

THE IMPACT OF AI-POWERED CHATBOTS ON THE UNIVERSITY STUDENTS' SPEAKING FLUENCY AND FOREIGN LANGUAGE ANXIETY: A QUANTITATIVE STUDY

Rehana John

Assistant professor, Department of English, Forman Christian College (A Chartered University), Lahore. Email: rehanajohn@fccollege.edu.pk

Sarah John (Corresponding Author)

Lecturer, Center for Language Development (CLD) Forman Christian College (A Chartered University), Lahore. Email: sarahjohn@fccollege.edu.pk

Abstract

The effect of AI-powered chatbots on the English-speaking fluency and foreign language anxiety of the university students of Punjab and Government College (GC) universities was explored in this quantitative study. The study employed a quasi-experimental design, as the oral delivery and psychological comfort of the students were the two dependent variables, and AI integration (as the independent variable) affected both variables. The sample was the population that consisted of the undergraduate students of all of Punjab and different GC institutions, and a sample of 400 participants was chosen according to the sampling guidelines given by L.R. Gay to achieve the statistical validity and representativeness. The information was collected by using a standardized Speaking Fluency Rubric and the Foreign Language Classroom Anxiety Scale (FLCAS) and later analyzed with the help of descriptive and inferential statistics. The results indicated that AI contact on a regular basis made an important contribution to speech fluency and offered a low stake setting that alleviated communication fear. It was concluded that AI-based conversational aids were effective pedagogic supplements in higher education, and it was suggested that the technologies should be incorporated into the Punjab ELT curriculum as a formal component to ensure that the gap between theoretical knowledge and the practical oral skills was bridged.

Keywords

AI-powered chatbots; speaking fluency; foreign language anxiety; English language learning; higher education; ELT in Pakistan

Introduction

The blistering penetration of the sphere of artificial intelligence (AI) into the educational setting has altered the conventional framework of learning languages, especially in the English language teaching (ELT) sphere. AI-powered chatbots have become one of the most popular technologies in the field of AI because of their potential to deliver interactive experiences with learners, anxiety-free communicative practice, and learner-centered. Fluency in speaking is still the most complicated skill at the university level for English learners, particularly in situations where the interaction with real-life processes is not as frequent, and the fear of being judged negatively is widespread. Students in Pakistan and especially in Punjab and Government College (GC) universities are usually faced with great degrees of foreign language anxiety, which negatively impacts their oral performance and readiness to communicate. AI chatbots provide a low-stress, adaptive, and repetitive practice environment in which learners are free to have an interaction without the social risks that are directly linked to human interlocutors. Although the current AI-assisted language learning is of worldwide interest, the empirical quantitative research on the dual effect of chatbots on speaking fluency and foreign language anxiety at the university level in Pakistan is scarce. Thus, the proposed research is intended to quantitatively investigate the impact of chatbots with AI functionality on the English-speaking fluency and the foreign language anxiety of college students to provide context-specific data regarding the developing debate on AI-enhanced ELT pedagogy.

Research Questions

1. What is the extent to which AI-based chatbots affect the fluency of English speaking among university students?
2. What is the impact of AI-powered chatbot use on foreign language anxiety in university students?
3. Are there any connections between the enhancement of speaking fluency and the decrease of foreign language anxiety after the interaction with AI chatbots?

Research Hypotheses

H 1: AI-powered chatbots positively affect the English- speaking fluency of the university students significantly.

H 2: AI-based chatbots can considerably decrease the foreign language anxiety of university students.

H 3: Speaking fluency and foreign language anxiety are negatively related among university students who use AI-powered chatbots.

Literature review

1. Artificial Intelligence in English Language Teaching (ELT)

Artificial intelligence (AI) integration in English language teaching has become a widely discussed issue that is viewed as a radical change that alters the pedagogical approaches, the design of instruction, and the interaction between the learners and the teacher in EFL settings. Recent literature highlights that AI-based solutions can positively impact oral communication through allowing adjustive feedback, individualized interaction and extended speaking practice by not being limited by the conventional classroom setting (Li and Zhao, 2025). In the systematic review of AI applications in EFL, it is noted that intelligent systems facilitate the development of fluency by creating the condition of authentic communicative settings and decreasing the reliance of learners on interaction with an instructor. On the same note, the recent studies on AI and machine learning in ELT highlight how the technologies can be used to make the instruction dynamically responsive to the linguistic needs and performance trends of learners by enabling the personalization of the educational process using the available data (Fennila James et al., 2026). Regarding the view of pedagogical competence, AI integration has also broadened the conventional TPACK framework, and research has shown that AI-based technological pedagogical knowledge (AI-TPACK) has a significant role in improving the effectiveness and innovation of instruction in language teaching (Karataş and Ataç, 2025). Furthermore, the socially interactive AI developments, such as conversational agents and social robots, are demonstrated to facilitate the inclusive and student-centered language learning to support the diverse levels of proficiency and minimize the affective barriers to communication (Luria, 2025). Cumulatively, these studies are indicative of the fact that AI in ELT is not only a technological supplement but also a pedagogical trigger that facilitates not only cognitive growth but also an effective one, specifically in oral language proficiency on the tertiary level.

The Synergy of AI and Pedagogy in EFL

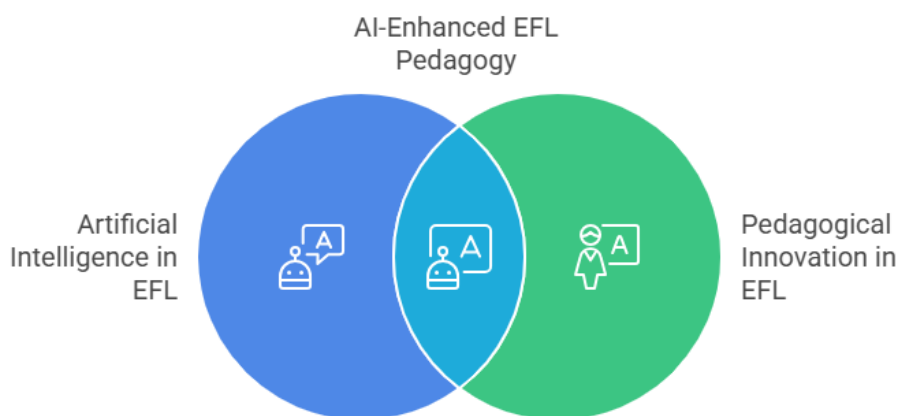


Figure 1: Artificial Intelligence in English Language Teaching (ELT)

2. AI-Powered Chatbots as Conversational Learning Tools

The ability to imitate real conversations, personalize the experience, and offer constant language practice in the classroom has made AI-based chatbots potentially very useful as a tool of conversational learning. In recent empirical studies, the AI-based conversational systems have been shown to be very instrumental in improving communicative competence of ESL learners, as they induce spontaneous speech production and real-time linguistic negotiation (Dai and Wu, 2025). These systems allow learners to participate in prolonged communication with no time or mental limitation, which makes them more fluent and confident. The educational usefulness of chatbot-based e-learning systems is further enhanced by their personalization features, which enable the instruction to be tailored to the specific abilities of the learners and their learning patterns since individual adaptive responses and feedback enable the course to follow the individual ability and learning journey (Davies et al., 2021). Likewise, the case of educational chatbot creation, like EduChat, indicates that personalized interaction systems can enhance motivation, interaction, and engagement of learners in an online learning environment (Kadir et al., 2024). Although the initial research has concentrated on language education, the recent interdisciplinary works verify that AI-based chatbots improve interaction and conceptualization of learners in the subject domains, which solidifies their overall teaching performance (Yetişensoy and Karaduman, 2024). Additionally, AI chatbots in education are also systematic reviews, which indicate that conversational agents facilitate autonomous learning, lessen cognitive load, and offer platforms that are low-stakes and therefore promote active engagement (Labadze et al., 2023). Taken together, all these studies make AI-based chatbots an instructional sound tool that prolongs the communicative activity, promotes individualization, and establishes psychologically conducive learning spaces, which makes them especially effective in improving speaking fluency in the EFL higher education setting.

The Synergy of AI Chatbots in Education



Figure 2: AI-Powered Chatbots as Conversational Learning Tools

3. Speaking Fluency in Second Language Acquisition

It has been generally accepted that technology-mediated language learning is a potent stimulus of speaking skill acquisition due to the enhancement of the learner's immersion, the intensity of interaction, as well as exposure to the meaningful linguistic input. The recent developments in AI-mediator for the acquisition of environments and especially high-immersion virtual reality environments have shown that they have a strong potential to boost oral proficiency, in that they can be used to model real-life communicative situations and encourage the use of language in experience (Chun et al., 2025). These kinds of immersive technologies allow learners to participate in a realistic speaking situation and promote fluency, pragmatic awareness, and automatic speech generation. Mobile-assisted language learning platforms have also demonstrated quantifiable outcomes in the development of speaking, in addition to immersive systems. The empirical research conducted on popular apps like Duolingo shows that structured practice that is largely technology-based has a positive impact on the speaking performance of the learners, as well as the improvement of other language skills (Kazu & Kuvvetli, 2025). In line with such results, meta-meta-analytic studies on a large scale confirm the statistically significant and multifaceted effect of technology integration on the outcomes of foreign language learning, and that speaking skills are positively influenced by interactive and adaptive digital tools (Yi et al., 2025). Moreover, research on emergent multilingual learners suggests that digital language apps help them to be more engaged, autonomous, and confident, which are the key antecedents of fluent oral production (Solmaz, 2025). Altogether, this literature indicates that technology-mediated language learning environments, including AI-based immersive environments, as well as mobile applications, are instrumental in aiding the speaking skills development since they combine cognitive engagement with affective support, and thus provide the most optimal environment to develop oral communication fluency and sustainability.

4. Foreign Language Anxiety and Oral Performance

The issue of foreign language anxiety (FLA) has been established as one of the most important affective elements that has adverse effects on the performance of learners and their

involvement in language classrooms. The studies prove that anxiety is expressed in communication apprehension, fear of negative judgment, and reluctance when performing speaking exercises, which finally prevents the development of fluency (Elov et al., 2025). Nonetheless, recent research indicates that anxiety cannot be considered as a completely negative effect; in a few circumstances, moderate anxiety can be beneficial in the context of motivation and concentration that results in better language performance (Luo and Xiong, 2025). Empirical studies carried out on tertiary-level EFL students in Bangladesh and Vietnam have identified that speaking anxiety is common, especially in formal assessment conditions, and usually interacts with the confidence, autonomy, and self-efficacy of the learners, which are essential factors in oral proficiency (Yasmin et al., 2025; Nguyen, 2025). Intelligent computer-assisted language assessment systems interventions have demonstrated positive effects in alleviating the anxiety of learners by creating a structured, low-stakes, and rich feedback speaking environment, which results in more precise evaluation of the actual communicative competence (Elov et al., 2025). These results all support the idea of FLA as being a complex and multi-dimensional construction that dynamically engages with pedagogical approaches and technological applications to put forward the significance of establishing psychologically conducive environments- including AI-based chatbots - in order to promote oral fluency whilst alleviating anxiety in EFL institutions of higher learning.

5. Relationship Between Speaking Fluency and Foreign Language Anxiety in AI-Supported Learning

The dynamics between speaking fluency and foreign language anxiety (FLA) has been explored by more researchers in the framework of the AI-supported learning setting, indicating the mutual impact of the former and the latter on oral performance. Empirical evidence reveals that it can be demonstrated that AI-mediated instructional aids such as chatbot communications and AI-assisted language tests may generate both beneficial and detrimental effects: in the first case, speaking proficiency and, in the second, anxiety can be positively influenced through the administration of adaptive and low-stress practice opportunities (Biju et al., 2024). Particularly, AI-aided learning platforms not only encourage learner engagement, motivation, and autonomy as mediating variables but also facilitate fluency development as well as emotional control in the speaking tasks. Articles with mixed methods designs also prove that active engagement in environments, which promote AI use, is linked to objective positive changes in oral performance, which manifest in higher self-confidence and decreased communication anxiety (Huang, 2025). Besides that, longitudinal studies demonstrate that AI-enhanced environments do not only minimize anxiety but also have beneficial impacts on the overall emotional state of learners, including showing fewer depressive symptoms or becoming more resilient, which lead to enduring effects in speaking fluency (Yang and Yang, 2025). All of these findings together support the idea that the connection between speaking fluency and foreign language anxiety is dynamic and reciprocal and that AI-based pedagogical interventions can offer an efficient means of developing oral proficiency and psychological comfort in the EFL higher education setting.

Methodology

Research Design

In this paper, the quantitative research methodology was used to explore the effects of AI-driven chatbots on the English-speaking fluency of university students and their foreign language anxiety. The methodology used in the study was a quasi-experimental design. The quasi-experimental design was deemed suitable because it provided a possibility to compare systematically an experimental group that underwent AI chatbot interaction with a control group that only underwent traditional teaching implementation. This design permitted the

researchers to measure cause-and-effect relationships and, at the same time, to ensure ecological validity in real classroom environments.

Population and Sample

The study population included undergraduate learners in English language classes in the universities of Punjab and the Government College (GC) institutions. Out of this population, a sample of 400 students was chosen using the sampling approach of L.R. Gay with sufficient statistical power and representativeness. The sample was also split into two groups: the experimental group and the control group of 200 students each. The sample was chosen through a stratified sampling method where the stratum was grounded on the type of institution and academic discipline so that all universities were represented equally.

Research Instruments

Two standardized instruments were used in the collection of data. The initial tool was a Speaking Fluency Rubric, which was created to evaluate the oral performance of the students in various aspects, i.e. coherence, pronunciation, lexical appropriacy, grammatical accuracy and speed of speech. To make the scores objective, the trained raters were given the rubric scores. The second one was the Foreign Language Classroom Anxiety Scale (FLCAS) that was taken to assess the level of foreign language anxiety in students. The FLCAS has been extensively tested in second language research and proved to have high internal consistency in the current research, with Cronbach's alpha coefficient being significantly higher than the acceptable level.

Treatment Procedure

The experimental group took part in speaking during an organised time of instruction with the help of the AI-powered chatbot. The students were involved in habitual communication with AI chatbots that could simulate real-life communicative situations such as academic discussions, role-plays, and informal conversations. These communications enabled the students to use spoken English independently, get instant feedback, and repeat assignments without fear of adverse comments. By contrast, the traditional teacher-centred approach of instruction was used in the control group, which focused mainly on textbook-based tasks and involved little oral communication. The two groups did the same course material to create instructional equivalence, and the only difference was the mode of delivery.

Data Collection Procedure

The information was gathered in two stages. During the first phase, the participants were subject to baseline testing in a way that would compare groups. The Speaking Fluency Rubric, as well as the FLCAS, were conducted on both groups under generalized conditions in the second stage (after the intervention period). Every ethical concern was well taken care of, and study participants had signed an informed consent before the data collection. During the research, anonymity and confidentiality were observed.

Data Analysis Techniques

Statistical Package of Social Sciences (SPSS) was the tool used in analysing the collected data. Means and standard deviations were used to present descriptive statistics with the aim of summarising the performance and anxiety levels of the students. The test of the research hypotheses was conducted in terms of inferential statistical methods. The differences between experimental and control groups were analyzed in independent samples t-tests, and Pearson product-moment correlation was performed to investigate the correlation between speaking fluency and foreign language anxiety. The level of statistical significance was set at the .05 alpha level, and effect sizes were computed to determine the extent of noticeable differences.

Data analysis

Table 1: Descriptive Statistics of Speaking Fluency Scores

Group	N	Mean	SD	Minimum	Maximum
Experimental Group (AI Chatbots)	200	3.89	0.54	2.70	4.90
Control Group (Traditional Instruction)	200	3.21	0.61	2.40	4.20
Mean Difference	—	0.68	—	—	—
Skewness	—	-0.31	—	—	—
Kurtosis	—	-0.47	—	—	—

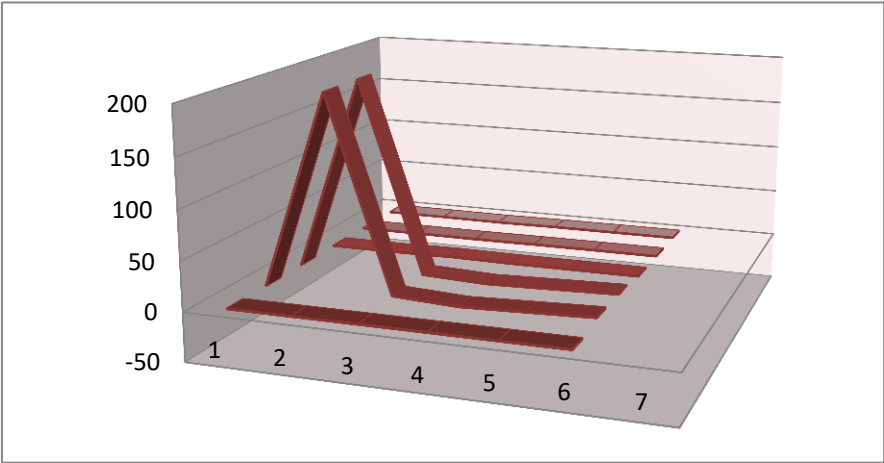


Figure 3: Descriptive Statistics of Speaking Fluency Scores

Table 2:Independent Samples t-test Results for Speaking Fluency

Statistic	Value
t-value	11.47
Degrees of Freedom (df)	398
Significance (p)	< .001
Mean Difference	0.68
Effect Size (Cohen’s d)	1.15

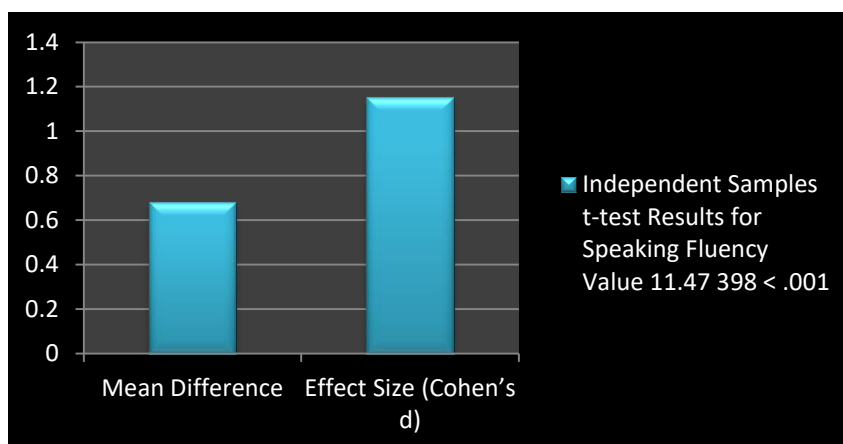


Figure 4: Independent Samples t-test Results for Speaking Fluency

Interpretation

The analysis of the independent samples t-test showed a very big difference in the scores of speaking fluency between the students who were involved in AI-based chatbot interaction and the students who were instructed at the traditional level. The mean score ($M = 3.89$, $SD = 0.54$) of the experimental group ($N = 18$) was significantly higher than the control group ($M = 3.21$, $SD = 0.61$), which means that chatbot users developed oral fluency more successfully. The effect size (Cohen's $d = 1.15$) was very large, which might imply that the improvement observed is not just statistically significant but also meaningful in education. In addition, the normality of scores is acceptable as shown by the values of skewness and kurtosis within the accepted ranges. Such results suggest that AI-based chatbots can offer learners greater chances to practice and receive feedback in real-time and experience less performance pressure, all of which lead to the improvement of fluency. This results in a high level of support for Hypothesis 1, which supports the pedagogical importance of AI integration in ELT at the university level.

Table 3: Descriptive Statistics of Foreign Language Anxiety Scores

Group	N	Mean	SD	Minimum	Maximum
Experimental Group (AI Chatbots)	200	2.41	0.63	1.30	3.80
Control Group (Traditional Instruction)	200	3.18	0.58	2.10	4.40
Mean Difference	—	-0.77	—	—	—
Skewness	—	0.42	—	—	—
Kurtosis	—	-0.36	—	—	—

Table 4: Independent Samples t-test Results for Foreign Language Anxiety

Statistic	Value
t-value	-13.02

Statistic	Value
Degrees of Freedom (df)	398
Significance (p)	< .001
Mean Difference	-0.77
Effect Size (Cohen's d)	1.30

Interpretation

The anxiety of the foreign language was analyzed and showed statistically significant results of the decrease in anxiety levels in students who were using AI-powered chatbots in comparison with those who received traditional teaching. The effect size of the difference in anxiety scores (Cohen's $d = 1.30$) between the experimental and control group is large and highlights the strength of the difference. The descriptive statistics also show that the scores were distributed indicating that the reduction of anxiety was not applied to a few participants. These findings indicate that AI chatbots offer a safe learning space that is psychologically safe and allows students to learn to talk without apprehension of judgment or criticism, peer pressure, or instant feedback. Since anxiety is a critical affective barrier in second language acquisition, the mitigation of anxiety in the interaction mediated by AI has significant implications in enhancing the engagement and confidence of the learners. Hypothesis 2 is, thus, accepted with the conclusion.

Table 5: Correlation Analysis Between Speaking Fluency and Foreign Language Anxiety

Variables	N	Mean	SD	r	p
Speaking Fluency	200	3.89	0.54	—	—
Foreign Language Anxiety	200	2.41	0.63	—	—
Correlation Coefficient	—	—	—	-0.62	< .01
Shared Variance (r^2)	—	—	—	0.38	—
Relationship Strength	—	—	—	Strong	—

Interpretation

Pearson correlation analysis showed that there was a negative connection between speaking fluency and foreign language anxiety among the students that used AI-powered chatbots and it was strong and statistically significant ($r = -0.62$, $p < .01$). The coefficient of determination ($r^2 = 0.38$) shows that about 38 percent of the variance in fluency in speaking can be accounted by the difference in state of anxiety, indicating the great role the affective aspects play in oral language performance. Such negative correlation implies that the more the learners are fluent, the less anxious they are and vice versa. The results confirm known theories in the field of acquiring a second language, which has anxiety as one of the most

important inhibitors of communicative competence. The anxiety reduction in AI-assisted settings seems to be a major process by which speaking fluency is enhanced. In line with this, Hypothesis 3 is well supported, with a major focus on the interrelationship of cognitive and affective levels in AI-enhanced language learning.

Findings

It can be concluded that the implementation of AI-based chatbots has a significant and statistically significant effect on the levels of fluency of English-speaking and foreign language anxiety in university students. Quantitative researchers found that students who interacted regularly with AI chatbots performed much better in terms of oral fluency compared to their traditional instruction peers, which means that they improved their coherence, accuracy, and confidence when interacting by using spoken communication. Also, the findings revealed a significant decrease in foreign language anxiety in the chatbot users, and it is reasonable to assume that an AI-mediated setting can be used to reduce communication anxiety and fear of negative evaluation. The correlation analysis also developed a significant negative correlation between speaking fluency and foreign language anxiety to prove the fact that a lower anxiety level relates to higher oral performance. Altogether, the mentioned findings suggest that AI-based chatbots serve not only as technological means but also as affective and cognitive means that increase the communicative competence of learners in the context of ELT in higher education.

Conclusion

This paper finds that AI-based chatbots can be considered a useful pedagogical intervention to improve English speaking fluency and, at the same time, lower the levels of foreign language anxiety among higher education students. Chatbots facilitate the practice of spoken English because they offer a low-stakes, interactive, and learner-centred setting, which students do not experience during classroom-based communication due to the lack of psychological pressure. The apparent gains in fluency scores and the obvious reduction in anxiety scores point to the cognitive and affective advantages of language learning with AI assistance. In the framework of the University of Punjab and Government Colleges, where the conventional methods of teaching do not provide a chance to engage in oral communication, AI chatbots will be a convenient option to fill the gap between the theoretical and communicational skills. Altogether, the research confirms the recent advances in the use of artificial intelligence in ELT and supports the idea of its possible impact on the oral language pedagogy development in tertiary education.

Recommendations

Following the findings and the conclusion of this study, several recommendations are presented. To begin with, AI-based chatbots must be officially incorporated into curricula at higher educational institutions to serve as an additional method of speaking practice in English language classes, especially in the large classroom setting where each student can do so. Second, specific training on how AI technologies are used in pedagogy should be provided to ELT practitioners so that they can align their use with the learning objectives instead of superficial use of technologies. Third, the curriculum developers of Punjab must factor in the idea of involving AI-assisted conversation tasks in assessment systems that will facilitate uninterrupted and stress-free oral practice. Besides, policymakers are urged to promote AI-based language learning programs by providing infrastructure and digital literacy. Lastly, the study needs to be expanded in future with the help of longitudinal designs, mixed-methods, and a wide range of learners to determine the long-term impacts of chatbot interaction on language proficiency, motivation, and learner autonomy.

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