Adaptive AI for Personalized Intercultural Communication Education: A Conversational Agent Powered by Retrieval-Augmented Generation (Student Abstract)

Mohamed Ahmed[1,2], Hyesun Choung[1]
[1] Purdue University, West Lafayette, IN 47907, USA
[2] Egypt University of Informatics, New Administrative Capital, Egypt
mohame43@purdue.edu, choungh@purdue.edu

Abstract

Traditional intercultural communication training often lacks safe spaces for open practice, leading to self-censorship and limited skill development. The ICC Tutor, an AI-powered conversational system, addresses this by offering a private, nonjudgmental environment for reflection and dialog. Using retrieval-augmented generation (RAG), the system grounds its prompts and feedback in course materials. We conducted a mixed-methods study (N = 25) with Beginner/Intermediate and expert learners. Preliminary findings suggest that the tutor helped reduce feelings of nervousness. While many beginners reported increased confidence in intercultural communication, expert learners' confidence temporarily decreased, suggesting the AI's role in fostering deeper self-reflection rather than just boosting perceived competence. These findings underscore the potential of AI tutors in supporting communication education and highlight the need for experience-adaptive designs to support nuanced learning trajectories.

Introduction

The increasing interconnectedness of global societies makes intercultural communication (ICC) a critical skill (Wang et al. 2024). Traditional pedagogical methods struggle with scalability and providing safe, low-stakes environments for practicing sensitive interactions, often leading to self-censorship and missed learning opportunities (Shen, Qiu, and Wang 2025). Artificial intelligence (AI), particularly generative AI, offers a novel and scalable avenue to address these challenges in teaching and practicing communication skills (Labadze, Grigolia, and Machadhize 2023).

Motivated by these limitations, we developed the ICC Tutor, a novel AI-powered conversational system utilizing Retrieval-Augmented Generation (RAG) for feedback grounded in course materials. This tool offers a non-judgmental, private setting for students to explore and practice diverse communication styles. We investigated its effectiveness in a mixed-methods study (N = 25) across Beginner/Intermediate and Expert learner groups.

System Design

The ICC Tutor is an AI-based chatbot designed to provide a psychologically safe, low-pressure environment for practicing intercultural communication. By offering a conversational, text-based interface, it allows users to reflect and respond without the immediacy or social pressure of face-to-face conversation, which can reduce fear of being judged or saying "the wrong thing."

The system's architecture, shown in Figure 1, includes two primary modules. The Quiz Module introduces and reinforces key intercultural concepts through short, adaptive Q&A drawn from course materials. The Scenario-based Role-play Module invites learners to apply these concepts in simulated conversational situations. Together, these modules support both conceptual understanding and practical skill development. To keep responses accurate and aligned with course goals, the ICC Tutor uses RAG. Rather than generating answers purely from the language model, the system retrieves relevant content from a vetted knowledge base (e.g., lecture notes and class readings), ensuring that examples and feedback reflect the instructor's intended framing rather than generic or potentially misleading interpretations or hallucinations (Li et al. 2025). A lightweight orchestration layer manages the flow between modules and maintains a supportive chatbot tone, all within a user-friendly interface. This design is engineered to prioritize psychological safety, helping users engage more openly while developing intercultural awareness and communication skills. (Shen, Qiu, and Wang 2025)

Methodology

We recruited 25 undergraduate students from a large Midwestern university's research participant pool; students participated voluntarily in exchange for course extra credit. Based on self-reported prior experience, participants were categorized into Beginner/Intermediate (n = 14) and Expert (n = 11) groups. A mixed-methods approach was employed, involving a pre-intervention survey to establish a baseline and a post-intervention survey to measure changes across three constructs relevant to intercultural communication learning: Communication Apprehension, Cultural Appreciation, and Intercultural Self-Efficacy. We used paired t-tests to measure pre-post changes within each group. To contextualize and interpret the quantitative results, we also conducted brief post-interaction interviews with all participants.

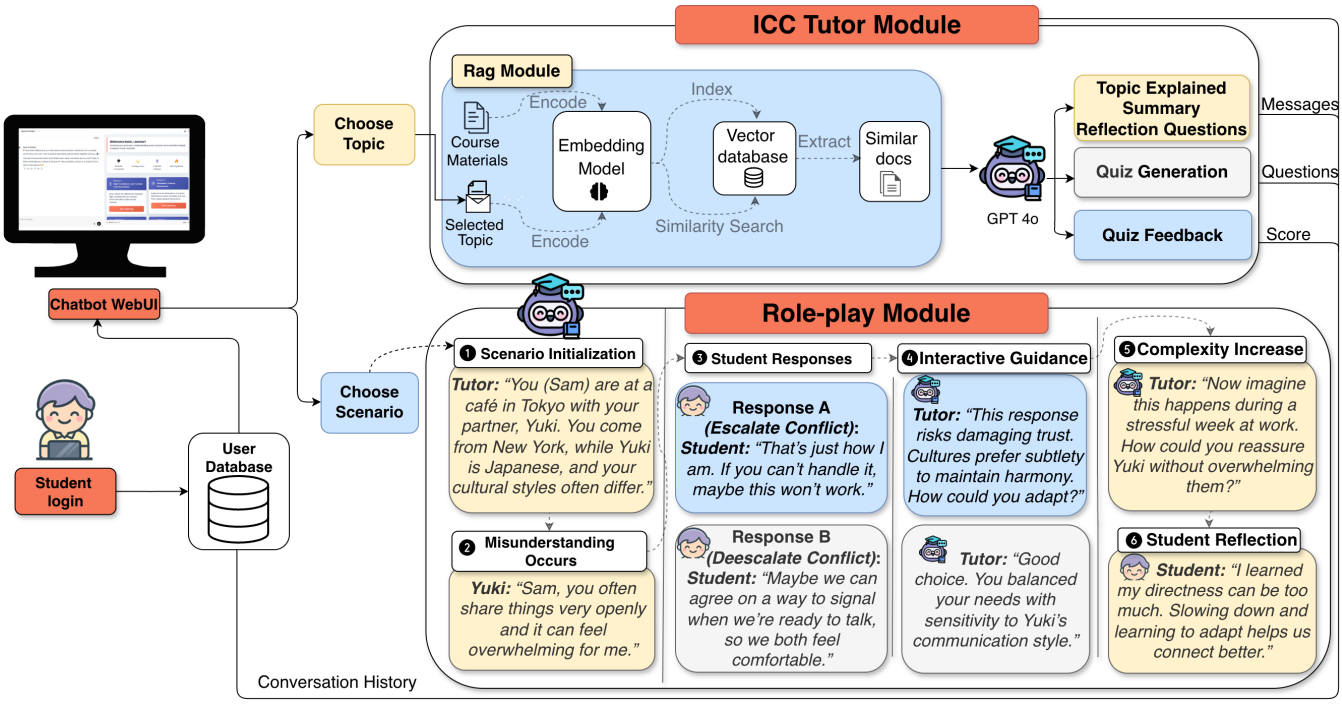

Figure 1: Overview of the ICC Tutor System Architecture. The system comprises two modules—a Quiz Module and a Scenario-based Role-play Module—that leverage a Large Language Model (LLM) and Retrieval-Augmented Generation (RAG) for personalized, evidence-based feedback. A central User Database tracks progress for experience-adaptive learning.

Results

The ICC Tutor demonstrated robust effectiveness in enhancing meaningful intercultural learning outcomes, with outcomes varying by learners' prior experience levels. As detailed in Table 1, the intervention significantly reduced Communication Apprehension by -0.72 points overall ($p = 0.004$, $d = 0.63$) and increased Cultural Appreciation by +0.48 points ($p = 0.008$, $d = 0.57$). When examining subgroups, Beginner/Intermediate learners showed a significant decrease in apprehension (-1.18, $p < 0.001$, $d = 1.32$). Expert learners showed an increase in in cultural appreciation (+0.64, $p = 0.046$, $d = 0.68$).

No.	Group	Pre Mean	Post Mean	Change	Effect size (d)	p-value
1	Overall	2.72	2.00	-0.72	0.638	0.004**
	Beginner/Int	3.07	1.89	-1.18	1.324	<0.001***
	Expert	2.27	2.14	-0.14	0.117	0.706
2	Overall	4.00	4.48	+0.48	0.575	0.008**
	Beginner/Int	4.18	4.54	+0.36	0.464	0.106
	Expert	3.77	4.41	+0.64	0.688	0.046*
3	Overall	4.08	4.16	+0.08	0.088	0.660
	Beginner/Int	3.71	4.14	+0.43	0.503	0.082
	Expert	4.55	4.18	–0.36	0.449	0.167

Table 1: Significant Intervention Outcomes by Construct[1]

Post-interaction Interviews revealed the AI's non-judgmental and low-pressure environment as key strengths. Participants noted, *"I could type out my thoughts first without feeling pressure to respond on the spot."* (P23) and *"Don't feel judged by an AI"* (P13), highlighting psychological safety. Nonetheless, limitations were noted regarding simplified scenarios and lack of realism. Participants suggested greater complexity and less overt guidance: *"The scenarios were different from real life because you were immediately given all the cues. In real life, you have to pick them up yourself."* (P15).

Conclusion and Future Work

These findings suggest that LLM-based chatbots can meaningfully complement traditional instruction by offering tailored support. For students newer to intercultural communication, using the ICC Tutor helped reduce communication apprehension, making them feel more at ease engaging in conversations across cultural differences. For experienced learners, the Tutor encouraged greater appreciation for cultural perspectives. Future work will involve evaluating the ICC Tutor in semester-long, course-embedded settings to examine its longitudinal effects on learner engagement and intercultural competencies. System enhancements will include the introduction of multimodal cues (e.g., voice and visuals) and more tailored feedback. Additionally, we plan to stress-test the RAG pipeline using controlled adversarial prompts to assess response reliability and implement guardrails against unintended bias. These steps aim to support the transition of the ICC Tutor from a controlled research prototype to a scalable instructional tool.

[1]Note: The numbered constructs in table 1 correspond to: (1) Communication Apprehension, (2) Cultural Appreciation, and (3) Self-Efficacy. Scores are based on Likert Scale (1-5)

Ethics Statement

The study was approved by the Purdue University Institutional Review Board (IRB-2025-454), and all participants provided informed consent before participation. Recruitment was voluntary through the university's SONA research participation management tool, and data were anonymized for analysis.

References

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