within the sample. At the dimensional level, AI ethics received the highest mean score ($M = 4.33$, $SD = 0.58$), followed by AI capability ($M = 4.10$, $SD = 0.60$) and AI attitude ($M = 4.04$, $SD = 0.57$), while AI knowledge had the lowest mean score among the four dimensions ($M = 3.91$, $SD = 0.50$).

Table 1. Descriptive Statistics of AI Literacy and Its Dimensions.

Variable	Mean	SD	Variance	Min	Max
AI total	127.43	14.57	212.35	95.00	155.00
AI ethics	4.33	0.58	0.34	3.00	5.00
AI capability	4.10	0.60	0.37	3.00	5.00
AI attitude	4.04	0.57	0.33	3.00	5.00
AI knowledge	3.91	0.50	0.25	3.00	5.00

Generally, the students demonstrated a positive attitude toward AI tools and possessed a certain level of operational ability and awareness of responsible use. The relatively high score for AI ethics indicates that many students were aware of issues related to responsibility, privacy, norms, and potential risks in AI use. However, the comparatively lower score for AI knowledge suggests that students' understanding of AI mechanisms and functional boundaries remained insufficient, and they still needed to better recognize the technical limitations of AI tools. In other words, their AI tool use appeared to be characterized by relatively strong practical engagement but comparatively limited conceptual understanding.

As shown in Table 2, the participants' overall intercultural competence was also at a moderately high level. The mean total score was 103.96, with a standard deviation of 11.87 and a variance of 140.92. The scores ranged from 80.89 to 129.86. Among the six dimensions, attitudes had the highest mean score ($M = 4.02$, $SD = 0.55$), followed by knowledge of one's own culture ($M = 3.88$), awareness ($M = 3.87$), and intercultural communication skills ($M = 3.86$). By contrast, knowledge of foreign cultures received the lowest mean score ($M = 3.20$, $SD = 0.64$), followed by intercultural cognitive skills ($M = 3.62$, $SD = 0.58$).

Table 2: Descriptive Statistics of Intercultural Competence and Its Dimensions.

Variable	Mean	SD	Variance	Min	Max
Intercultural competence total	103.96	11.87	140.92	80.89	129.86
Attitudes	4.02	0.55	0.31	2.67	5.00
Knowledge of one's own culture	3.88	0.59	0.35	3.00	5.00
Awareness	3.87	0.53	0.28	2.67	5.00
Intercultural communication skills	3.86	0.51	0.27	3.00	5.00
Intercultural cognitive skills	3.62	0.58	0.33	2.67	5.00
Knowledge of foreign cultures	3.20	0.64	0.41	1.57	4.71

In summary, the participants tended to hold positive and open attitudes toward intercultural communication and had developed a certain level of cultural awareness and basic communicative

ability. However, their knowledge of foreign cultures and their ability to analyze, compare, and interpret complex cultural phenomena remained relatively weak. Overall, the participants' intercultural competence showed an uneven pattern: they were relatively strong in intercultural attitudes and awareness, but weaker in foreign cultural knowledge and deeper intercultural cognition. Correspondingly, foreign language education should not only encourage students' willingness to engage in intercultural communication but also provide richer cultural input and more systematic analytical training.

5.2. Relationship between AI Literacy and Intercultural Competence

To address the second research question, Pearson correlation analysis was conducted to examine the relationship between AI literacy and intercultural competence. As shown in Table 3, the results revealed a significant positive correlation between the total score of AI literacy and the total score of intercultural competence ($r = 0.57$, $p < 0.001$). This indicates that students with higher AI literacy tend to report higher levels of intercultural competence. The finding suggests that AI literacy and intercultural competence were statistically associated, although this association does not imply causality.

To examine differences in intercultural competence among students with different levels of AI literacy, the sample was divided into a high-AI-literacy group and a low-AI-literacy group based on the median score of the AI literacy scale (median = 127.00). Participants scoring at or above the median were classified into the high-AI-literacy group ($n = 21$), whereas those scoring below the median were classified into the low-AI-literacy group ($n = 19$). The independent-samples t-test indicated a significant difference in intercultural competence between the two groups ($p = 0.02$). The high-AI-literacy group obtained a higher mean score in intercultural competence ($M = 108.02$, $SD = 10.37$) than the low-AI-literacy group ($M = 99.49$, $SD = 12.06$). This result further indicates that students with higher AI literacy tend to demonstrate stronger overall intercultural competence.

Table 3: Correlation and Group Comparison Results.

Analysis	Result
Pearson correlation	$r = 0.57$, $p < 0.001$
AI literacy median	127.00
High-AI-literacy group	$n = 21$, $M = 108.02$, $SD = 10.37$
Low-AI-literacy group	$n = 19$, $M = 99.49$, $SD = 12.06$
Independent-samples t-test	$p = 0.02$

At the dimensional level, the high-AI-literacy group scored higher than the low-AI-literacy group across all six dimensions of intercultural competence. The largest gap was found in knowledge of foreign cultures (Gap = 0.481), followed by attitudes (Gap = 0.466) and knowledge of one's own culture (Gap = 0.346), while smaller gaps were observed in intercultural cognitive skills (Gap = 0.105) and awareness (Gap = 0.147). These results suggest that higher AI literacy may be associated with broader access to cultural knowledge, more diverse cultural information, and more positive attitudes toward intercultural communication.

However, the correlation analysis and group comparison indicate only a statistical correlation between AI literacy and intercultural competence; they do not establish a direct causal relationship. In particular, the relatively small group difference in intercultural cognitive skills suggests that the contribution of AI tools to deeper cultural analysis, value judgment, and critical understanding may be limited. More specifically, AI tools appear to provide stronger support for cultural information access and intercultural communication preparation, whereas whether such support can be transformed into higher-level intercultural cognition may depend on students' reflective ability, problem awareness, and teachers' pedagogical guidance.

5.3. Possible Pathways through Which AI Tools May Be Related to Different Dimensions of Intercultural Competence

Based on the quantitative findings, AI tools may be associated with intercultural competence mainly through expanding access to cultural information, fostering more positive intercultural attitudes, and supporting intercultural expression, although such support remains limited.

First, AI tools may broaden students' access to foreign cultural knowledge. The high-AI-literacy group showed the largest advantage in the dimension of knowledge of foreign cultures, suggesting that AI tools may support students in obtaining cultural background information, examples, explanations, and multiple perspectives. Compared with traditional classroom input and textbook-based materials, AI tools provide a more immediate and flexible source of cultural information, which may partly explain why students with higher AI literacy performed better in the dimension of foreign cultural knowledge.

Second, AI literacy appears to exhibit a positive association with intercultural attitudes. The relatively large gap in the attitude dimension suggests that students with higher AI literacy may be more willing to engage with diverse cultural content and to explore different cultural perspectives through questioning, scenario simulation, and expression revision. By lowering the threshold for accessing intercultural materials and practicing intercultural communication, AI tools may increase students' willingness to participate in intercultural learning and communication.

Third, AI tools may provide scaffolding for intercultural expression. Students can use AI tools for language polishing, expression adjustment, contextual explanation, and communicative strategy refinement. Such support may help them prepare more effectively for intercultural communication. However, this support is mainly auxiliary and process-oriented; it should not be equated with the automatic development of intercultural competence. Intercultural competence requires not only access to information and linguistic expression, but also the ability to compare cultural differences, understand underlying values, and make critical judgments.

Therefore, the influence of AI tools on intercultural competence is ambivalent. On the one hand, AI tools can expand cultural input, improve learning efficiency, and encourage students to engage with foreign cultures. On the other hand, if students lack sufficient AI knowledge and critical awareness, they may passively accept AI-generated content and fail to develop genuine intercultural understanding. Accordingly, foreign language teaching should integrate AI tool use with intercultural tasks, such as cultural case comparison, scenario-based simulation, intercultural expression practice, and reflective writing. Teachers should also guide students to evaluate the accuracy, appropriateness, and potential cultural bias of AI-generated content. In this way, students can move from using AI to obtain answers toward using AI to support intercultural understanding and reflection. Only when AI use is combined with teacher guidance, task design, and student reflection can AI tools more effectively support the development of intercultural competence among foreign language majors.

6. Conclusion

The study explored the connection between AI literacy and intercultural competence of undergraduates majoring in English using an established scale, an intercultural competence scale and an AI literacy scale. The current study studied three aspects: the levels and dimensional characteristics of students' AI literacy and intercultural competence, their correlation, and the possible pathways by which AI tools are likely to be related to different dimensions of intercultural competence. This way, it provides empirical proof for the development of intercultural competence in foreign language teaching in the age of AI.

The results revealed that the overall AI competence of the subject was moderately high level. Of the four dimensions, AI Ethics, AI Capability, and AI Attitude obtained relatively high scores; whereas AI Knowledge received the lowest score. This indicated that students on the whole, accepted AI tools with a high level of conviction and possessed some cognitive abilities or awareness regarding responsible use, but an unacceptably low level of insight into AI mechanisms and functional limits.

In terms of intercultural competence, the participants also showed an overall moderately high level. The dimension related to attitude earned the highest score, while knowledge of a foreign culture and intercultural cognitive skills earned lower scores.

A more in-depth study demonstrated a positive correlation between AI literacy and intercultural competence. Compared to the low-AI-literacy group, overall intercultural competence significantly higher for the high-AI-literacy group, and the latter outperformed the former in the six dimensions too. The findings revealed largest differences between groups in terms of knowledge of foreign cultures and attitudes. This implies that the use of AI tools can assist learners in accessing cultural information easily, receiving contextualized assistance for intercultural communication and lowering the threshold for interacting with foreign cultures. However, the fact that intercultural cognitive skills are more similar than different also indicates that learning with AI does not automatically result in a stronger cultural comparison, value judgment or critical reflection among students, but rather is dependent on problem awareness and evaluative ability of students as well as teachers' pedagogical guidance.

Thus, in the age of AI, language teachers need not perceive an AI tool purely as a device to polish language, assist in translation or generate answers. AI tools need to be used as part of the overall design of intercultural competence development. In the classroom, teachers can lead their students to make use of various AI tools for tasks like comparing cultural cases, simulating intercultural scenarios, reflective writing, and problem-based tasks. In addition, students must be stimulated to verify, contrast and critically evaluate AI products. At the same time, the education system should strengthen AI literacy education so that students can advance from using AI simply to understanding, evaluating and using AI appropriately.

Nonetheless, the study consisted of a drawback. To begin with, the sample size or the number of respondents is relatively small, where only 40 respondents were valid and only from one university. Moreover, this research relies on cross-sectional questionnaire data. Results show that there is a significant relationship between AI literacy and intercultural competence, however, this does not confirm a relationship between the two. As a third point, analysis of possible pathways through which the AI tools may be related to intercultural competence was mainly based on quantitative results and was not further supported by interviews, classroom observations, or longitudinal data. Future research could be methodologically extended by making the sample more global with students from other universities, languages, and other years. It could also include interviews, classroom experiments, or longitudinal designs to more systemically examine how AI tools impact the development of intercultural competence.

As a whole, the findings reveal that among undergraduates of the English major, AI literacy is significantly correlated with intercultural competence. AI tools are a set of resources for intercultural learning but do not automatically lead to scaffolding. Combining AI use with cultural input, critical thinking, and teacher guidance can render AI tools more beneficial in supporting English majors' intercultural competence development.

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