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EXPLORING THE IMPACT OF AI CHATBOTS ON ENGLISH-SPEAKING SKILLS IN ENGINEERING EDUCATION: A MIXED-METHODS STUDY

Abstract. This study examines the effectiveness of AI-powered chatbots in developing English-speaking skills among Pre-Intermediate engineering students. The relevance of the research is driven by the need to expand opportunities for oral language practice in technical universities, where traditional instructional approaches often fail to provide sufficient communicative engagement for learners. The study employed a mixed-methods research design and was conducted at Abylkas Saginov Karaganda Technical University. The pedagogical intervention focused on enhancing students' speaking proficiency through the use of interactive AI chatbots, incorporating role-play conversations, spontaneous speaking practice, and voice-based exercises. The findings revealed a substantial improvement in the performance of the experimental group, including increased speaking fluency, greater grammatical accuracy, and reduced levels of communication anxiety. The analysis of the collected data further demonstrated enhanced linguistic self-confidence, a lower fear of making mistakes, and increased learner autonomy. At the same time, several limitations of AI-based tools were identified, including occasional inaccuracies in interpreting user input and a restricted capacity to sustain in-depth conversations. Overall, the results confirm the pedagogical value of AI chatbots as an effective instrument for fostering oral English-language communication skills within the context of technical higher education.

Keywords: artificial intelligence, AI chatbots, speaking skills, engineering education, mixed-methods research, language anxiety, digital pedagogy.

Introduction

The rapid advancement of artificial intelligence (AI) technologies is exerting a profound influence on higher education, creating new opportunities for personalized learning, enhanced interactivity, and improved instructional effectiveness (Winkler & Söllner, 2018). Among the most promising AI-driven tools are chatbots capable of sustaining natural, real-time communication with users. Owing to their ability to simulate authentic dialogue, provide immediate feedback, and adapt interactions to learners' individual needs, AI chatbots are increasingly being used to support the development of English-speaking skills in educational settings (Gutiérrez, 2023).

The integration of AI chatbots is particularly relevant in the context of engineering education. In today's professional environment, engineers are expected not only to possess solid technical expertise but also to demonstrate effective communication skills in English. Such competencies are essential for participation in international projects, professional discussions, academic mobility programmes, and collaboration with colleagues from different countries. Nevertheless, the development of English-speaking skills among engineering students remains one of the most challenging objectives of language education. The nature of study at technical universities requires students to devote a substantial portion of their academic time to discipline-specific courses, which often limits opportunities for systematic oral language practice. In addition, many engineering students experience difficulties in engaging in spontaneous communication in English, demonstrate low confidence during oral interactions, and experience high levels of communication anxiety. As a result, even learners who possess an adequate vocabulary and a sound knowledge of grammatical structures frequently struggle to achieve speaking fluency and sustain meaningful communication in English.

Within this context, AI chatbots represent a promising tool for the development of speaking skills. Unlike traditional approaches to organizing oral language practice, chatbots provide virtually unlimited opportunities for communicative interaction, enable learners to receive immediate feedback, and facilitate language practice beyond the classroom setting. Another important advantage is the creation of a psychologically supportive environment in which the fear of making mistakes is reduced and students become

more willing to use English for communication. Furthermore, the integration of such tools into learners' familiar digital environment may enhance both their engagement and motivation in the process of learning English.

Despite the growing scholarly interest in the application of artificial intelligence in language education, most existing studies have focused primarily on the quantitative assessment of learning outcomes. However, a comprehensive understanding of the pedagogical potential of AI chatbots requires consideration not only of objective indicators of speaking-skill development but also of learners' subjective experiences, perceptions of the technology, attitudes toward its use, and the advantages and limitations identified during the learning process (Winkler & Söllner, 2018; Gutiérrez, 2023).

To address this gap, the present study adopts a mixed-methods research design that combines quantitative and qualitative approaches to data collection and analysis. The quantitative phase of the study seeks to evaluate changes in students' speaking proficiency following the integration of AI chatbots into English language instruction. The qualitative phase explores learners' experiences, their attitudes toward chatbot-assisted language learning, and their perceptions of the role of AI chatbots in fostering oral communication skills.

The study was conducted at Abylkas Saginov Karaganda Technical University and involved Pre-Intermediate students enrolled in engineering degree programmes. The primary aim of the study was to investigate the impact of AI chatbots on the development of English-speaking skills among engineering students and to examine learners' perceptions of chatbots as a language-learning tool through the application of a mixed-methods research approach.

Based on the identified research gap, the study hypothesized that the integration of AI chatbots into speaking instruction for students of technical specialties would result in a significant improvement in oral proficiency, a reduction in communicative anxiety, and an increase in learners' linguistic activity at the Pre-Intermediate level, compared with traditional instructional methods. This hypothesis was theoretically grounded in the pedagogical affordances of AI chatbots, particularly their capacity to facilitate interactive communication, provide immediate feedback, adapt to individual learner needs, and simulate authentic communicative situations. These affordances were expected to support a lower-anxiety learning environment, facilitate sustained opportunities for oral language practice, and foster greater learner autonomy in speaking activities.

Methodology and Research Materials

To provide a comprehensive evaluation of the effectiveness of AI chatbots in developing English-speaking skills, the study adopted a mixed-methods research approach. A Convergent Study Design (CSD) was selected as the primary research strategy, enabling the integration of quantitative and qualitative data and facilitating a deeper interpretation of the findings.

The research was conducted at Abylkas Saginov Karaganda Technical University. The sample consisted of engineering students studying English at the Pre-Intermediate level. All participants demonstrated a comparable level of language proficiency, as confirmed by the results of a placement test administered prior to the study.

The quantitative assessment focused on four key dimensions of oral proficiency: fluency, grammatical accuracy, lexical resource, and pronunciation. These dimensions were selected to provide a comprehensive assessment of students' speaking performance and to identify changes associated with the use of AI chatbots in English language instruction. The implementation of the convergent design involved two complementary methods of data collection.

The quantitative component consisted of pre-test and post-test assessments designed to measure changes in students' speaking performance. The assessments were administered before and after the intervention to ensure comparability of the results.

The qualitative component was conducted through semi-structured individual interviews with participants from the experimental group. This instrument enabled the exploration of students' experiences with AI chatbots, their perceptions of chatbot-assisted language learning, and the influence of AI-mediated interaction on communication anxiety, language confidence, and motivation for independent speaking practice. The interviews addressed several thematic areas, including overall experiences with AI chatbots, perceived changes in speaking fluency, pronunciation and vocabulary development, the impact of chatbot

interaction on confidence in oral communication, and the perceived advantages and limitations of AI tools in English language learning. The qualitative findings complemented the quantitative results and provided deeper insights into the mechanisms through which AI technologies may influence speaking-skill development among engineering students.

The triangulation of quantitative and qualitative methods enhanced the validity of the study by not only identifying measurable changes across the four speaking indicators but also revealing the underlying pedagogical mechanisms through which AI technologies affect language learning outcomes.

The research was conducted using a set of complementary pedagogical and scientific methods, including:

Theoretical analysis and systematization. A comprehensive analysis of contemporary language-teaching approaches to speaking instruction was conducted, with particular emphasis on communicative and interactive methodologies. Special attention was given to the psycholinguistic factors underlying the development of oral communication skills.

Literature review and analysis. Previous studies investigating the application of artificial intelligence and generative language models in education were examined. Particular attention was paid to research exploring the use of AI chatbots and automated feedback systems for developing speaking skills in English language-learning contexts (Gutiérrez, 2023; Beisembayeva, 2025; Khamsa & Zagidullina, 2025; Lobeeva, 2023).

Analysis of practical applications. Existing cases of integrating digital pedagogical tools into educational practice were examined. The functional capabilities of platforms such as ChatGPT Live, Google Gemini, Duolingo Max, Talkpal AI, Character.AI, Claude AI, and Microsoft Copilot were analyzed with regard to their potential for supporting speaking-skill development (Gutiérrez, 2023; Beisembayeva, 2025; Khamsa & Zagidullina, 2025).

Empirical investigation. The empirical phase of the study involved 80 engineering students studying English at the Pre-Intermediate level. Over a four-week period, participants in the experimental group engaged in additional speaking practice through AI chatbots. Changes in oral proficiency were assessed across four dimensions: fluency, grammatical accuracy, lexical resource, and pronunciation. Semi-structured interviews were also conducted to investigate students' experiences of developing speaking skills through chatbot-assisted learning.

The instructional materials were aligned with the Pre-Intermediate proficiency level and adapted for integration with AI-powered learning tools. Task design sought to approximate authentic communicative situations that students might encounter in both everyday and professional contexts. Learning activities included role-play dialogues, situational conversations, discussions of current and professionally relevant topics, and communicative tasks requiring extended oral responses and justification of personal viewpoints.

The following technological tools were employed during the experiment:

AI chatbots: ChatGPT Live, Google Gemini, Duolingo Max, Talkpal AI, Character.AI, Claude AI, and Microsoft Copilot. These platforms were selected for their ability to sustain interactive conversations, provide feedback, and adapt to individual learner needs (Gutiérrez, 2023; Beisembayeva, 2025; Khamsa & Zagidullina, 2025).

Voice-based interfaces: utilized to support pronunciation practice and the development of spontaneous oral communication skills (Gutiérrez, 2023).

Instructional materials: adapted to the Pre-Intermediate level and integrated with chatbot-generated interactive tasks, including role-play scenarios and discussions of everyday topics.

AI chatbots were incorporated into both classroom instruction and independent out-of-class learning activities (Gutiérrez, 2023; Khamsa & Zagidullina, 2025). Students engaged in several forms of interaction:

- **Role-play dialogues**, in which learners practiced communication on assigned topics such as travel, shopping, and social interaction;
- Pronunciation training, using voice-based features to improve articulation and spoken accuracy;
- Spontaneous speaking activities, requiring extended oral responses and open-ended conversations on a variety of topics;
- Individual speaking practice, allowing students to regulate the intensity of interaction and gain additional experience using English in a supportive digital environment.

Particular attention was devoted to reducing communication anxiety and enhancing learners' confidence in spoken English. The opportunity to interact repeatedly with AI chatbots without fear of negative evaluation encouraged greater participation in oral practice and promoted a more active engagement in language learning (Gutiérrez, 2023; Khamsa & Zagidullina, 2025).

Literature review on AI chatbots usage in language learning

Given the growing interest in the integration of artificial intelligence into English language education in the Republic of Kazakhstan, which further highlights the relevance of the present study, a systematic review of international scholarly publications indexed in the Web of Science database was conducted. The list of sources reviewed is provided in the References section.

A comparative analysis of international and Kazakhstani studies suggests that artificial intelligence technologies possess considerable potential for language education. However, their successful implementation depends on a systematic approach that combines technological infrastructure, methodological support, and the development of digital competencies among all participants in the educational process.

Particularly noteworthy is the study conducted by Gutiérrez (2023), which emphasizes that artificial intelligence, and chatbots in particular, creates new opportunities for establishing flexible, safe, and personalized language-learning environments. Tools such as ChatGPT and natural language processing (NLP) technologies enable learners to engage in real-time communication practice, thereby facilitating the development of communicative competence and increasing learner engagement. An especially important finding is that chatbot-assisted interaction may reduce speaking anxiety and provide a supportive environment for independent and out-of-class language practice. At the same time, Gutiérrez identifies several limitations. Most existing chatbots are capable of processing only relatively simple and predictable user requests, reflecting the developmental stage of current language models. Furthermore, concerns remain regarding information accuracy, cultural neutrality, and the ethical implications of AI use in education. Consequently, the author highlights digital literacy among both teachers and learners as a prerequisite for the effective and responsible integration of AI technologies into educational settings (Gutiérrez, 2023).

Another influential contribution is the study "Unleashing the Potential of Chatbots in Education: A State-of-the-Art Analysis" by Winkler and Söllner (2018). This work is of particular theoretical and methodological significance due to its comprehensive review of 1,405 publications addressing the use of chatbots in education, of which 80 studies were selected for detailed analysis. The authors argue that chatbot-supported learning remains at an early stage of development but demonstrates substantial potential for improving learning outcomes and personalizing instruction, particularly within large-scale educational environments. Their study systematizes three core concepts: chatbots, Technology-Mediated Learning (TML), and learning outcomes (Gutiérrez, 2023).

According to Winkler and Söllner, chatbots can be defined as software applications that simulate human conversation through text- or voice-based interaction. Examples include systems such as Alexa, Google Home, and ChatGPT. Chatbots may be classified according to their underlying architecture (retrieval-based or generative), mode of interaction (text or speech), and ability to process conversational context. Chatbot-Mediated Learning (CML) is presented as a specific form of Technology-Mediated Learning characterized by a high degree of personalization, flexibility, real-time interaction, and accessibility (Gutiérrez, 2023).

The authors further categorize learning outcomes associated with chatbot use into three domains: cognitive outcomes (knowledge acquisition and higher-order thinking), affective outcomes (motivation, emotions, and interest), and psychomotor outcomes (practical skills). They also emphasize the contribution of chatbots to the development of metacognitive abilities, particularly through the provision of feedback and support for self-regulated learning. The proposed TML/CML framework consists of three interconnected components: input factors (technology and instructional structure), interaction processes, and expected educational outcomes (Gutiérrez, 2023).

The authors also identify several factors that influence the effectiveness of chatbot-assisted learning:

- Individual characteristics of students (attitudes toward technology, level of self-efficacy, emotional state);
- Educational context (medicine, language learning, massive open online courses);
- Design and functional features of chatbots (flow-based scenarios, artificial intelligence, speech

recognition, contextual data);

- Degree of integration into learning environments (LMS, messaging platforms).

As a result of the analysis, the authors conclude that chatbots can significantly enhance cognitive, affective, and metacognitive learning outcomes, provided that they are implemented appropriately. They are particularly effective in large learning groups where individualized instruction is difficult to ensure, as well as in situations requiring autonomous or flexible modes of interaction.

A more localized perspective is provided by the study of Beisembayeva A.B. (2025), which focuses on the use of artificial intelligence in English language teaching in the Kazakhstani context. The article presents the results of a survey of teachers and students, expert interviews with methodologists and IT specialists, as well as an analysis of the functionality of platforms such as ChatGPT, Grammarly, ELSA Speak, BilimLand, and Daryn.Online. Of particular interest is an experiment conducted at a humanities college in the city of Ust-Kamenogorsk, where the use of AI tools in a learning group led to an 18% increase in vocabulary and grammar proficiency and a 20% reduction in oral errors. Students reported increased motivation and more effective independent learning, while teachers emphasized improved progress tracking and more targeted support. At the same time, the author highlights several limitations, including a lack of technical resources in some regions and the absence of adapted methodological materials. The recommendations include the development of digital infrastructure, professional development for teachers, and support for local AI-enhanced educational platforms (Beisembayeva, 2025).

In the study by Khamsa M.A. and Zagidullina A.A. (2025), titled “Integration of Chatbots in English-speaking skills Education”, published in the journal *News of Ablai Khan Kazakh University of International Relations and World Languages*, the effectiveness of integrating chatbots, particularly ChatGPT and Duolingo Super, into English-speaking skills teaching in higher education institutions of the Republic of Kazakhstan is examined. A combination of theoretical analysis, questionnaire-based research (n=134 teachers and n=237 students), and experimental implementation with B1-level students allowed the authors to identify positive dynamics in the development of language competencies. According to the findings, 82% of teachers and 78% of students reported increased motivation when using chatbots. The experimental group demonstrated significant improvement in both speaking and writing skills, as well as higher engagement levels. The authors emphasize the potential of chatbots for personalizing learning, fostering learner autonomy, and improving the quality of language instruction, while also noting the need for further research to address methodological and technological limitations (Khamsa & Zagidullina, 2025).

Results of the Empirical Study and Discussion

Quantitative Phase of the Study

The experiment was designed to examine changes in students’ oral proficiency and communicative anxiety following regular interaction with AI-based conversational partners and to compare these changes with those observed under traditional speaking instruction. The use of conversational agents in structured learning activities can support academically productive interaction and provide learners with opportunities for sustained dialogue (Tegos et al., 2016).

To test the research hypothesis, the quantitative phase examined three aspects relevant to the expected effects of the intervention: oral proficiency, communicative anxiety, and students’ engagement in speaking activities. Oral proficiency was assessed through speaking fluency, grammatical accuracy, pronunciation, and vocabulary use. Communicative anxiety was measured using the Foreign Language Classroom Anxiety Scale (FLCAS). Students’ engagement in speaking practice was additionally considered through their participation in speaking activities and their responses to the post-intervention questionnaire. The results obtained before and after the intervention were analyzed to determine whether students who participated in AI chatbot-assisted speaking practice demonstrated more pronounced positive changes than those who followed traditional speaking instruction.

An experimental study was conducted involving first-year students enrolled in engineering programmes at Abylkas Saginov Karaganda Technical University. The total sample comprised 80 participants, who were divided into two groups:

Experimental group (n = 40): students who engaged in regular speaking practice using AI chatbots (including ChatGPT Live, Google Gemini, and voice-enabled modules);

Control group (n = 40): students who followed a traditional instruction model without the use of AI-based tools.

Experimental Procedure.

The experimental design consisted of several stages aimed at identifying the impact of AI chatbot-assisted learning on the development of Pre-Intermediate speaking skills:

Pre-test stage (baseline assessment). At the beginning of the experiment, both groups completed a diagnostic assessment that included: assessment of speaking performance in terms of fluency, grammatical accuracy, pronunciation, and interactive participation in dialogue; measurement of communicative anxiety using an adapted version of the Foreign Language Classroom Anxiety Scale (FLCAS).

Four-week intervention phase. The experimental group engaged in AI chatbot-assisted speaking practice three times per week, with each session lasting 30–40 minutes. Activities included role-play dialogues, voice-based exercises, and tasks designed to develop spontaneous speech production.

The control group completed equivalent topic-based speaking activities using traditional instructional methods, including pair work, textbook-based tasks, and classroom discussions.

All speaking activities in both groups were conducted under the supervision of the instructor to maintain comparable instructional conditions.

Post-test stage. After the four-week intervention, both groups completed a post-test identical in structure to the pre-test. This procedure made it possible to compare changes in speaking performance and communicative anxiety over the course of the experiment.

Assessment Instruments

The Foreign Language Classroom Anxiety Scale (FLCAS) (Horwitz et al., 1986) was used to measure communicative anxiety (adapted Russian version);

Students' speaking performance was evaluated according to CEFR-based criteria, including fluency, grammatical accuracy, pronunciation, vocabulary use, and interactive participation in communication;

The quantitative analysis focused on comparing pre-test and post-test results in the experimental and control groups. The obtained data were used to determine the direction and magnitude of changes in the main indicators of speaking performance and communicative anxiety.

Quantitative Results. Table 1 presents the comparative results obtained before and after the four-week intervention.

Table 1.

Comparative results before and after the experiment

Group	Indicator	Pre-test	Post-test	Change (%)
Experimental	Speaking fluency (words per minute)	78	112	+43,6%
Experimental	Accuracy (%)	64%	83%	+19%
Experimental	Communication anxiety (FLCAS)	3,2	2,1	-34,3%
Control	Speaking fluency (words per minute)	76	82	+7,9%
Control	Accuracy (%)	65%	69%	+6,2%
Control	Communication anxiety (FLCAS)	3,3	3,1	-6,1%

The quantitative results demonstrate a more pronounced positive change in the experimental group across the measured indicators. Speaking fluency in the experimental group increased from 78 to 112 words per minute, corresponding to a 43.6% increase. In comparison, the control group demonstrated an increase from 76 to 82 words per minute, or 7.9%.

A similar pattern was observed for grammatical accuracy. In the experimental group, accuracy increased from 64% to 83%, representing a 19-percentage-point improvement. In the control group, accuracy increased from 65% to 69%, corresponding to a 4-percentage-point improvement. Thus, the experimental group demonstrated greater improvement in the measured dimensions of oral proficiency.

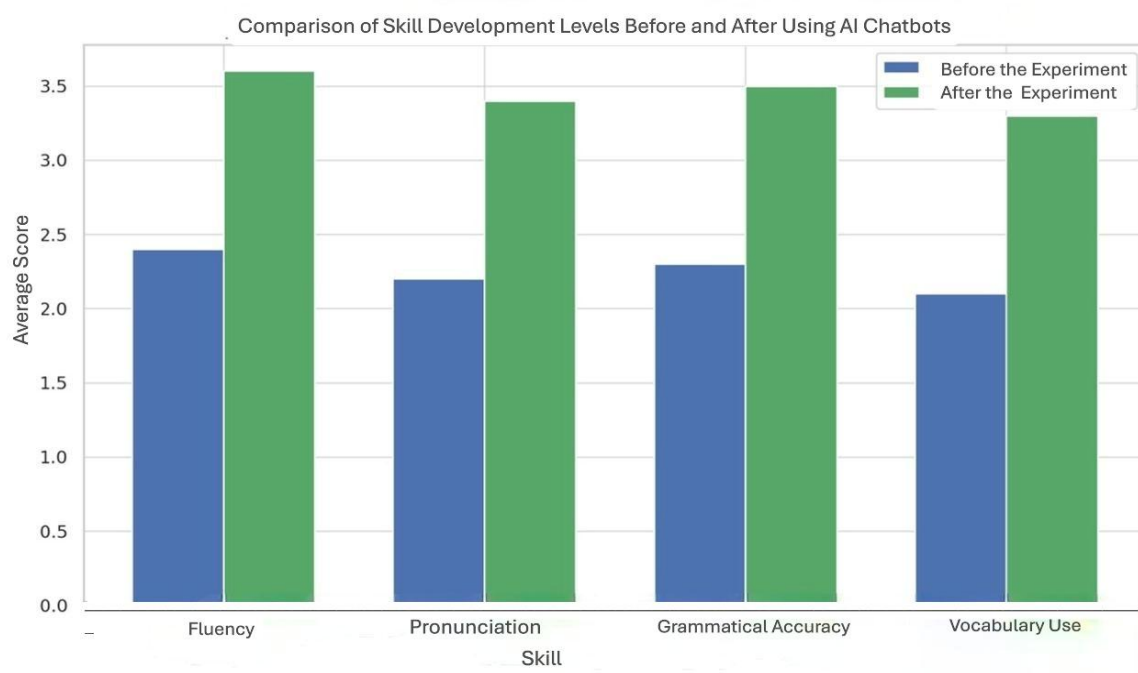
The results for communicative anxiety also showed a more pronounced change in the experimental group. The mean FLCAS score decreased from 3.2 to 2.1, representing a 34.3% reduction. In the control group, the score decreased from 3.3 to 3.1, corresponding to a 6.1% reduction. This difference indicates a substantially greater decrease in communicative anxiety among students who participated in AI chatbot-assisted speaking

practice.

In addition to the comparative measures presented in Table 1, the development of specific speaking skills in the experimental group was assessed using average performance scores. As shown in Figure 1, all four assessed dimensions as fluency, pronunciation, grammatical accuracy, and vocabulary use demonstrated higher average scores after the intervention. The average score for fluency increased from 2.4 to 3.6, pronunciation from 2.2 to 3.4, grammatical accuracy from 2.3 to 3.5, and vocabulary use from 2.1 to 3.3. These results provide additional evidence of positive changes in students' oral proficiency following the four-week intervention.

Figure 1.

Changes in average speaking-skill scores in the experimental group before and after the intervention.



The questionnaire administered after the intervention provided additional information about students' engagement with AI-supported speaking practice. A total of 85% of respondents reported increased confidence in speaking English, 78% indicated perceived improvement in pronunciation, and 90% expressed willingness to continue using AI chatbots for independent English-language learning. These responses indicate a positive perception of the intervention and suggest that students were willing to continue engaging in AI-supported speaking activities beyond the structured classroom tasks.

Taken together, the quantitative findings provide empirical support for the central elements of the research hypothesis. First, the experimental group demonstrated greater improvement in oral proficiency, as reflected in speaking fluency and grammatical accuracy in Table 1 and in the average scores for fluency, pronunciation, grammatical accuracy, and vocabulary use presented in Figure 1. Second, the experimental group demonstrated a substantially greater reduction in communicative anxiety than the control group, as indicated by the FLCAS results. Third, the questionnaire findings showed increased confidence and willingness to continue participating in AI-supported speaking practice, providing additional evidence of students' engagement with the intervention.

Overall, the comparison of pre-test and post-test results indicates that the experimental group experienced more pronounced positive changes than the control group across the principal measured outcomes. These findings provide empirical support for the hypothesis that the use of AI chatbots in speaking instruction can contribute to the development of oral proficiency and the reduction of communicative anxiety among Pre-Intermediate engineering students. The qualitative phase of the study further examined students' experiences and perceptions in order to provide a deeper interpretation of these quantitative findings, including the ways in which AI-supported practice influenced their willingness to communicate and engage in English-speaking activities.

Qualitative Phase of the Study

To explore students' experiences of using chatbots for the development of English-speaking skills, a semi-structured interview was conducted with participants from the experimental group as part of the qualitative phase of the study. While the quantitative data allowed for measuring changes in speaking performance and communicative anxiety levels, the qualitative analysis was aimed at examining students' perceptions, experiences, and attitudes toward the use of AI chatbots, as well as their evaluation of the effectiveness of this form of language practice.

The interviews involved students from the experimental group who had used AI chatbots over a four-week period. The interviews were conducted after the completion of the experiment and included questions related to the usability of AI tools, the impact of digital conversational partners on speaking confidence, features of independent speaking practice, as well as the advantages and limitations of using chatbots in English language learning.

The analysis of the obtained data revealed several recurring thematic categories. The most frequently reported aspect was the opportunity for regular speaking practice without the fear of making mistakes, which contributed to a reduction in psychological barriers when using English. Many participants emphasized that interaction with AI chatbots created a comfortable environment for practicing speaking skills and allowed them to engage in language use at their own pace.

This finding is supported by participants' statements. For example, one respondent noted:

"During communication with the chatbot, I felt more confident because I was not afraid of making mistakes or receiving negative evaluation. This helped me speak more often and more freely." (Respondent 5).

A similar view was expressed by another participant:

"It used to be difficult for me to quickly formulate my thoughts in English, but after several weeks of interaction with the chatbot, it became much easier to respond." (Respondent 11).

A considerable number of respondents also highlighted the positive impact of chatbots on speaking fluency and vocabulary development. According to the students, continuous participation in dialogues facilitated faster retrieval of linguistic resources, improved spontaneous speech skills, and increased confidence in producing extended utterances. The usefulness of voice-based features was also emphasized, as they contributed to the improvement of pronunciation and enabled more natural oral interaction.

In addition, many participants stressed the value of independent practice outside the classroom. Unlike traditional learning formats, AI chatbots provided continuous access to speaking practice and allowed students to regulate the intensity of their learning independently (Oxford, 2017). As one respondent stated:

"I liked that I could study at any time and choose topics that were interesting to me" (Respondent 8).

Another student noted a high level of engagement in the interaction process: *"Sometimes I talked to the chatbot longer than required by the task because it felt like a real conversation rather than a learning exercise"* (Respondent 14).

At the same time, participants identified several limitations in the use of AI tools. These included occasional misinterpretation of prompts, limited depth of some dialogues, and the need to verify certain language suggestions. However, most students considered these drawbacks to be minor compared to the benefits of constant access to speaking practice and immediate feedback.

Overall, the results of the qualitative phase confirmed the findings obtained in the quantitative analysis. The interviews demonstrated that the observed improvement in speaking performance was accompanied by increased language confidence, reduced communicative anxiety, and higher motivation for independent English language learning. The findings suggest that AI chatbots can serve not only as a supplementary tool for language practice but also as an effective means of supporting speaking activity among engineering students.

Integration of Quantitative and Qualitative Results

The use of a mixed-methods research design enabled a multifaceted examination of the impact of AI chatbots on the development of speaking skills. Quantitative data provided evidence of measurable changes in students' oral proficiency, whereas the qualitative analysis helped to explain how learners perceived this experience and which factors, in their view, contributed to the observed outcomes. The comparison of findings

from both phases of the study demonstrated that the results are not contradictory but rather mutually reinforcing and complementary.

The results of the quantitative analysis revealed a consistent positive trend in the experimental group. After four weeks of using AI chatbots, students demonstrated higher levels of speaking fluency and grammatical accuracy, as well as a reduction in communicative anxiety compared with the control group. These findings suggest that regular practice with digital conversational partners may create additional opportunities for the development of English-speaking skills. They are also consistent with previous research on the effectiveness of AI-supported language learning environments (Godwin-Jones, 2019).

During the interviews, we sought to understand the factors underlying these quantitative changes. The analysis of responses showed that most students attributed their progress primarily to the opportunity to use English regularly in a comfortable and psychologically safe environment. Many participants noted that interaction with chatbots made them feel more confident, as they did not fear criticism or negative evaluation. As a result, they engaged more frequently in dialogue, were more willing to use new linguistic structures, and devoted more time to speaking practice.

The relationship between reduced communicative anxiety and increased language confidence appeared particularly significant. While the quantitative results indicated a decrease in FLCAS scores, the interviews provided insight into how these changes manifested in practice. Students repeatedly emphasized that it became easier for them to express their thoughts in English, maintain conversations, and respond to questions without long pauses. Thus, the qualitative data confirmed the trends identified in the quantitative analysis and offered a deeper understanding of students' perceptions of their interaction with AI chatbots.

At the same time, the qualitative analysis revealed certain limitations of AI chatbot use. Some students reported occasional misinterpretations of prompts and a limited depth of discussion on specific topics compared to real-life communication. A number of respondents also highlighted the need for critical verification of some linguistic suggestions, as chatbot responses did not always fully account for communicative context. However, these limitations were sporadic in nature and, according to the majority of participants, did not significantly affect the overall effectiveness of this tool in developing speaking skills.

The integration of quantitative and qualitative data demonstrated the consistency of findings obtained at different stages of the study. The observed improvements in speaking performance were accompanied by positive changes in students' perceptions of their language learning experience. Previous research has also highlighted the didactic potential of chatbots as supplementary tools in English language teaching (Lobeeva, 2023). In the context of the present study, these findings support the view that AI chatbots can provide additional opportunities for speaking practice and contribute to a more flexible learning environment for engineering students. These findings allow for a more detailed discussion of the pedagogical implications of AI chatbot use and the potential mechanisms underlying their impact on the development of speaking skills among engineering students.

Conclusion

The findings of the present study provide empirical support for the hypothesis that the use of AI chatbots can contribute to the development of speaking skills among technical university students at the Pre-Intermediate level. Based on theoretical analysis, a review of contemporary applied linguistics literature, and empirical data obtained during the pedagogical experiment, it was established that regular interaction with AI conversational partners was associated with improvements in key indicators of speaking performance, including fluency and grammatical accuracy, as well as a reduction in communicative anxiety.

The experiment conducted at Abylkas Saginov Karaganda Technical University involved 80 first-year engineering students who were divided into experimental and control groups. Over a four-week period, students in the experimental group interacted with AI chatbots (ChatGPT Live, Google Gemini, etc.) within structured speaking tasks aimed at developing both dialogic and monologic speech, including voice-based exercises and role-play activities. All interactions between students and chatbots were conducted during in-class time under the supervision of the instructor.

The quantitative analysis indicated positive changes in the experimental group. Speaking fluency increased from 78 to 112 words per minute, while grammatical accuracy improved from 64% to 83%. Communicative anxiety, measured using the FLCAS, decreased from 3.2 to 2.1. In comparison, the control

group demonstrated more limited changes across all three indicators.

The quantitative findings were complemented by the results of the qualitative phase of the study, which made it possible to identify key mechanisms underlying the observed changes. Students reported that interaction with AI chatbots created a psychologically safe environment for speaking practice, reduced their fear of making mistakes, and contributed to more confident communicative behavior. The availability of immediate feedback and regular opportunities for speaking practice were also identified as important factors.

The participants also associated improvements in their speaking skills not only with increased practice frequency but also with a more positive attitude toward English communication. Many students demonstrated greater readiness to communicate, reduced tension during spontaneous speech, and increased motivation to use English in both academic and everyday contexts.

At the same time, the qualitative analysis revealed certain limitations of AI chatbot use, including occasional misinterpretation of prompts, limited depth of some interactions, and the need for critical evaluation of linguistic feedback provided by the system. These limitations were generally perceived by the participants as manageable within the learning context and did not prevent them from using AI chatbots as an additional tool for speaking practice.

Overall, the findings suggest that the use of AI chatbots can provide additional opportunities for speaking practice and contribute to a more flexible, personalized, and psychologically comfortable learning environment conducive to the development of communicative competence. The findings also indicate that AI technologies may influence both cognitive and affective aspects of English language learning. AI chatbots therefore have potential as a supplementary tool in the language training of engineering students. At the same time, their implementation requires further methodological refinement, expansion of the experimental base, and investigation of long-term effects across different proficiency levels.

Conflict of Interest Statement

Authors declare no potential conflicts of interest with respect to the research, authorship, or publication of this article.

Author Contributions

Damira Jantassova and Eleonora Prozovskaya contributed equally to the conceptualization, methodology, data collection and analysis, literature review, preparation of the original manuscript draft, visualization, validation, review, editing, and finalization of the study. Both authors participated in all stages of the research and approved the final version of the manuscript.

Declaration of Use of Generative AI and AI-Assisted Technologies

The authors declare that no generative AI or AI-assisted technologies were used in the preparation of this manuscript.

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