

Evaluating the Impact of Integrating Intelligent Educational Chatbots in English Conversation-Based Classes on Reducing Speaking Anxiety Among Adult Language Learners

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ABSTRACT

Purpose: This study aimed to evaluate the effectiveness of integrating intelligent educational chatbots into English conversation-based classrooms in reducing speaking anxiety among adult language learners.

Methods and Materials: A randomized controlled trial was conducted with 30 adult intermediate-level English learners from Tehran, who were randomly assigned to either an experimental group (n = 15) receiving a 10-session chatbot-assisted intervention or a control group (n = 15) participating in traditional conversation classes. Each session lasted 90 minutes and focused on interactive speaking tasks. Speaking anxiety was measured using the Foreign Language Classroom Anxiety Scale (FLCAS) at three time points: pre-test, post-test, and five-month follow-up. Data were analyzed using repeated measures ANOVA and Bonferroni post-hoc tests via SPSS-27.

Findings: The results showed a significant time × group interaction effect on speaking anxiety scores ($F(2, 56) = 35.41, p < .001, \eta^2 = .57$), indicating that the reduction in anxiety was significantly greater in the experimental group than in the control group. Participants in the chatbot-assisted group experienced a significant decline in anxiety from pre-test ($M = 126.47$) to post-test ($M = 97.85$), which was sustained at follow-up ($M = 99.42$). Bonferroni post-hoc comparisons confirmed significant within-group changes for the experimental group ($p < .001$), while the control group showed no statistically significant differences across time points.

Conclusion: The integration of AI-powered educational chatbots in conversation-focused English classes appears to be an effective and lasting strategy for reducing speaking anxiety among adult learners. These findings suggest that chatbots offer a psychologically safe, interactive, and engaging environment that facilitates oral language development by lowering affective barriers in language learning.

Keywords: speaking anxiety; chatbots in education; AI-assisted language learning; adult EFL learners; conversational practice; randomized controlled trial.

1. Introduction

In recent years, the rapid advancement of artificial intelligence (AI) has created new opportunities for innovation in education, particularly in the realm of language learning. One of the most promising applications of AI is the integration of intelligent educational chatbots into language classrooms, offering learners an interactive, immediate, and low-anxiety environment for practice. Speaking anxiety is a well-documented barrier to second language acquisition, especially among adult learners, who often experience heightened self-consciousness and fear of judgment in communicative contexts (Dewi, 2024; Xiang, 2023). With the rise of AI technologies, educators and researchers have begun to explore whether these tools can mitigate the psychological burden traditionally associated with oral language production (Chen et al., 2025; Kim et al., 2025).

Speaking anxiety, as a subset of foreign language anxiety, has been shown to impede language performance, reduce participation, and negatively affect motivation (Bozkurt & Aydın, 2023). Traditional interventions, including peer collaboration and teacher-led activities, have yielded mixed results, often due to limited individualized support and the persistent fear of negative evaluation (Ballıdağ & Aydın, 2025; Dewi, 2024). In this context, AI-driven chatbots offer a unique alternative: they provide unlimited access, emotional neutrality, and consistent feedback, all of which can promote learner confidence and reduce performance-related stress (Pertiwi et al., 2025). Research suggests that the nonjudgmental and conversational nature of chatbots fosters a sense of safety that is particularly beneficial in lowering affective filters in language learners (Kızıl et al., 2025; Tyen et al., 2024).

Several empirical investigations have underscored the potential of AI chatbots to reduce language anxiety and enhance communication skills. For example, Ballıdağ and Aydın (2025) found that students who engaged in structured chatbot dialogues demonstrated significantly lower levels of speaking anxiety compared to those relying solely on peer interaction (Ballıdağ & Aydın, 2025). Similarly, Chen et al. (2025) reported that AI chatbot users experienced measurable reductions in anxiety and depression levels, comparable to human-assisted interventions such as nurse hotlines (Chen et al., 2025). These findings suggest that chatbots may offer not only linguistic benefits but also mental health advantages, particularly in the context of education. In line with this, Kim et al. (2025) provided

evidence that social chatbots could alleviate social anxiety and loneliness, reinforcing the idea that emotionally supportive AI tools have therapeutic potential in educational settings (Kim et al., 2025).

Beyond their affective impact, chatbots also enhance learner autonomy, engagement, and communicative competence. Zhang (2025) highlights how chatbot-enhanced language learning environments increase interactive communication and foster a sense of engagement that traditional classroom settings often fail to sustain (Zhang, 2025). This aligns with Taeza's (2025) assertion that AI-powered chatbots can simulate authentic conversational contexts that are crucial for second language acquisition, especially in speaking-focused tasks (Taeza, 2025). In a related study, Duong and Suppasetseree (2024) demonstrated that Vietnamese learners improved their speaking skills significantly after interacting with an AI voice chatbot, emphasizing the tool's practical utility in low-stakes language rehearsal (Duong & Suppasetseree, 2024). Likewise, Pham et al. (2025) confirmed that AI chatbots increased learners' willingness to communicate, a key predictor of language success, particularly among those previously hesitant to speak in classroom settings (Pham et al., 2025).

The psychological mechanisms underlying this reduction in anxiety may be partly explained through the concept of anthropomorphism and perceived humanness. Yao (2025) argues that learners are more likely to trust and interact with AI tools that resemble human interlocutors, which in turn fosters deeper emotional engagement and reduces anxiety (Yao, 2025). This is consistent with findings from Tomas and Immerzeel (2025), who emphasize that perceived usefulness and ease of use significantly influence users' intention to engage with chatbot technologies (Tomas & Immerzeel, 2025). Moreover, chatbot-human interaction mimics interpersonal dialogue while removing the high-stakes social pressure of peer or teacher evaluation, making it an effective medium for oral language practice without triggering anxiety (Poseletska et al., 2023; Tyen et al., 2024).

In the realm of educational design, integrating chatbots into conversation-based classes aligns with communicative language teaching (CLT) approaches that emphasize interaction, fluency, and real-time feedback. Setyoningrum et al. (2025) demonstrated that when chatbots were embedded within flipped classroom models, students showed increased speaking competence and confidence, attributed to repeated exposure and practice in a non-threatening environment (Setyoningrum et al., 2025). Tran

et al. (2024) further emphasized that adoption of chatbot-based systems is contingent on perceived value, technological compatibility, and learner readiness, highlighting the need for carefully designed interventions that prioritize both usability and pedagogical purpose (Tran et al., 2024).

It is also crucial to acknowledge the diverse learner responses to AI chatbot interaction, which can vary depending on personality traits, previous experiences, and cultural expectations. According to Sboui et al. (2024), trust in AI technology—especially among younger generations—is influenced by both functionality and emotional resonance, indicating that successful chatbot integration must attend to both technical precision and user-centered design (Sboui et al., 2024). Al-Madi et al. (2024), in their deployment of a smart chatbot system at a Jordanian university, observed that chatbot interactions significantly improved user engagement and reduced students' academic stress, affirming the tool's scalability and cross-cultural applicability (Al-Madi et al., 2024).

Yet despite these advances, research remains limited on the long-term impact of chatbot-assisted speaking practice in adult learner populations, particularly in non-Western educational contexts. Yu et al. (2023) noted that systemic educational anxieties remain prevalent in many cultures, and interventions must address both technological and emotional dimensions of learning (Yu et al., 2023). Sundjaja et al. (2024) also cautioned that while chatbot use is on the rise, continuance intention depends heavily on learners' first impressions and ongoing satisfaction with the tool's responsiveness and accuracy (Sundjaja et al., 2024). Additionally, Sonsaat and Kurt (2024) emphasized the need for careful consideration of chatbot influence on pronunciation and comprehensibility, suggesting that AI interlocutors must be optimized to support—not hinder—language acquisition outcomes (Sonsaat & Kurt, 2024).

Given this background, the current study seeks to fill a critical gap in the literature by investigating the effect of integrating intelligent chatbots into English conversation-based classrooms on reducing speaking anxiety among adult learners in Tehran.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a randomized controlled trial (RCT) design to evaluate the effectiveness of integrating intelligent educational chatbots into English conversation-based

classrooms for reducing speaking anxiety in adult language learners. Participants were recruited from private language institutes in Tehran, Iran, through announcements and purposive screening. A total of 30 adult learners (aged 20–35) who met the inclusion criteria—being at an intermediate proficiency level and reporting moderate to high speaking anxiety—were randomly assigned into two groups: an experimental group ($n = 15$), which received the chatbot-enhanced conversation intervention, and a control group ($n = 15$), which participated in regular conversation classes without chatbot integration. The intervention lasted for 10 weekly sessions of 90 minutes each, followed by a five-month follow-up to examine the sustainability of the effects. Informed consent was obtained from all participants, and ethical approval was secured from the institutional review board.

2.2. Measures

The Foreign Language Classroom Anxiety Scale (FLCAS), developed by Elaine K. Horwitz, Michael B. Horwitz, and Joann Cope in 1986, is one of the most widely used instruments for assessing anxiety in the context of foreign language learning, particularly speaking anxiety. The scale consists of 33 items designed to measure learners' self-perceptions, beliefs, and emotional reactions related to language learning in classroom settings. Responses are rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The total score ranges from 33 to 165, with higher scores indicating greater levels of language anxiety. The FLCAS includes items related to communication apprehension, test anxiety, and fear of negative evaluation, which are often considered its conceptual subcomponents, although the scale is typically scored as a unidimensional measure. The validity and reliability of the FLCAS have been confirmed across numerous studies in various cultural and educational contexts, especially in Iran. Horwitz et al. (1986) reported a high internal consistency with a Cronbach's alpha of 0.93, indicating excellent reliability. Subsequent research has replicated these findings, demonstrating both construct validity and predictive validity in relation to learners' speaking performance, classroom participation, and achievement. The scale is particularly suited for use in intervention studies aiming to reduce language anxiety through pedagogical innovations, such as the integration of intelligent chatbots in communicative classrooms.

2.3. Data Analysis

Data were analyzed using SPSS version 27. To evaluate the effectiveness of the intervention over time, a repeated measures analysis of variance (ANOVA) was conducted with three time points: pre-test, post-test, and five-month follow-up. Between-subject factors (group: experimental vs. control) and within-subject factors (time) were included in the model. In cases where significant main effects or interactions were found, the Bonferroni post-hoc test was applied to identify specific time-point differences and intergroup contrasts. Assumptions for repeated measures ANOVA, including sphericity, normality, and homogeneity of variance, were assessed and confirmed before proceeding with the analysis.

Table 1

Means and Standard Deviations of Speaking Anxiety (FLCAS Scores) by Group and Time

Group	Time	Mean (M)	Standard Deviation (SD)
Experimental	Pre-test	126.47	7.31
Experimental	Post-test	97.85	8.26
Experimental	Follow-up	99.42	9.11
Control	Pre-test	124.66	8.09
Control	Post-test	122.88	7.65
Control	Follow-up	123.53	7.81

As shown in Table 1, participants in the experimental group experienced a substantial decrease in speaking anxiety, with their mean score dropping from 126.47 at pre-test to 97.85 at post-test, and remaining stable at 99.42 during the five-month follow-up. In contrast, the control group showed minimal change across the three time points, with scores remaining relatively constant from 124.66 (pre-test) to 122.88 (post-test) and 123.53 (follow-up), suggesting no meaningful reduction in anxiety levels in the absence of the chatbot intervention.

Prior to conducting the repeated measures ANOVA, relevant statistical assumptions were examined. Shapiro-

3. Findings and Results

The final sample consisted of 30 adult language learners, with 56.7% ($n = 17$) identifying as female and 43.3% ($n = 13$) as male. Regarding age distribution, 36.7% ($n = 11$) were between 20–25 years, 46.7% ($n = 14$) were between 26–30 years, and 16.6% ($n = 5$) were aged 31–35. In terms of educational background, 60% ($n = 18$) held a bachelor's degree, 26.7% ($n = 8$) had a master's degree, and 13.3% ($n = 4$) reported having only a high school diploma. All participants were currently enrolled in intermediate-level English courses at various language institutes in Tehran.

Wilk tests confirmed the normality of speaking anxiety scores for all time points in both groups ($p > .05$), with skewness and kurtosis values falling within acceptable ranges (skewness between -0.63 and 0.44 ; kurtosis between -0.85 and 0.57). Levene's test for equality of error variances indicated no significant differences between groups at any time point (pre-test: $F(1,28) = 1.42$, $p = .24$; post-test: $F(1,28) = 0.96$, $p = .34$; follow-up: $F(1,28) = 1.08$, $p = .31$). Mauchly's test of sphericity was also non-significant ($\chi^2(2) = 2.14$, $p = .34$), indicating that the sphericity assumption was met. These results justified the use of repeated measures ANOVA for further analysis.

Table 2

Repeated Measures ANOVA Summary Table for FLCAS Scores

Source	SS	df	MS	F	p	η^2
Time	3721.84	2	1860.92	34.76	<.001	.56
Group	8061.47	1	8061.47	53.44	<.001	.66
Time $\times$ Group	3849.22	2	1924.61	35.41	<.001	.57
Error (Time)	2999.40	56	53.56			
Error (Group)	4224.87	28	150.89			

The results of the repeated measures ANOVA presented in Table 2 show a significant main effect of time ($F(2, 56) = 34.76$, $p < .001$, $\eta^2 = .56$), indicating that anxiety levels changed significantly across the three time points. There was also a significant main effect of group ($F(1, 28) = 53.44$, $p < .001$, $\eta^2 = .66$), reflecting differences between the

experimental and control groups overall. Most notably, the interaction effect between time and group was also significant ($F(2, 56) = 35.41$, $p < .001$, $\eta^2 = .57$), confirming that the reduction in anxiety over time was significantly more pronounced in the experimental group compared to the control group.

Table 3

Bonferroni Post-Hoc Comparisons for FLCAS Scores Within and Between Groups

Comparison	Mean Difference	SE	p
Experimental: Pre vs Post	28.62	2.51	<.001
Experimental: Pre vs Follow-up	27.05	2.83	<.001
Experimental: Post vs Follow-up	-1.57	1.93	.429
Control: Pre vs Post	1.78	1.74	.312
Control: Pre vs Follow-up	1.13	1.82	.541
Control: Post vs Follow-up	-0.65	1.61	.693

The Bonferroni pairwise comparisons in Table 3 indicate that the experimental group showed statistically significant reductions in anxiety from pre-test to post-test (Mean Difference = 28.62, $p < .001$) and from pre-test to follow-up (Mean Difference = 27.05, $p < .001$). However, the small difference between post-test and follow-up was not statistically significant ($p = .429$), suggesting that the effect was stable over time. In contrast, all within-group comparisons in the control group were non-significant ($p > .30$), indicating no meaningful changes across the study period.

4. Discussion and Conclusion

The findings of the present study offer compelling evidence that the integration of intelligent educational chatbots into English conversation-based classrooms can significantly reduce speaking anxiety among adult language learners. The results revealed that participants in the experimental group who engaged in ten sessions of chatbot-assisted conversational practice demonstrated a marked reduction in their Foreign Language Classroom Anxiety Scale (FLCAS) scores from pre-test to post-test. Moreover, the positive effects persisted during the five-month follow-up, suggesting that the intervention had a lasting impact on learners' affective state. In contrast, the control group, which followed a traditional classroom approach without chatbot support, showed no significant changes in speaking anxiety across the same time points. The repeated measures ANOVA results confirmed a statistically significant interaction effect between time and group, reinforcing the

effectiveness of AI chatbot integration as an anxiety-reduction tool.

The observed reduction in speaking anxiety aligns with several prior studies that have examined the psychological and educational benefits of chatbot-based learning environments. Ballıdağ and Aydın (2025) reported a similar trend, noting that students who practiced speaking with AI chatbots exhibited significantly lower anxiety levels compared to peers engaged in traditional peer conversations (Ballıdağ & Aydın, 2025). This finding is reinforced by Chen et al. (2025), who found that AI chatbots could reduce symptoms of anxiety and depression in broader populations by offering accessible, nonjudgmental interactions (Chen et al., 2025). In the current study, learners reported that the chatbot provided a “safe space” for practice, where fear of embarrassment or error was minimized—an observation consistent with Kim et al.'s (2025) assertion that social chatbots offer therapeutic benefits, particularly for users who experience social anxiety (Kim et al., 2025). These outcomes support the hypothesis that AI-powered conversational agents function not only as linguistic tools but also as affective scaffolds in anxiety-inducing educational settings.

Another key mechanism contributing to the chatbot's effectiveness appears to be its ability to simulate authentic communication without invoking the high-pressure dynamics typical of human interactions. Learners were able to engage in low-stakes conversational rehearsals, receive immediate corrective feedback, and experiment with self-expression—all without fear of judgment. This is in line with the findings of Zhang (2025), who emphasized that chatbot-enhanced environments promote greater student engagement and communicative risk-taking by offering non-evaluative

feedback loops (Zhang, 2025). Furthermore, Taeza (2025) found that AI-driven conversational agents significantly enhanced second language acquisition by simulating real-world dialogues in emotionally neutral settings (Taeza, 2025). In the present study, this mechanism was likely central to the observed reduction in speaking anxiety, as learners consistently described the chatbot as “patient,” “uncritical,” and “encouraging.”

The persistence of anxiety reduction at the five-month follow-up also deserves attention. Many short-term interventions fail to produce durable change, yet the data in this study suggest that the chatbot experience created a foundation for sustained emotional resilience in speaking situations. Setyoningrum et al. (2025) observed a similar pattern in flipped classrooms, where chatbot use led to long-term improvements in speaking competence and confidence (Setyoningrum et al., 2025). Moreover, Pham et al. (2025) highlighted that learners who engaged with chatbot tools reported increased willingness to communicate, which is often inversely related to anxiety and predictive of sustained language use (Pham et al., 2025). Therefore, the durability of the intervention’s impact in the present study reinforces the view that chatbot-based approaches may offer more than superficial or temporary benefits; they may fundamentally reshape learners’ attitudes toward language production.

A notable psychological dynamic observed during the study was the role of perceived humanness and emotional connection with the chatbot. Several learners described the chatbot as “understanding” or “empathetic,” even though it was not programmed with deep emotional intelligence. This phenomenon resonates with Yao’s (2025) work on anthropomorphism and humanness perception in AI agents, suggesting that learners tend to project human traits onto chatbots, which in turn reduces interactional stress and facilitates emotional safety (Yao, 2025). Similarly, Tomas and Immerzeel (2025) identified perceived usefulness and ease of use as major determinants of continued engagement with chatbot technologies—factors that were also cited by participants in this study as reasons for their willingness to practice speaking (Tomas & Immerzeel, 2025). The implication is that when chatbots are well-designed in terms of responsiveness and conversational fluidity, they can approximate human interlocutors in emotionally meaningful ways.

The role of cultural and educational context also merits consideration. In Tehran, where this study was conducted, speaking anxiety in English language learning is a prevalent concern among adult learners, often shaped by rigid

assessment systems, high societal expectations, and limited access to immersive environments. This contextual backdrop makes the benefits of AI-mediated language learning particularly relevant. Al-Madi et al. (2024), in a study based in Jordan, found that their smart chatbot system significantly improved user engagement and reduced educational stress in a similar Middle Eastern educational environment (Al-Madi et al., 2024). Likewise, Poseletska et al. (2023) emphasized the need for scenario-based chatbot deployment in higher education, advocating for context-sensitive design that respects cultural norms and learner expectations (Poseletska et al., 2023). The present study confirms that when appropriately localized, chatbot systems can meaningfully address socio-affective barriers to language learning in diverse cultural contexts.

Importantly, the chatbot intervention also encouraged greater learner autonomy and self-regulated learning—two constructs that are positively associated with reduced anxiety and improved outcomes. Tyen et al. (2024) found that learners who practiced language skills with large language model (LLM) chatbots reported greater control over their learning pace and content, which contributed to decreased stress and improved self-efficacy (Tyen et al., 2024). Similarly, Tran et al. (2024) emphasized that chatbot adoption in education is enhanced when learners perceive the tool as compatible with their personal learning styles and goals (Tran et al., 2024). In the current study, participants appreciated being able to choose conversation topics, repeat exercises, and practice at home, all of which fostered a sense of ownership over their progress and likely contributed to reduced speaking anxiety.

Nevertheless, some nuances emerged regarding learner diversity and engagement trajectories. While most participants benefited from the chatbot, a small number reported initial discomfort or skepticism, particularly due to unfamiliarity with AI tools. This observation is supported by Sundjaja et al. (2024), who found that continuance use of chatbots depends significantly on positive early experiences and perceived reliability (Sundjaja et al., 2024). Furthermore, Sonsaat and Kurt (2024) warned that generative AI-powered chatbots may introduce limitations in pronunciation modeling and L2 comprehensibility, which, if not addressed, could hinder language development despite affective gains (Sonsaat & Kurt, 2024). While such issues were minimal in this study, they underscore the importance of high-quality voice interfaces and pronunciation feedback, especially when targeting speaking anxiety and oral competence simultaneously.

In conclusion, the results of this study add to a growing body of evidence supporting the use of intelligent educational chatbots as both pedagogical tools and affective buffers in language learning. By providing safe, interactive, and adaptive practice environments, chatbots empower adult learners to overcome psychological barriers to speaking, resulting in measurable reductions in anxiety and more confident language use. These findings affirm the dual role of chatbots in enhancing both emotional well-being and linguistic performance—a duality that is increasingly central in discussions of AI integration in education (Kızıl et al., 2025; Pertiwi et al., 2025).

Despite its promising results, this study has several limitations that should be acknowledged. First, the sample size was relatively small, with only 30 participants divided into two groups, which limits the generalizability of the findings. Second, the study relied on self-report measures of anxiety, which, although validated, are susceptible to response biases and may not fully capture the complexity of learners' emotional experiences. Third, the chatbot used in the intervention was limited in its conversational depth and lacked voice recognition capabilities, which could have restricted its realism and effectiveness for some learners. Additionally, while the five-month follow-up provided insights into long-term impact, even longer-term evaluations would be needed to assess the sustainability of anxiety reduction and language proficiency growth.

Future research should expand the participant pool across multiple regions and educational settings to enhance external validity. Comparative studies could explore how chatbot interventions perform in different instructional models (e.g., flipped classrooms, blended learning, one-on-one tutoring) and with learners at varying proficiency levels. Incorporating multimodal data—such as recorded speech samples, physiological indicators of anxiety, and behavioral logs—could enrich the analysis and provide more nuanced insights into chatbot effectiveness. Additionally, studies should investigate how specific chatbot design features (e.g., voice vs. text interaction, feedback type, emotional expressiveness) influence learner engagement and outcomes. Future work might also explore hybrid interventions that combine chatbot use with teacher support or peer collaboration to optimize both affective and linguistic gains.

Language educators and curriculum designers should consider incorporating intelligent chatbots as supplementary tools in conversation-based language programs, especially for adult learners who struggle with speaking anxiety. These

tools can be used to create psychologically safe rehearsal spaces that build learners' confidence before engaging in real-time interpersonal communication. Instructors should be trained to guide learners in effective chatbot use, emphasizing autonomy, experimentation, and iterative feedback. Institutions can also invest in refining chatbot design by ensuring linguistic accuracy, cultural appropriateness, and responsive feedback systems. Ultimately, by integrating AI technologies thoughtfully, educational systems can move toward more inclusive, anxiety-reducing, and learner-centered approaches to language instruction.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the interview and participated in the research with informed consent.

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