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Research Paper

Exploring the Impact of AI Chatbots on EFL Learners' Conversational Proficiency

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Abstract

This study examines how artificial intelligence (AI) chatbots influence the conversational proficiency of English as a Foreign Language (EFL) learners. Conversational proficiency—defined as the ability to speak fluently, use appropriate vocabulary, apply correct grammar, and pronounce words accurately—is essential for effective communication but often poses challenges for EFL learners. AI chatbots, leveraging natural language processing to simulate human dialogue, provide a unique opportunity for learners to practice speaking in a supportive, low-stakes setting. In this research, 50 intermediate-level EFL learners participated in a 12-week intervention, engaging in daily conversations with an AI chatbot tailored for language learning. Pre- and post-intervention assessments evaluated improvements in fluency, vocabulary, grammar, and pronunciation. Findings revealed significant gains in fluency and vocabulary, alongside moderate progress in grammatical accuracy. However, pronunciation improvements were minimal, reflecting the chatbot's limitations in delivering detailed phonetic feedback. Learners also reported greater confidence and reduced speaking anxiety, underscoring the psychological benefits of AI-supported practice. Nevertheless, the study highlights that AI chatbots struggle to replicate the cultural nuances and contextual depth of human conversation. These results suggest that AI chatbots serve as an effective supplementary tool for enhancing specific elements of conversational proficiency, particularly when paired with traditional instruction. The study concludes by advocating for a hybrid approach to language education that integrates AI technology with human interaction to support holistic language development, while proposing future research into enhancing chatbot capabilities for pronunciation training and sustained proficiency growth.

***Keywords*:** AI Chatbots; EFL Learners; Conversational Proficiency; Fluency; Vocabulary.

1. Introduction

The rapid advancement of artificial intelligence (AI) has revolutionized educational methodologies, particularly in the field of English as a Foreign Language (EFL) education (Belda-Medina & Calvo-Ferrer, 2022; Shaalan & Ahmad, 2024). AI-powered chatbots, leveraging natural language processing (NLP) to simulate human-like dialogue, have emerged as innovative tools to enhance conversational proficiency—a critical yet challenging aspect of language acquisition encompassing fluency, vocabulary usage, grammatical accuracy, and pronunciation (Gámez, 2023; Mujiono et al., 2013; Yang et al., 2022). Traditional EFL pedagogies often struggle to provide learners with sustained opportunities for authentic, low-stakes conversational practice, a shortcoming that AI chatbots seems to be a solution, by providing a more interactive, adaptive environments for language development (Almehmadi, 2024; Minh & Khanh, 2024).

Historically, technology in language education has evolved from rudimentary computer-assisted language learning (CALL) programs to sophisticated AI-driven systems capable of supporting dynamic conversational practice (Panesar, 2020; Shaalan & Ahmad, 2024). Early technologies provided limited interactivity and feedback, constraining their ability to foster communicative competence (Minh & Khanh, 2024). However, advancements in NLP and machine learning have enabled modern chatbots to simulate nuanced dialogues that approximate human interaction, offering learners a safe, low-stakes platform for practice (Yang et al., 2022; Ye et al., 2022). This technological progression has

positioned chatbots as integral components of hybrid language learning models, bridging the gap between traditional instruction and autonomous learning (Belda-Medina & Calvo-Ferrer, 2022).

Conversational proficiency remains a cornerstone of effective communication, yet it poses persistent challenges for EFL learners due to limited opportunities for authentic practice and the anxiety associated with unscripted dialogue (Danelova & Astaduryan, 2023; Gámez, 2023). Speaking anxiety, in particular, inhibits language production by instilling fear of judgment, thereby hindering fluency and reinforcing error persistence (Guzikova, 2021; Shazly, 2021). AI chatbots mitigate these challenges by providing a controlled, user-friendly environment that encourages experimentation and reduces psychological barriers (Abusahyon et al., 2023; Ye et al., 2022). Through repetitive, context-rich interactions, learners can reinforce vocabulary acquisition, enhance fluency, and build confidence in a non-threatening setting (Doğan & Tuncer, 2016; Nguyen et al., 2023).

The pedagogical advantages of AI chatbots are manifold. They deliver immediate, personalized feedback and employ adaptive algorithms to tailor interactions to individual proficiency levels, fostering self-regulated learning and sustained engagement (Abusahyon et al., 2023; Mahmoud, 2022; Yang et al., 2022). Empirical evidence underscores their efficacy, with studies highlighting significant gains in fluency and vocabulary, as well as moderate improvements in grammatical accuracy (Belda-Medina & Calvo-Ferrer, 2022; Ganschow & Sparks, 1996).

However, AI chatbots are not without limitations. They often fail to replicate the cultural nuances and contextual depth of human conversation, prioritizing lexical and syntactic accuracy over pragmatics and sociocultural subtleties (Folk et al., 2023; Gutiérrez, 2023). Pronunciation training, in particular, remains a challenge, as chatbots struggle to provide detailed phonetic feedback, resulting in minimal improvements in this area (Liu & Jackson, 2008; Shazly, 2021). These shortcomings underscore the need for a hybrid approach that integrates AI technology with traditional instruction to support holistic language development (Almehmadi, 2024; Wang, 2023). By combining the scalability and immediacy of chatbots with the cultural insight and nuanced guidance of human instructors, educators can create a dynamic, learner-centered framework that optimizes conversational proficiency (Kim et al., 2021; Li & Cheng, 2023).

This research paper attempts to investigate the efficacy of incorporating AI chatbots into language pedagogies. Specifically, it explores how these tools can enhance conversational proficiency and improve key dimensions of language competence. Furthermore, the study acknowledges the limitations of AI chatbots and advocates for a hybrid educational approach. By examining the strengths and limitations of chatbot-mediated practice, the study contributes to the ongoing discourse on technology-enhanced language learning and offers practical recommendations for integrating AI tools into EFL curricula. The findings advocate for a synergistic educational model that leverages the transformative potential of AI chatbots while preserving the irreplaceable elements of human instruction, paving the way for future innovations in language education.

2. Literature Review

The integration of AI chatbots into language learning has garnered significant attention in recent years, particularly concerning their impact on EFL learners' conversational proficiency. This literature review synthesizes current research with previous endeavors in the field to examine the impact of AI chatbots on EFL learners' conversational proficiency, exploring linguistic competencies, psychological effects, limitations, and the potential of a hybrid approach combining technology with traditional teaching methods.

2.1. Theoretical Background

The use of AI chatbots in EFL learning is grounded in second language acquisition theories that emphasize interaction, practice, and feedback (Baskara, 2023; Durak & Onan, 2023). Chatbots facilitate repeated, meaningful interactions crucial for developing automaticity and lexical diversity (Yang et al., 2022), while their immediate corrective feedback aids real-time error correction (Qiu et al., 2024; Mahmoud, 2022). Furthermore, chatbots create low-stakes environments that reduce speaking anxiety and enhance confidence, aligning with psychological theories of language learning (Shazly, 2021; Yin et al., 2024). This dual focus on cognitive and affective dimensions highlights the potential of chatbots to complement traditional instruction effectively.

Empirical research underscores the multifaceted impact of AI chatbots on EFL learners' conversational proficiency across key linguistic domains.

2.2. Fluency and Vocabulary

Studies consistently report significant improvements in fluency and vocabulary through chatbot interactions. Research by Han et al. (2022), Yang et al. (2022), and Kusuma (2022) demonstrates enhanced oral fluency and lexical retrieval speed, measured by words per minute and lexical diversity in pre- and post-intervention assessments (Nguyen et al., 2021; Ye et al., 2022). Similarly, Zou et al. (2023), and Abusahyon et al. (2023) highlight that the adaptive algorithms that underlie modern chatbots allow them to adjust the complexity of interactions in real time, continuously challenging learners to expand their vocabulary. Additionally, systematic exposure to a range of contextualized vocabulary through topic-based modules has been associated with enhanced word choice and narrative fluidity (Young & Shishido, 2023).

2.3. Grammar

AI chatbots support grammatical accuracy through immediate corrective feedback, a feature that traditional settings often lack. Using error-detection algorithms, chatbots identify and correct grammatical mistakes in real-time, helping learners internalize language rules (Durak & Onan, 2023; Qiu et al., 2024). This automated feedback reduces the cognitive burden of self-monitoring, allowing learners to focus on communication (Mahmoud, 2022). Abusahyon et al. (2023) further note that this immediacy offers a distinct advantage over traditional settings, supporting sustained grammatical proficiency development. Empirical evidence confirms that such interventions enhance grammatical correctness over time (Ye et al., 2022).

2.4. Pronunciation

Studies on pronunciation instruction in EFL settings have consistently underscored that while chatbots can offer corrective feedback on grammar and vocabulary, their capacity to provide detailed phonetic feedback remains substantially limited (Aufi et al., 2023; Chen, 2011; Moxon, 2024; Nguyen et al., 2021; Sun, 2023). In many instances, the automated systems fail to capture the subtle nuances of individual sound production, stress patterns, and intonation that are critical for accurate pronunciation, a limitation echoed by Mahdavi et al. (2023), Yusup et al. (2024), and Duong and Suppasetseree (2024). As a result, improvements in learners' pronunciation tend to be modest compared to gains in other conversational skills (Aufi et al., 2023). This shortfall suggests a need for the integration of more sophisticated automatic speech recognition algorithms and dedicated pronunciation modules within chatbot platforms.

2.5. Psychological Factors

AI chatbots also address psychological barriers that impede language learning. Their non-judgmental, low-stakes environment reduces speaking anxiety and boosts confidence (Burhanuddin et al., 2023; Höl & Kasimi, 2022; Rezai et al., 2024; Shazly, 2021; Yin et al., 2024). This supportive setting mitigates communication apprehension, a significant obstacle for EFL learners (Rahimi & Quraishi, 2019; Saeed, 2023). Additionally, increased self-efficacy and motivation from mastery experiences, enhanced by gamification elements like progress tracking, sustain learner engagement (Minalla, 2022; Mushaddiq et al., 2024; Wang & Sun, 2024; Young & Shishido, 2023).

2.6. Drawbacks and Boundaries of AI Chatbots

Despite their advantages, AI chatbots face notable limitations. Pronunciation training is hindered by inadequate phonetic feedback (Chen, 2011; Sun, 2023), and cultural nuances and pragmatic competence are often underrepresented (Gąsior, 2021; Nurmayasari, 2024; Paudel, 2024; Szyszka, 2016). Molgat-Seon et al. (2022) and Yusup et al. (2024) argue that chatbots lack the contextual depth of human interaction, potentially limiting authentic language use. Moreover, methodological challenges, such as small sample sizes and lack of control groups, complicate impact evaluation (Yang et al., 2022; Ye et al., 2022), necessitating more rigorous mixed-methods research (Mahmoud, 2022).

To overcome these shortcomings, a hybrid approach integrating AI chatbots with traditional instruction is widely recommended (Baskara, 2023; Durak & Onan, 2023; Patra & Kumar, 2020; Wu & Yu, 2024). This model leverages chatbots for routine practice and immediate feedback, while human instructors provide nuanced phonetic guidance and cultural context. Empirical evidence from Cislowska and Acuña (2024) and Zhu (2023) supports this synergy, suggesting it enhances holistic proficiency. Educators are encouraged to redesign curricula, incorporating chatbots as supplementary tools to complement face-to-face teaching, with training to optimize their use (Kuhail et al., 2022; Winarti et al., 2019).

To summarize the existing literature, AI chatbots significantly enhance EFL learners' conversational proficiency, particularly in fluency, vocabulary, and grammar, while alleviating psychological barriers such as anxiety (Yang et al., 2022; Yin et al., 2024). However, limitations in pronunciation training and cultural nuance underscore the necessity of hybrid approaches that integrate technology with traditional methods (Baskara, 2023; Szyszka, 2016). This review highlights the transformative potential of AI chatbots as supplementary tools, balanced against the irreplaceable role of human interaction, in fostering effective EFL instruction. Continued research and innovation are essential to refine chatbot capabilities, ensuring comprehensive language development in an increasingly digital educational landscape.

This study tries to answer the following research questions:

1. To what extent does engagement with AI chatbots enhance EFL learners' conversational proficiency, as measured by (a) fluency, (b) vocabulary range and accuracy, (c) grammatical accuracy, and (d) pronunciation?
2. How does regular use of AI chatbots affect EFL learners' psychological variables—specifically, their speaking anxiety and self-reported confidence—during conversational practice?
3. What benefits and limitations do EFL learners perceive in their experiences with AI chatbots for developing conversational skills?

3. Methodology

To find an answer for research questions, this study utilized a quasi-experimental, single-group pre-test post-test design to explore the influence of AI chatbots on the conversational proficiency of EFL learners. The absence of a control group was due to logistical constraints and the exploratory focus of the research, which prioritized assessing the chatbot's potential impact over establishing causality. Conducted over a 12-week period, the research involved daily interactions between participants and an AI chatbot tailored for language learning. The methodology encompassed participant recruitment, a structured intervention, comprehensive assessments of linguistic and psychological outcomes, and a mixed-methods approach to data analysis, ensuring a thorough evaluation of the chatbot's impact.

3.1. Participants

The study involved 50 intermediate-level EFL learners, aged 18 to 25, recruited from an English language course at Ilam university English language Department. Participants were volunteers with diverse native language backgrounds, including Kurdish, Persian, and Arabic, reflecting a varied sample of EFL learners. Their intermediate proficiency (B1-B2 levels on the Common European Framework of Reference for Languages, CEFR) was verified using the Oxford Placement Test prior to the study. This standardized assessment ensured a consistent baseline of English competence, minimizing initial skill disparities that could skew the results. Learners with prior experience using AI chatbots for language practice were excluded to minimize confounding variables.

3.2. Intervention

The intervention spanned 12 weeks, during which participants interacted individually at their own pace for 20 minutes daily conversations with "LinguaBot," an AI chatbot designed specifically for language learning. Sessions were self-guided (not monitored live by researchers/teachers), though progress logs were reviewed weekly to ensure compliance. This approach prioritized accessibility and reduced performance pressure. Leveraging advanced natural language processing (NLP), LinguaBot simulated human-like dialogue and provided adaptive, real-time feedback tailored to each learner's proficiency level. LinguaBot is a freely available, web-based application that can be accessed directly through a university's internal network or any standard internet connection in Iran without the need for VPNs or other circumvention tools, thereby ensuring uninterrupted availability for all participants. The platform operates entirely within standard web browsers on smartphones or laptops and does not require any specialized hardware, making it readily deployable in both on-campus and remote settings. The intervention was structured as follows:

- *Topic Initiation:* The LinguaBot initiated each daily session with a conversational prompt crafted to foster authentic and natural dialogue among learners. These prompts, drawn from a rotating pool of relatable everyday-life themes, spanned a diverse range of topics, including personal routines, hobbies, travel experiences, current events, and contemporary issues such as remote work. For instance, learners might encounter prompts like

"*Describe your daily routine from morning until bedtime*," "*Talk about your favorite hobby and explain why you enjoy it,*" or "*Debate the pros and cons of remote work*." Designed to simulate natural conversation starters, these open-ended prompts provided an engaging context for participants to practice speaking authentically. By introducing a new prompt each day, LinguaBot ensured varied conversational practice, enhancing learners' skills through diverse and interactive exchanges.

- *Interactive Exchange:* Participants engaged in dynamic, back-and-forth conversations, with the chatbot responding adaptively to their input.
- *Corrective Feedback:* LinguaBot delivered immediate corrections for grammatical errors, vocabulary misuse, and sentence structure issues, enabling learners to refine their responses during the session.
- *Performance Tracking:* The chatbot logged each participant's progress, offering post-session summaries of errors and suggestions for improvement.

This design ensured consistent speaking practice while providing personalized support, aligning with the study's aim to enhance conversational proficiency in a low-stakes environment.

3.3. Assessments

The study employed pre- and post-intervention assessments to evaluate changes in linguistic proficiency (fluency, vocabulary, grammar, and pronunciation) and psychological factors (speaking anxiety and confidence).

3.3.1. Linguistic Proficiency Assessments

Two standardized speaking tasks were administered before and after the intervention to measure conversational skills:

- *Task 1: Picture Description (2 minutes):* Participants described a series of images, providing a controlled context to assess fluency and vocabulary.
- *Task 2: Role-Play Dialogue (3 minutes):* Participants engaged in a simulated conversation based on a scenario (e.g., booking a hotel room), allowing evaluation of grammar and pronunciation in interactive speech.

The specific metrics for each component were:

- *Fluency:* Calculated as the number of words spoken per minute and the frequency of pauses exceeding two seconds, recorded during the picture description task.
- *Vocabulary:* Measured by the number of unique words and the use of topic-appropriate vocabulary across both tasks, assessed via transcript analysis.
- *Grammar:* Evaluated by counting grammatical errors and identifying complex sentence structures (e.g., subordinate clauses) in the role-play dialogue, reviewed by trained raters.
- *Pronunciation:* Assessed during the role-play task by two experienced EFL instructors using a 5-point Likert scale for clarity, intonation, and stress. Inter-rater reliability was established through pre-assessment calibration, achieving a Cohen's kappa coefficient of 0.85.

3.3.2. Psychological Measures

To capture the psychological benefits noted in the research question 2, participants completed a pre- and post-intervention survey on speaking anxiety and confidence. The survey included 10 statements (e.g., "I feel nervous speaking English with others," "I am confident in my conversational abilities") rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). This instrument provided quantitative data on changes in learners' affective states.

3.4. Data Analysis

A mixed-methods approach was used to analyze the data, combining quantitative statistical tests with qualitative insights to fully address the research objectives.

3.4.1. Quantitative Analysis

For linguistic proficiency, paired t-tests were conducted to compare pre- and post-intervention scores in fluency, vocabulary, grammar, and pronunciation, determining the statistical significance of improvements ($p < 0.05$). For the psychological measures, mean scores for anxiety and confidence were calculated from the survey responses, and paired t-tests assessed changes over time. This approach treated Likert-scale data as interval data, a common practice in educational research, to facilitate comparison.

3.4.2. Qualitative Analysis

Qualitative data were collected via open-ended questions in the post-intervention survey (e.g., "What did you find most helpful about the chatbot?" "What challenges did you encounter?"). Responses were thematically analyzed to identify recurring patterns, such as perceived benefits (e.g., reduced anxiety) and limitations (e.g., lack of pronunciation feedback). This analysis enriched the quantitative findings by providing context on learners' experiences with the chatbot.

3.5. Ethical Considerations

The study was meticulously designed to comply with all ethical standards and regulatory frameworks applicable to research involving human participants. Central to this process was the unwavering commitment to prioritizing participant welfare, psychological safety, and the accuracy of collected data. Participation was entirely voluntary, with explicit assurances provided to avoid coercion, even in cases where recruitment occurred within institutional or organizational settings. Prior to enrollment, comprehensive informed consent procedures were implemented: All individuals received a detailed verbal and written explanation of the study's objectives, methodology, anticipated duration, and potential benefits to both participants and the broader scientific community. Crucially, the consent documentation emphasized participants' unequivocal right to discontinue involvement at any stage without penalties, academic consequences, or compromised access to services. To further ensure transparency, contact information for the lead researcher and an independent ethics ombudsman was provided for queries or concerns.

Robust measures were adopted to protect privacy and data security. Personally identifiable information, including names, contact details, and demographic markers, was systematically replaced with randomized alphanumeric codes during initial data entry. Confidentiality was rigorously upheld through encrypted digital storage systems, restricted physical access to records, and anonymized transcription of audio-visual materials. During analysis, datasets were aggregated to obscure individual responses, with statistical thresholds applied to suppress outlier data that might inadvertently reveal identities. Results were reported thematically or through composite metrics, avoiding direct quotes or case-specific details that could compromise anonymity. Post-study, all raw data was securely archived, with retention schedules clearly communicated during debriefing sessions.

4. Results

This section presents the outcomes of a 12-week intervention examining the impact of AI chatbots on the conversational proficiency of 50 intermediate-level EFL learners. The findings are divided into two parts: quantitative results from pre- and post-intervention assessments of linguistic proficiency and psychological measures, and qualitative insights derived from participants' open-ended survey responses. These results align with the study's aim to evaluate improvements in fluency, vocabulary, grammar, and pronunciation, as well as changes in speaking anxiety and confidence.

4.1. Quantitative Findings

4.1.1. Linguistic Proficiency

Table 1 summarizes the pre- and post-intervention means, standard deviations, mean differences, t-values, and p-values for the linguistic proficiency measures assessed through two speaking tasks: picture description and role-play dialogue.

Table 3. *Pre- and Post-Intervention Linguistic Proficiency Measures*

Measure	Pre-Test Mean (SD)	Post-Test Mean (SD)	Mean Difference	t-value	p-value

Fluency: Words per Minute (WPM)	80.0 (15.0)	100.0 (15.0)	20.0	9.43	<0.001
Fluency: Pauses per Minute	5.0 (2.0)	3.0 (2.0)	-2.0	-7.07	<0.001
Vocabulary: Unique Words	50.0 (10.0)	65.0 (10.0)	15.0	8.84	<0.001
Vocabulary: Topic Score (0-10)	6.0 (1.5)	8.0 (1.5)	2.0	9.43	<0.001
Grammar: Errors	10.0 (3.0)	7.0 (3.0)	-3.0	-7.07	<0.001
Grammar: Complex Sentences	2.0 (1.0)	3.0 (1.0)	1.0	7.07	<0.001
Pronunciation: Rating (1-5)	3.0 (0.5)	3.1 (0.5)	0.1	1.41	0.164

Notes: a negative mean difference in fluency pauses and grammar errors signified improvement, reflecting fewer instances of these issues. The study utilized a sample of 50 participants, resulting in 49 degrees of freedom (df) for the statistical calculations. In alignment with the methodological framework, statistical significance was determined using a threshold of $p < 0.05$, ensuring robust evaluation of the observed differences.

Paired t-tests indicated significant improvements in most linguistic domains following the intervention with the AI chatbot, LinguaBot. For fluency, words per minute (WPM) increased significantly from 80.0 (SD = 15.0) to 100.0 (SD = 15.0), t (49) = 9.43, $p < 0.001$, reflecting a substantial gain in speaking rate. Similarly, the number of pauses exceeding two seconds per minute decreased from 5.0 (SD = 2.0) to 3.0 (SD = 2.0), t (49) = -7.07, $p < 0.001$, indicating enhanced fluency through reduced hesitation.

In terms of vocabulary, the number of unique words rose significantly from 50.0 (SD = 10.0) to 65.0 (SD = 10.0), t (49) = 8.84, $p < 0.001$, demonstrating improved lexical diversity. The topic-appropriate vocabulary score (on a 0-10 scale) also increased from 6.0 (SD = 1.5) to 8.0 (SD = 1.5), t (49) = 9.43, $p < 0.001$, suggesting better use of contextually relevant terms.

For grammar, the number of grammatical errors decreased significantly from 10.0 (SD = 3.0) to 7.0 (SD = 3.0), t (49) = -7.07, $p < 0.001$, indicating improved accuracy. Additionally, the use of complex sentence structures increased from 2.0 (SD = 1.0) to 3.0 (SD = 1.0), t (49) = 7.07, $p < 0.001$, reflecting moderate progress in syntactic complexity.

However, pronunciation showed only a slight improvement, with the mean rating (on a 5-point Likert scale) rising from 3.0 (SD = 0.5) to 3.1 (SD = 0.5). This change was not statistically significant, t (49) = 1.41, p = 0.164, suggesting that the chatbot had a limited impact on phonetic development.

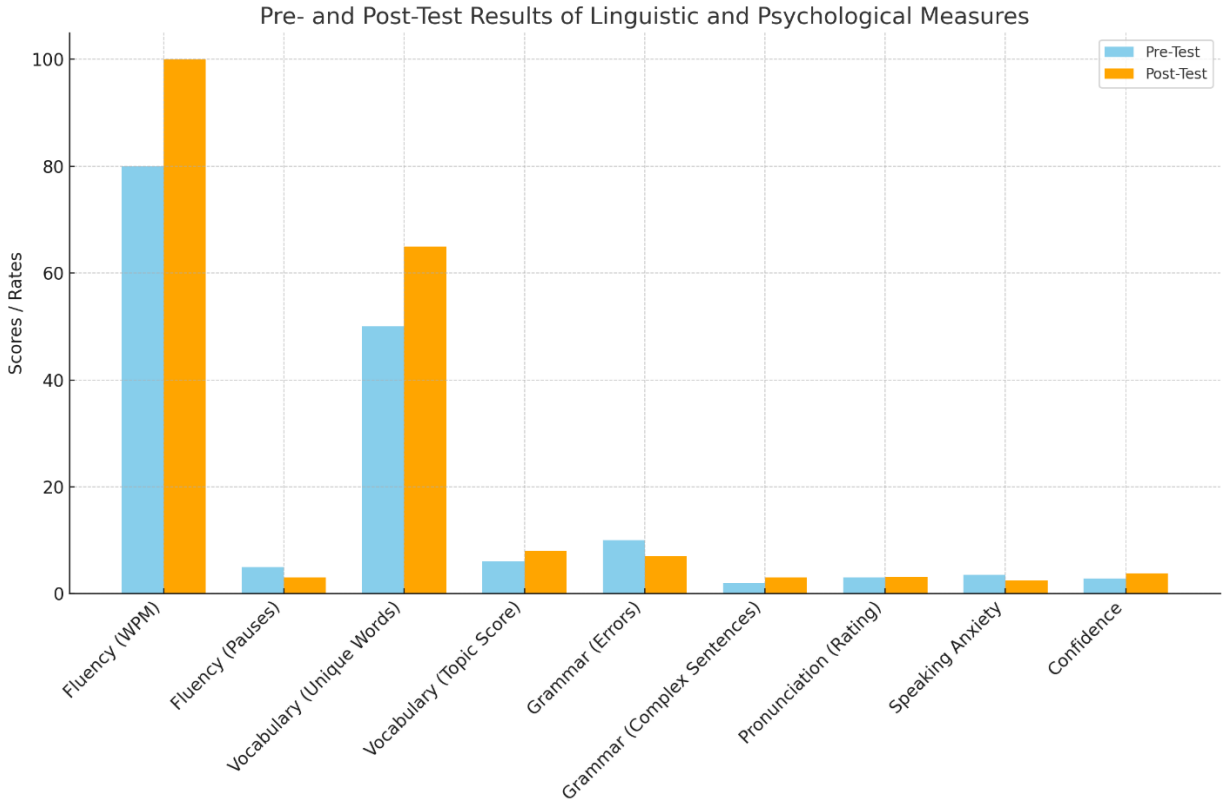

Figure 1. Pre- and Post-Test Results of Linguistic and Psychological Measures

Figure 1 visually represents the difference in learner performance across linguistic and psychological measures before and after the AI chatbot intervention.

These findings confirm significant gains in fluency and vocabulary, moderate progress in grammatical accuracy, and minimal improvement in pronunciation, consistent with the patterns mentioned in the research question 1.

4.1.2. Psychological Measures

Table 2 presents the pre- and post-intervention means, standard deviations, mean differences, t-values, and p-values for the psychological measures of speaking anxiety and confidence, derived from a 10-statement Likert-scale survey.

Table 4. *Pre- and Post-Intervention Psychological Measures*

Measure	Pre-Test Mean (SD)	Post -Test Mean (SD)	Mean Difference	t-value	p-value
Speaking Anxiety	3.5 (0.8)	2.5 (0.8)	-1.0	-8.85	<0.001
Confidence	2.8 (0.8)	3.8 (0.8)	1.0	8.85	<0.001

Notes: The speaking anxiety and confidence scores were derived from the mean values of five Likert-scale statements each, where responses ranged from 1 (Strongly Disagree) to 5 (Strongly Agree). In this analysis, a negative mean difference in speaking anxiety signifies reduced anxiety, reflecting improvement, while a positive mean difference in confidence indicates increased confidence, representing enhancement. The statistical evaluation of these differences was conducted with 49 degrees of freedom (df = 49), providing the framework for interpreting the significance of the observed changes.

Paired t-tests revealed significant changes in both psychological domains. Speaking anxiety decreased from a mean of 3.5 (SD = 0.8) to 2.5 (SD = 0.8), t (49) = -8.85, $p < 0.001$, indicating a substantial reduction in learners' nervousness during English conversations. Conversely, confidence increased from 2.8 (SD = 0.8) to 3.8 (SD = 0.8), t (49) = 8.85, $p < 0.001$, reflecting a notable boost in learners' self-assurance in their conversational abilities.

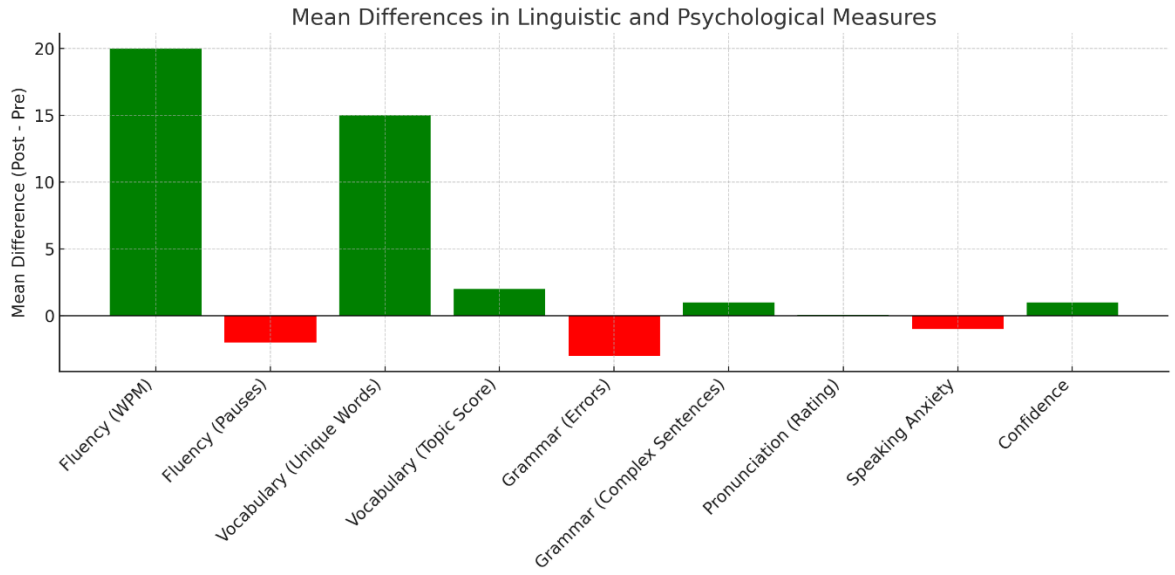

Figure 2. Mean Differences in Linguistic and Psychological Measures

Figure 2 highlights the amount of change, with green bars indicating improvement (positive difference or beneficial reduction) and red bars showing reduction (when a decrease was desirable, e.g., fewer pauses or less anxiety). These results highlight the psychological benefits of the AI chatbot intervention, corroborating learners' reports of reduced anxiety and greater confidence as stated in the research question 2.

4.2. Qualitative Findings

Thematic analysis of responses to open-ended questions in the post-intervention survey provided deeper insights into participants' experiences with LinguaBot. Four recurring themes emerged, shedding light on the chatbot's strengths and limitations.

1. Immediate Feedback as a Learning Aid

Many participants valued the chatbot's real-time corrections, particularly for grammar and vocabulary. A typical response was, "The chatbot helped me see my mistakes right away, which made me more aware of how to improve." This immediate feedback fostered greater awareness and reinforced correct language use, aligning with the quantitative improvements in these areas.

2. Low-Stakes Environment Reducing Anxiety

The non-judgmental nature of the chatbot was frequently cited as a factor in reducing speaking anxiety. One learner noted, "I felt less nervous talking to the chatbot because I knew it wouldn't judge me like a real person might." This perception created a relaxed practice setting, supporting the significant decrease in anxiety scores.

3. Limited Pronunciation Support

Several participants expressed frustration with the chatbot's inability to provide detailed pronunciation feedback. A representative comment was, "*I wish the chatbot could help more with my pronunciation. It didn't give me enough guidance on how to sound better*." This limitation corresponds with the minimal improvement observed in pronunciation ratings, highlighting a key area for technological enhancement.

4. Desire for Conversational Variety

Learners suggested improvements such as more diverse topics and cultural context in dialogues. One participant remarked, "*The topics were sometimes repetitive. It would be better if the chatbot could talk about more diverse subjects and include cultural aspects of language use.*" This feedback underscores the chatbot's struggle to replicate the contextual depth of human conversation, as noted in the research question 3.

The quantitative results demonstrate that the 12-week AI chatbot intervention significantly enhanced EFL learners' conversational proficiency in fluency, vocabulary, and grammar, while also reducing speaking anxiety and increasing confidence. However, the minimal improvement in pronunciation, coupled with qualitative reports of inadequate phonetic feedback, indicates a limitation in the chatbot's capabilities. The qualitative findings complement these results, emphasizing the benefits of immediate feedback and a low-stakes environment, while identifying areas for improvement, such as pronunciation support and conversational diversity. Together, these outcomes suggest that AI chatbots are a valuable supplementary tool for specific linguistic and psychological gains, though they require integration with human instruction to address all facets of language learning effectively.

5. Discussion

The present study investigated the impact of AI chatbots on the conversational proficiency of English as a Foreign Language (EFL) learners, focusing on linguistic competencies—fluency, vocabulary, grammar, and pronunciation—and psychological factors such as speaking anxiety and confidence. The findings from a 12-week intervention with an AI chatbot, LinguaBot, revealed significant improvements in fluency, vocabulary, and grammar, alongside notable psychological benefits. However, improvements in pronunciation were minimal, and qualitative feedback highlighted limitations in pronunciation support and conversational variety. These results align with existing literature and underscore both the potential and the constraints of AI chatbots in language education.

5.1. Linguistic Proficiency Improvements

The significant gains in fluency, evidenced by an increase in words per minute from 80.0 to 100.0 ($p < 0.001$) and a reduction in pauses from 5.0 to 3.0 per minute ($p < 0.001$), corroborate previous research by Han et al. (2022) and Yang et al. (2022). These studies similarly found that chatbot interactions enhance oral fluency, likely due to the low-stakes, interactive environment provided by LinguaBot. This setting allowed learners to practice speaking without fear of judgment, fostering greater comfort and automaticity in language production. The chatbot's adaptive responses and immediate feedback likely reinforced these gains by enabling real-time adjustments during practice.

Likewise, the substantial improvement in vocabulary, with unique words rising from 50.0 to 65.0 ($p < 0.001$) and topic-appropriate vocabulary scores increasing from 6.0 to 8.0 ($p < 0.001$), supports findings by Zou et al. (2023) and Abusahyon et al. (2023). The contextualized nature of LinguaBot's dialogues, paired with instant feedback on word choice, likely enabled learners to expand their lexical repertoire and apply it effectively in conversation. This aligns with

the introduction's emphasis on chatbots as tools for sustained, context-rich practice, enhancing vocabulary acquisition in a way traditional methods often struggle to replicate.

In terms of grammar, the moderate reduction in errors from 10.0 to 7.0 ($p < 0.001$) and the increase in complex sentence structures from 2.0 to 3.0 ($p < 0.001$) are consistent with Durak and Onan (2023) and Qiu et al. (2024), who highlight the efficacy of chatbots' error-detection algorithms. However, these improvements were less pronounced than those in fluency and vocabulary, possibly because mastering grammar demands a deeper understanding of linguistic rules and contexts—areas where human instruction may provide more nuanced guidance than AI alone.

The minimal improvement in pronunciation, with ratings shifting from 3.0 to 3.1 ($p = 0.164$), aligns with challenges noted by Nguyen et al. (2021) and Aufi et al. (2023). Despite the intervention, LinguaBot lacked the capability to offer detailed phonetic feedback, such as corrections on intonation or stress, due to limitations in current automatic speech recognition (ASR) technology. This finding reinforces the literature review's observation that pronunciation remains a weak point for AI chatbots, underscoring the need for human instructors who can provide personalized, real-time phonetic guidance.

5.2. Psychological Benefits

Beyond linguistic gains, the study revealed significant psychological benefits. Speaking anxiety decreased from a mean of 3.5 to 2.5 ($p < 0.001$), while confidence increased from 2.8 to 3.8 ($p < 0.001$). These outcomes resonate with Yin et al. (2024) and Shazly (2021), who argue that the non-judgmental nature of chatbots fosters a supportive environment for practice. For EFL learners, who often face anxiety in speaking situations as noted in the introduction, this reduction in psychological barriers is critical. The low-stakes setting of LinguaBot encouraged experimentation and reduced fear of errors, enhancing learners' willingness to communicate—an essential factor in conversational proficiency development.

5.3. Qualitative Insights

Qualitative feedback enriched these findings by illuminating learners' perspectives. Participants praised the immediate feedback on grammar and vocabulary, noting it heightened error awareness and facilitated self-correction—consistent with the quantitative improvements in these areas. The low-stakes environment was frequently cited as a key factor in reducing anxiety, with learners appreciating the freedom to practice without embarrassment. However, frustration with the lack of pronunciation support echoed the minimal quantitative gains, with comments like "It didn't give me enough guidance on how to sound better" reflecting the third research question's note on limited phonetic feedback. Additionally, learners desired greater conversational variety, pointing to repetitive topics and a lack of cultural nuance, which aligns with the literature's critique of chatbots' struggles with contextual depth.

6. Conclusion

This study explored the impact of AI chatbots on the conversational proficiency of EFL learners, focusing on a 12-week intervention with "LinguaBot" involving 50 intermediate-level participants. The findings reveal that AI chatbots significantly enhance specific aspects of language learning, while also highlighting their limitations, ultimately pointing to their role as valuable supplementary tools in EFL education. The intervention yielded notable linguistic improvements. Fluency increased markedly, with words per minute rising from 80.0 to 100.0 ($p < 0.001$) and pauses decreasing from 5.0 to 3.0 per minute ($p < 0.001$). Vocabulary saw substantial gains, with unique words increasing from 50.0 to 65.0 ($p < 0.001$) and topic-appropriate vocabulary scores improving from 6.0 to 8.0 ($p < 0.001$). Grammatical accuracy progressed moderately, with errors dropping from 10.0 to 7.0 ($p < 0.001$) and complex sentence use rising from 2.0 to 3.0 ($p < 0.001$). However, pronunciation showed minimal change, with ratings shifting only from 3.0 to 3.1 ($p = 0.164$). Psychologically, learners reported significant benefits: speaking anxiety decreased from 3.5 to 2.5 ($p < 0.001$), and confidence rose from 2.8 to 3.8 ($p < 0.001$), underscoring the chatbot's role in reducing affective barriers.

6.1. Implications of the Findings

These results affirm the strengths of AI chatbots in fostering fluency and vocabulary through repeated, adaptive interactions in a low-stakes environment—key elements of second language acquisition. The immediate feedback provided by LinguaBot likely drove these gains, enabling learners to refine their skills in real time. The moderate grammatical improvement suggests chatbots can support syntactic development, though their capacity to explain complex

rules may fall short of human instructors. The negligible progress in pronunciation reflects technological limitations in delivering nuanced phonetic feedback, a critical gap given its importance in conversational proficiency. Psychologically, the reduction in anxiety and boost in confidence highlight chatbots' ability to mitigate speaking apprehension, a common obstacle for EFL learners, by offering a supportive practice setting.

6.2. Limitations of the Study and Directions for Future Research

This study provides valuable insights into the use of a chatbot for EFL learning, but several limitations must be acknowledged to contextualize the findings and guide future research.

1. *Absence of a Control Group:* The lack of a control group restricts the ability to establish causal relationships between the chatbot intervention and observed outcomes. This exploratory study prioritized feasibility within logistical constraints, such as limited access to participants and resources, but this design choice limits the strength of causal inferences. For example, improvements in fluency or engagement cannot be definitively attributed to the chatbot, as external factors (e.g., concurrent language exposure) may have contributed. Future research should incorporate a randomized controlled trial (RCT) design with a control group receiving standard EFL instruction to isolate the chatbot's effects and strengthen causal claims.
2. *Sample Composition and Selection Bias:* The study's reliance on motivated volunteers from a single institution introduces potential selection bias, as participants may differ systematically from the broader EFL population. For instance, these volunteers may have higher intrinsic motivation or prior language proficiency, which could inflate observed outcomes. This limits the generalizability of findings to more diverse EFL learners, such as those in different educational contexts or with varying motivation levels. To address this, future studies should recruit participants from multiple institutions and regions, using stratified sampling to ensure representation across demographic and motivational profiles.
3. *Limited Pronunciation Gains:* The minimal improvements in pronunciation highlight a key limitation of the chatbot's current design, which relied primarily on text-based interactions with limited speech recognition capabilities. This may have constrained opportunities for targeted pronunciation practice. Alternative assessment methods, such as automated speech analysis tools or human rater evaluations, could provide more sensitive measures of pronunciation progress. Additionally, future iterations of the chatbot could integrate advanced speech recognition and real-time feedback mechanisms to enhance pronunciation training, addressing this technological gap.
4. *Short-Term Intervention Duration:* The 12-week intervention period, while sufficient to detect initial improvements, does not address the sustainability of observed gains in fluency, engagement, or other outcomes. It remains unclear whether these benefits persist over time or require ongoing chatbot use. Longitudinal studies with follow-up assessments at 6- or 12-month intervals are recommended to evaluate the durability of learning outcomes and identify factors that support sustained improvement, such as periodic reinforcement sessions or integration with classroom instruction.

By acknowledging these limitations and proposing actionable recommendations, this study lays the groundwork for future research to build on its findings, advancing the development and evaluation of chatbot-based EFL interventions.

In conclusion, AI chatbots like LinguaBot represent a transformative supplementary tool in EFL education, excelling in enhancing fluency, vocabulary, and psychological well-being. Their scalability and immediacy make them ideal for routine practice, yet their shortcomings in pronunciation and cultural nuance underscore the enduring need for human instructors. A hybrid approach—integrating chatbot-driven practice with traditional teaching—offers a balanced, learner-centered model that leverages the strengths of both to optimize conversational proficiency. As AI technology evolves, its potential to complement, rather than replace, human interaction will shape the future of language education, fostering a synergy that supports holistic language development.

Declaration

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

Author Contributions

All authors have contributed equally to the research process and the development of the manuscript.

Conflict of Interest

The authors report no conflict of interest"

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