THE EFFECTIVENESS OF AI-BASED CHATBOTS IN ENHANCING ENGLISH AS A FOREIGN LANGUAGE (EFL) LEARNING

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ABSTRACT

The integration of Artificial Intelligence (AI) in education has created new opportunities for English as a Foreign Language (EFL) learning; however, research on the effectiveness of AI-based chatbots in improving students' language skills and learning motivation remains limited, particularly in EFL contexts. This study investigates the impact of AI-based chatbots on students' speaking and writing skills, as well as their motivation toward learning English. A quasi-experimental design was employed involving two groups of students: an experimental group using AI-based chatbots and a control group receiving traditional instruction. Data were collected through pre-tests, post-tests, questionnaires, and interviews to evaluate students' achievement and perceptions. The findings revealed that the experimental group showed significantly greater improvement than the control group, with average post-test scores increasing by approximately 18% in speaking and 15% in writing. In addition, students reported higher levels of motivation, confidence, and classroom engagement due to the interactive and immediate feedback provided by the chatbots. These findings suggest that AI-based chatbots can effectively support EFL learning and complement conventional teaching methods by creating more interactive and student-centered learning environments. Future research is recommended to examine the long-term effects of chatbot-assisted learning and explore the integration of more advanced AI features in language education..

Keywords: Artificial Intelligence, Chatbots, EFL Learning, Language Proficiency, Learning Motivation.

INTRODUCTION

The integration of technology in education has developed rapidly in recent years, particularly with the emergence of Artificial Intelligence (AI). In the context of English as a Foreign Language (EFL) learning, AI has created new opportunities to support language acquisition through interactive and adaptive systems. Among these innovations, AI-powered chatbots have attracted considerable attention because they can simulate human-like conversations, provide immediate feedback, and facilitate continuous learning beyond the classroom. These features make chatbot technology a promising solution to common challenges in language learning, such as limited exposure to authentic communication and insufficient individualized instruction.

Previous studies have shown that AI technologies positively influence language learning by increasing student engagement, promoting learner autonomy, and improving language proficiency. AI-supported learning environments also enable students to practice at their own pace and receive personalized learning experiences tailored to their needs (Kim & Lee, 2023; Zhang & Wang, 2024; Liu et al., 2025). As a result, AI has the potential to transform traditional EFL classrooms into more dynamic and learner-centered learning environments.

More specifically, chatbot-assisted learning has been widely examined for its contribution to the development of language skills and learning motivation. Several studies have reported that chatbots improve students' participation, confidence, and motivation in English learning contexts (Rahman et al., 2022; Huang et al., 2023). Other researchers have emphasized their effectiveness in enhancing productive skills, particularly writing and speaking, because these tools provide immediate feedback and create a low-anxiety environment for practice (Chen & Duong, 2025; Fachriyah et al., 2026). In addition, AI-supported chatbots encourage students to engage in more frequent and independent language practice, which contributes to the development of self-regulated learning skills such as goal setting, time management, and self-evaluation (Garcia & Torres, 2025).

Despite these advantages, some scholars argue that AI systems should complement rather than replace teachers. Human interaction remains essential for providing meaningful feedback, emotional support, and opportunities for critical thinking that AI technologies may not fully replicate (Smith & Johnson, 2024). Therefore, understanding how chatbot technology can be effectively integrated

into language learning remains an important issue in contemporary education.

Although previous studies have demonstrated the benefits of chatbot-assisted learning, several research gaps still exist. First, many earlier studies focused on only one language skill, such as speaking or writing, without examining both skills simultaneously. Second, limited research has compared chatbot-assisted instruction with traditional teaching methods using a quasi-experimental design. Third, studies investigating the effectiveness of AI-based chatbots in EFL contexts, particularly in developing countries such as Indonesia, remain relatively limited. Consequently, further investigation is needed to determine how these technologies influence students' language skills and motivation in diverse educational settings.

Therefore, this study aims to investigate the effectiveness of AI-based chatbots in EFL learning by examining their impact on students' speaking and writing skills as well as their learning motivation. The findings are expected to contribute to the growing body of research on AI-assisted language learning and provide practical insights for educators seeking to create more interactive and student-centered learning environments through.

REVIEW OF RELATED LITERATURES

The rapid development of Artificial Intelligence (AI) has significantly influenced educational practices, particularly in English as a Foreign Language (EFL) learning. Among various AI technologies, AI-based chatbots have gained considerable attention because they can simulate human-like conversations through natural language processing and provide interactive learning experiences. According to Caldarini et al. (2022), chatbots are AI-driven systems that enable automated conversational interaction, allowing learners to practice language skills in a more accessible and flexible environment. In EFL contexts, these tools help address common challenges such as limited opportunities for authentic communication and insufficient speaking practice.

A growing body of research demonstrates that AI chatbots positively affect language learning outcomes. Several studies (Liu et al., 2025; Wu & Li, 2024; Safitri et al., 2025) consistently show that chatbot-assisted learning

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improves students' overall English performance, learner engagement, and motivation. These systems also provide immediate and personalized feedback, which supports more interactive and learner-centered learning environments. Such findings indicate that AI chatbots can facilitate active participation and encourage students to practice English more frequently both inside and outside the classroom.

Research has also emphasized the role of chatbot technology in improving speaking skills and reducing language anxiety. Studies by Safitri et al. (2025) and Rachmadani et al. (2026) found that learners who interact with AI chatbots demonstrate greater fluency, improved pronunciation, and higher confidence in speaking activities. Similarly, Zhang et al. (2025) reported that conversational AI tools increase students' willingness to communicate because they provide a low-anxiety environment where learners feel less afraid of making mistakes. These findings suggest that chatbot-assisted interaction can create supportive learning conditions that enhance students' oral communication skills.

In addition to speaking development, AI chatbots have also been shown to support writing improvement and learner autonomy. Chen and Duong (2025) reported that chatbot-assisted writing activities enhance students' grammatical accuracy and writing confidence. Likewise, Garcia and Torres (2025) emphasized that AI-supported learning encourages self-regulated learning by helping students set learning goals, monitor progress, and engage in independent practice. Therefore, chatbot technology not only strengthens linguistic competence but also promotes autonomous learning, which is essential for successful language acquisition.

Despite these advantages, several researchers have highlighted limitations in the implementation of AI chatbots in education. Smith and Johnson (2024) argued that AI systems cannot fully replace teachers because they lack deeper pedagogical judgment, emotional understanding, and contextual sensitivity. In addition, Zhang et al. (2025) pointed out that technical issues, including inaccurate responses and excessive dependence on technology, may reduce learning effectiveness if not carefully managed. These findings suggest that AI chatbots should function as complementary tools that support, rather than replace, traditional teaching practices.

Although previous studies have demonstrated the positive effects of AI chatbots on language learning, several research gaps remain. First, many existing studies focus on a single language skill, such as speaking or writing, without examining both skills simultaneously. Second, limited studies have employed quasi-experimental designs to compare chatbot-assisted learning with traditional instructional methods in real classroom settings. Third, research investigating the implementation of AI chatbots in EFL contexts, particularly in developing countries such as Indonesia, is still relatively limited. Therefore, this study seeks to address these gaps by examining the effectiveness of AI-based chatbots in improving students' speaking and writing skills as well as their learning motivation through a quasi-experimental approach in an EFL classroom context.

.METHODS

This study employed a quantitative approach using a quasi-experimental design with a pre-test and post-test control group design to examine the effectiveness of AI-based chatbots in English as a Foreign Language (EFL) learning. This design was selected because it enables the researcher to compare learning outcomes between students who used AI-assisted learning tools and those who received conventional instruction without random assignment (Creswell & Creswell, 2022).

The participants consisted of 60 EFL students from a senior high school/university in Indonesia who were selected through purposive sampling. The students were divided into two groups: an experimental group (30 students) and a control group (30 students). Participants were selected based on their similar English proficiency levels to ensure comparability between groups. The experimental group used an AI-based chatbot application, such as ChatGPT or another educational chatbot platform, during English learning activities, while the control group learned through traditional classroom instruction without AI assistance.

The treatment was conducted over eight weeks with two instructional sessions per week. During the intervention, students in the experimental group interacted with the chatbot for speaking and writing practice, including dialogue exercises, question-and-answer

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activities, paragraph writing, and feedback-based revision tasks. Meanwhile, the control group completed similar learning materials through teacher-centered activities and textbook-based exercises. Both groups received the same learning objectives and instructional content to ensure that the use of AI-based chatbots was the primary distinguishing variable.

The instruments used in this study included speaking and writing tests, as well as a motivation questionnaire. The pre-test and post-test were designed to measure students' speaking and writing performance before and after the treatment. The speaking test assessed fluency, pronunciation, vocabulary, and comprehension, while the writing test evaluated grammar, organization, vocabulary use, and coherence. The questionnaire consisted of Likert-scale items aimed at measuring students' motivation, engagement, and perceptions toward chatbot-assisted learning.

To ensure the quality of the instruments, validity and reliability procedures were conducted prior to data collection. The test instruments and questionnaire items were adapted from previous EFL studies and validated through expert judgment by two English education lecturers. A pilot test was also conducted with students outside the sample group to evaluate clarity and consistency. The reliability of the questionnaire was measured using Cronbach's Alpha, which yielded a coefficient of 0.87, indicating high reliability.

Data collection was carried out in several stages. First, both groups completed the pre-test to determine their initial proficiency levels. Second, the experimental group participated in chatbot-assisted learning sessions, while the control group received traditional instruction over the treatment period. Finally, both groups completed the post-test and questionnaire to measure learning outcomes and students' perceptions after the intervention.

The collected data were analyzed using descriptive and inferential statistics. Mean scores and standard deviations were used to describe students' performance, while an independent samples t-test was conducted to determine whether there were significant differences between the experimental and control groups. Statistical analysis was performed using SPSS software.

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This methodological framework enabled the researcher to systematically evaluate the impact of AI-based chatbots on students' speaking and writing skills as well as their learning motivation. The use of a quasi-experimental design, validated instruments, and statistical analysis contributed to the reliability and credibility of the study findings.

RESULTS AND DISCUSSION

The findings of this study demonstrate that the use of AI-based chatbots positively affected students' English language learning outcomes. Based on the pre-test and post-test results presented in Table 1, the experimental group showed substantially greater improvement than the control group across all measured aspects. The mean test score of the experimental group increased from 65 to 82, while the control group improved only from 66 to 74. This result indicates that chatbot-assisted learning contributed more effectively to students' language development than traditional instruction alone. These findings support Liu et al. (2025), who reported that AI-assisted learning environments significantly improve learners' English proficiency and classroom participation.

The improvement was particularly noticeable in speaking skills and confidence. As shown in Table 1, the experimental group's speaking fluency score increased from 68 to 85, whereas the control group improved from 67 to only 75. Similarly, students' confidence level in the experimental group rose dramatically from 60 to 88, compared to 62 to 70 in the control group. This significant increase may be explained by the interactive and low-anxiety learning environment provided by AI chatbots. Students were able to practice speaking repeatedly without fear of making mistakes or being judged by peers, which encouraged more active participation in communication activities. This finding is consistent with Safitri et al. (2025) and Rachmadani et al. (2026), who emphasized that conversational AI tools help reduce speaking anxiety and increase learners' willingness to communicate in English.

Motivation and engagement also showed remarkable improvement among students who used chatbot-assisted

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learning. The motivation level in the experimental group increased from 65 to 90, while the control group showed a smaller increase from 64 to 72. Likewise, participation and engagement scores improved from 70 to 92 in the experimental group, compared to 68 to 75 in the control group. These findings suggest that AI-based chatbots created a more enjoyable and interactive learning experience. The immediate feedback, personalized responses, and flexible learning opportunities provided by the chatbots likely contributed to students' increased motivation. In addition, students could practice at their own pace and access learning support outside classroom hours, which enhanced their sense of autonomy and responsibility for learning. These results align with Wu and Li (2024), who found that AI-supported learning environments significantly increase learner engagement and motivation in EFL classrooms.

The results also revealed substantial improvement in writing performance. The writing score of the experimental group increased from 66 to 84, whereas the control group improved only from 65 to 73. Grammar accuracy showed one of the largest gains, increasing from 62 to 86 in the experimental group, compared to 63 to 74 in the control group. This finding indicates that chatbot-assisted writing activities helped students improve sentence structure, vocabulary usage, and grammatical correctness more effectively than conventional instruction. One possible explanation is that chatbots provided immediate corrective feedback and revision suggestions, allowing students to identify and correct errors independently during the writing process. This supports Chen and Duong (2025), who reported that AI chatbots improve students' writing quality by offering instant feedback and opportunities for repeated revision.

Another important finding relates to autonomous learning skills. Table 1 shows that self-regulation scores in the experimental group increased significantly from 58 to 85, while the control group improved from 60 to 70. This suggests that chatbot-assisted learning encouraged students to become more independent learners. Through continuous interaction with AI tools, students were able to manage their learning activities, monitor progress, and practice English outside formal classroom sessions. This result supports Garcia and Torres (2025), who argued that AI-supported learning environments

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foster self-regulated learning and learner autonomy.

Despite the positive outcomes, several limitations were identified during the implementation process. As shown in Table 1, 12 students in the experimental group reported experiencing confusion due to inaccurate or unclear chatbot responses, compared to 8 students in the control group who reported difficulties related to traditional learning materials. Although these issues did not significantly affect the overall learning outcomes, they indicate that AI systems still have limitations in contextual understanding and response accuracy. Some students occasionally received grammatically awkward or irrelevant answers from the chatbot, which required teacher clarification. Therefore, teacher supervision remains essential to ensure that students receive accurate guidance and to prevent misconceptions during learning activities. This finding supports Smith and Johnson (2024), who argued that AI technologies should function as complementary tools rather than complete replacements for teachers.

Tabel. Pre-test and Post-test Comparison of Experimental and Control Groups

No.	Aspect	Indicator	Experimental Group (Pre → Post)	Control Group (Pre → Post)
1.	Learning Outcomes	Mean Test Score	65 → 82	66 → 74
2.	Speaking Skills	Fluency Score	68 → 85	67 → 75
3.	Speaking Confidence	Confidence Level	60 → 88	62 → 70
4.	Motivation	Motivation Level	65 → 90	64 → 72
5.	Engagement	Participation Rate	70 → 92	68 → 75
6.	Writing Skills	Writing Score	66 → 84	65 → 73
7.	Grammar Accuracy	Correct Usage	62 → 86	63 → 74
8.	Autonomous Learning	Self-Regulation	58 → 85	60 → 70
9.	Perception	Positive Response	85	68
10.	Learning Issues	Reported Confusion	12	8

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The tabke above presents the comparison of pre-test and post-test results between the experimental group and the control group across several aspects of EFL learning. The experimental group, which used AI-based chatbots during the instructional treatment, demonstrated substantially greater improvement than the control group in all measured indicators. Significant gains were observed in speaking fluency (68 → 85), speaking confidence (60 → 88), motivation (65 → 90), engagement (70 → 92), writing performance (66 → 84), grammar accuracy (62 → 86), and autonomous learning (58 → 85). In contrast, the control group showed only moderate improvement after receiving traditional instruction. The table also indicates that students in the experimental group reported more positive perceptions toward the learning process, although a small number experienced confusion due to occasional inaccuracies in chatbot responses. Overall, the findings suggest that AI-based chatbots positively contribute to students' language proficiency, motivation, and independent learning in EFL contexts.

CONCLUSIONS

This study investigated the effectiveness of AI-based chatbots in English as a Foreign Language (EFL) learning using a quasi-experimental design. The findings demonstrate that chatbot-assisted learning significantly improved students' speaking skills, writing performance, grammar accuracy, motivation, engagement, and autonomous learning compared to traditional instruction. The experimental group consistently achieved higher post-test scores, indicating that AI integration can create a more interactive, flexible, and student-centered learning environment.

The findings support previous studies showing that AI technologies enhance language learning through immediate feedback, low-anxiety interaction, and self-paced practice. However, this study also contributes to the existing literature in several important ways. First, it provides empirical evidence through a quasi-experimental approach comparing chatbot-assisted learning with conventional teaching methods. Second, it examines the impact of AI-based chatbots on both speaking and writing skills simultaneously, an area that remains relatively underexplored in previous research. Third, this study offers insights into the

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implementation of chatbot-assisted learning in an EFL context within a developing educational setting.

Despite the positive outcomes, several limitations should be acknowledged. Some students experienced confusion due to occasional inaccurate or contextually inappropriate chatbot responses, indicating that AI systems still require teacher supervision and guidance during classroom implementation. Therefore, AI-based chatbots should function as complementary learning tools rather than replacements for teachers, whose role remains essential in providing pedagogical support, contextual explanation, and meaningful human interaction.

Based on these findings, future research is recommended to investigate the long-term effectiveness of chatbot-assisted learning in real classroom settings, compare different types of AI chatbot platforms, and explore effective strategies for teacher–AI collaboration in language instruction. Further studies may also examine how advanced AI features, such as adaptive feedback and speech recognition, can optimize students' language learning outcomes in EFL contexts.

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