Chatbot Tutor vs. Human Tutor: Assessing Learning Effectivenes in AI- and Human-Led EFL Learning

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Abstract

This study investigates the comparative effectiveness of chatbot-led and human-led instruction in teaching English grammar to undergraduate EFL learners in Indonesia. Using a quasi-experimental design, the study involved 30 students from the English Department of Universitas Serambi Mekkah who were divided equally into a chatbot group (CG) (n=15) and a human tutor group (HTG) (n=15). Both groups received instruction on the simple past tense with a focus on irregular verbs during a single structured learning session. Grammar development was measured through pre-tests and post-tests, supported by semi-structured interviews to explore their perceptions. The findings show that both instructional modes resulted in measurable improvement in grammatical accuracy. The human tutor group achieved slightly higher gains in sentence construction, indicating deeper conceptual understanding, while the chatbot group reported higher engagement, reduced anxiety, and greater learner autonomy. These results suggest that chatbot tutors are effective for form-focused practice and affective support, whereas human tutors remain essential for nuanced explanation and adaptive teaching. Regarding the limitations, the chatbot group noted chatbot's ineffectiveness in providing contextual explanations while the human tutor group considered time as the major constraint in accessing continuous and individualized support. The study concludes that a blended approach integrating chatbot tools with human instruction offers the most pedagogically effective model for EFL grammar learning.

1. Introduction

The rapid advancement of artificial intelligence (AI) has significantly influenced the way languages are taught and learned, particularly in higher education. In recent years, AI-powered tools have been increasingly integrated into English as a Foreign Language (EFL) instruction, offering learners new opportunities to practise language skills, receive immediate feedback, and access learning support beyond the traditional classroom. Among these tools, conversational chatbot tutors have gained considerable attention due to their ability to simulate human-like interaction through natural language processing.

Chatbot tutors are designed to provide explanations, examples, and corrective feedback in real time (Ekizoğlu & Demir, 2025), making them especially appealing for grammar learning, which often requires repeated

practice and immediate error correction. For EFL learners, grammar is frequently perceived as difficult and anxiety-inducing, particularly when mistakes are made in front of peers or instructors. In this context, chatbot tutors may offer a low-pressure learning environment where students can experiment with language forms without fear of judgement. As a result, AI chatbots are often associated with increased engagement, motivation, and learner autonomy.

In Indonesia, the use of AI in education has expanded rapidly following the widespread availability of generative AI tools such as ChatGPT. Many university students now use AI tools informally to check grammar, generate examples, or clarify language rules. Despite this growing reliance on AI, empirical research examining its actual learning effectiveness, especially in comparison with human-led instruction, remains limited. Most existing studies focus on learner perceptions or general attitudes toward AI, rather than measurable learning outcomes. Furthermore, Indonesian EFL classrooms are traditionally teacher-centred, and interpersonal interaction between teachers and students is culturally valued. This raises important questions about whether AI tutors can meaningfully support learning or merely function as superficial aids.

Grammar instruction provides an appropriate context for comparing AI- and human-led tutoring. On the one hand, grammar learning benefits from consistency, repetition, and immediate feedback, all of which can be efficiently provided by AI chatbots. On the other hand, grammar also involves conceptual understanding, contextual interpretation, and sensitivity to learner confusion, which are areas where human tutors have traditionally demonstrated strength. Human tutors are able to adapt explanations, provide culturally relevant examples, and offer emotional encouragement, aspects of teaching that remain difficult for AI systems to replicate fully.

Given these considerations, a direct comparison between chatbot tutors and human tutors is necessary to better understand their respective roles in EFL learning. This study addresses this need by examining the effectiveness of a chatbot tutor and human tutors in teaching English grammar to undergraduate students at Universitas Serambi Mekkah, Aceh. Using a quasi-experimental design, the study investigates students' grammar improvement through pre-tests and post-tests, as well as their perceptions of engagement, motivation, and autonomy.

By exploring both cognitive and affective dimensions of learning, this study contributes to ongoing discussions about the pedagogical potential and limitations of AI in language education. Rather than framing AI as a replacement for teachers, the study seeks to provide empirical evidence that can inform more balanced and pedagogically sound approaches to integrating AI tools into EFL instruction.

1.1 Literature Review

Artificial Intelligence in Language Education

Artificial intelligence (AI) has become an increasingly prominent component of language education, particularly in higher education contexts where digital learning environments are expanding rapidly. Recent scholarship characterises AI in language learning as encompassing intelligent tutoring systems, automated writing evaluation, speech-recognition tools, and conversational agents designed to support personalised learning (Zawacki-Richter et al., 2019; Dou et al., 2025). These systems are valued for their capacity to analyse learner input, provide immediate feedback, and adapt instructional content to individual needs.

In EFL contexts, AI tools are often positioned as solutions to persistent pedagogical challenges, such as large class sizes, limited instructional time, and uneven learner proficiency levels. Empirical studies suggest that AI-supported environments can enhance learner autonomy and self-regulated learning by allowing students to practise independently and receive feedback without constant teacher mediation (Xiaofei, 2025). However, scholars caution that the pedagogical effectiveness of AI depends not merely on technological sophistication but on how these tools are integrated into instructional design and learning objectives (Zawacki-Richter et al., 2019).

Chatbot Tutors in EFL Grammar Learning

Among AI applications, chatbot tutors have attracted particular attention due to their conversational nature and accessibility. Chatbots are designed to simulate human-like dialogue using natural language processing, enabling learners to ask questions, receive explanations, and practise language forms interactively. Recent studies indicate that chatbot tutors can positively influence EFL learners' engagement, motivation, and willingness to communicate, especially in low-stakes learning environments (Dr. Tanzeela Urooj et al., 2025).

In grammar learning specifically, chatbots have been found effective in supporting form-focused practice through immediate corrective feedback and repeated exposure to grammatical structures (Al Ghaithi & Behforouz, 2023). Learners benefit from the opportunity to experiment with language without fear of negative evaluation, which can reduce anxiety and encourage active participation. Tang and Putra (2025) argued that generative AI chatbots represent a shift from rule-based instruction toward dialogic learning, where learners co-construct understanding through interaction with the system.

Nevertheless, concerns persist regarding the instructional depth of chatbot explanations. While chatbots excel at providing rapid feedback, they may oversimplify grammatical rules or fail to address contextual nuances and exceptions. Such limitations raise questions about whether chatbot-based instruction supports deep grammatical understanding or primarily facilitates surface-level accuracy (Alqahtani & Abumalik, 2025).

Learner Engagement, Autonomy, and Affective Factors

Recent research emphasises that the effectiveness of AI tools in language learning cannot be evaluated solely through test scores; affective and psychological dimensions play a crucial role. Engagement, motivation, and learner autonomy have emerged as central themes in studies of chatbot-assisted language learning (Fauziah et al., 2025; Watcharapol et al., 2025). Chatbots are often perceived as non-judgmental interlocutors, which can lower learners' affective filters and promote a sense of psychological safety (Skjuve et al., 2022).

Studies conducted in Asian EFL contexts report that learners value chatbots for allowing them to control the pace of learning, repeat explanations, and ask questions freely, thereby fostering self-directed learning behaviours (Guan et al., 2025; Tian et al., 2021; Yin et al., 2021). This sense of autonomy is particularly significant in cultures where students may be hesitant to speak up in teacher-fronted classrooms. However, excessive reliance on AI tools has also raised concerns about reduced critical engagement and overdependence, especially when learners accept AI-generated feedback uncritically (Xu & Warschauer, 2023).

Human Tutors in Grammar Instruction

Despite advances in AI, human tutors remain central to EFL instruction due to their emotional intelligence, pedagogical flexibility, and social presence. Human tutors are able to interpret learners' verbal and non-verbal cues, diagnose misunderstandings, and adjust explanations accordingly. In grammar instruction, this adaptive capacity is particularly important for addressing learner-specific difficulties and promoting conceptual understanding (Gurung et al., 2025).

Research consistently demonstrates that human tutors facilitate deeper cognitive processing by encouraging learners to explain their reasoning, justify grammatical choices, and reflect on errors (Asgar, 2025; Fakour & Imani, 2025). Additionally, the affective support provided by human tutors, such as encouragement, empathy, and humour, has been shown to enhance learner confidence and persistence. These interpersonal dimensions of teaching remain difficult for AI systems to replicate fully.

Comparing AI- and Human-Led Instruction

A growing body of comparative research examines the relative effectiveness of AI-led and human-led instruction in language learning. Findings are mixed. Some studies report that AI tutors can produce learning gains comparable to those achieved through human instruction, particularly for structured, form-focused tasks such as grammar drills and vocabulary practice (Farah, 2025; Polyzi & Moussiades, 2023). Other studies

suggest that while AI tools are efficient and engaging, human tutors remain superior in fostering higher-order thinking, contextual and complex understanding, and providing emotional support (Fakour & Imani, 2025; Zawacki & Richter, 2019).

Recent consensus in the literature points toward a complementary model rather than a replacement paradigm. AI chatbots are increasingly viewed as effective supplementary tools that enhance practice opportunities, engagement, and learner autonomy (Guan et al., 2025; Tian et al., 2021; Yin et al., 2021), while human tutors provide conceptual depth, pedagogical judgment, and emotional interaction (Fakour & Imani, 2025; Qian & Arumugan, 2025). This perspective aligns with calls for blended and hybrid approaches that strategically combine technological innovation with human expertise.

2. Research Methods

Research Design

This study employed a quasi-experimental design with two non-randomized groups. Such a design was chosen to accommodate authentic classroom conditions while still allowing systematic comparison between instructional modes.

Participants

The participants were 30 undergraduate students enrolled in the English Department of Universitas Serambi Mekkah. Based on departmental placement data, the students had comparable intermediate-level English proficiency. They were divided into 2 groups, namely Chatbot Group (CG) (15 students) and Human Tutor Group (HG) (15 students). The human-tutor group was supported by four human tutors, all lecturers or senior instructors in the English Department. The tutors collaboratively coordinated the lesson to ensure consistency in content, explanation, and instructional time. Only participants' initials were used to ensure the confidentiality.

Learning Materials and Tools

The instructional focus was on the simple past tense, with emphasis on irregular verb forms. Learning materials included short explanations, example sentences, guided practice, and short sentence-construction tasks.

The chatbot tutor was programmed to explain grammatical rules in simple English, generate multiple examples, correct learner errors and provide brief feedback, and respond to follow-up questions. Meanwhile, the human tutors used the same lesson plan and examples to ensure comparability.

Procedure

The research procedure followed four stages, including Pre-test (A grammar test consisting of multiple-choice items and sentence-completion tasks, Instructional Session (A 45-60 minute session led either by the chatbot or human tutors), Post-test (The same test format as the pre-test with parallel items), and semi-structured interviews to explore learner perceptions.

Data Analysis

Test scores were analysed using descriptive statistics (mean scores and gain scores). Qualitative data from interviews were analysed thematically, following an inductive coding process to identify recurring patterns related to engagement, autonomy, and perceived instructional strengths and limitations.

Translation Validity of Qualitative Data

The qualitative excerpts were originally produced by participants in Indonesian. To ensure translation validity, all excerpts were first retained in their original language and then translated into English by a professional translator and applied linguist. The translations prioritised meaning equivalence rather than literal word-for-word correspondence, aiming to preserve participants' intended meanings, tone, and pragmatic nuance. Where

necessary, translations were refined to maintain clarity for an international academic audience while retaining the authenticity of the original student voice.

3. Result and Discussion

This section presents and discusses the findings of the study, integrating quantitative results from the grammar tests with qualitative insights from learner interviews. The analysis highlights how chatbot-led and human-led instruction contributed differently to learners' grammatical development, engagement, and perceptions.

3.1 Grammar Learning Outcomes

Learners' grammatical development was examined through pre-test and post-test results, complemented by qualitative error analysis. Both the Chatbot Group (CG) and the Human Tutor Group (HG) demonstrated clear improvement in their understanding of the simple past tense, particularly in the use of irregular verbs. Table 1 shows the mean scores of both groups before and after the instructional intervention.

Table 1. Pre-test and Post-test Mean Scores

Group	Pre-test Mean	Post-test Mean	Gain Score
Chatbot Group (CG)	58.4	72.6	14.2
Human Tutor Group (HG)	59.1	75.8	16.7

Both groups achieved comparable learning gains. The Chatbot Group improved by 14.2 points, indicating that AI-assisted instruction was effective in reinforcing grammatical rules and supporting accuracy development. The Human Tutor Group showed a slightly higher gain of 16.7 points, suggesting that human-led instruction may provide additional support for deeper grammatical processing.

A closer analysis of students' written production revealed qualitative differences between the two groups. Learners in the Human Tutor Group were more successful in producing complete and contextually appropriate sentences, especially in tasks requiring sentence construction rather than recognition. This suggests that while chatbot-based learning effectively supported form-focused practice, human tutors were more effective in facilitating conceptual understanding and syntactic control.

To further illustrate learners' grammatical development, an error analysis was conducted on pre-test and post-test responses. Table 2 presents representative examples of authentic learner errors.

Table 2. Examples of Learner Errors in Simple Past Tense

No.	Student Sentence (Erroneous)	Corrected Sentence	Error Type
1	Yesterday I go to campus.	Yesterday I went to campus.	Irregular verb misuse
2	She didn't went to class last week.	She didn't go to class last week.	Overgeneralisation
3	We was study grammar last meeting.	We studied grammar last meeting.	Verb form confusion
4	He buy a new book yesterday.	He bought a new book yesterday.	Irregular verb misuse
5	They were went to the library.	They went to the library.	Redundant auxiliary
6	I didn't understood the lesson.	I didn't understand the lesson.	Double marking

These patterns indicate that learners initially relied on base verb forms, overgeneralised tense markers, and incorrectly combined auxiliaries with past forms—features commonly reported in Indonesian EFL interlanguage development. Post-test analysis showed a noticeable reduction in errors across both groups. However, learners in the Human Tutor Group demonstrated greater improvement in avoiding double marking and redundant auxiliary usage, indicating stronger grammatical awareness. In contrast, learners in the Chatbot Group showed faster improvement in surface-level accuracy, particularly in irregular verb selection, likely due to immediate corrective feedback.

These findings suggest that chatbot instruction is highly effective for reinforcing accuracy and promoting noticing, whereas human tutors contribute more strongly to deeper structural understanding.

3.2 Learner Engagement, Motivation, and Perceptions

Interview data revealed that affective and experiential dimensions played an important role in learners' perceptions of both instructional modes. Students in the Chatbot Group frequently described the learning experience as enjoyable, interactive, and psychologically safe. Many participants emphasised that they felt less anxious when interacting with a chatbot:

"Enaknya sama Chatbot, kita engga takut salah jawab. Bisa ulang lagi tanpa takut salah atau ditegur." (A)
["The good thing about chatbots is that I'm not afraid of making mistakes. I can try again immediately without feeling judged."]

"Dengan chatbot, saya engga takut ketinggalan penjelasan soalnya bisa tanya kapan aja tanpa segan." (RS)
["With chatbots, I'm not worried about missing explanations because I can ask anytime without hesitation."]

These responses indicate that chatbot interaction reduced anxiety and encouraged experimentation, supporting previous findings that AI-based tools can foster low-pressure learning environments.

In contrast, learners in the Human Tutor Group highlighted the pedagogical and interpersonal strengths of human instructors. One prominent theme was adaptive explanation. Students valued the tutors' ability to detect confusion and rephrase explanations using alternative examples:

"Kalau masih belum ngerti, dosennya langsung kasih contoh lain yang lebih sederhana." (GT)
["If I was still confused, the lecturer immediately provided another, simpler example."]

Another recurring theme concerned dialogic interaction. Learners appreciated the opportunity to engage in discussion and ask follow-up questions:

"Kalau sama dosen, kita bisa langsung tanya kenapa jawabannya gitu sampe betul-betul paham." (MF)
["With lecturers, we can directly ask why the answer is like that until we really understand."]

Students also reported higher levels of focus in teacher-led sessions:

"Kalau dengan dosen, saya lebih fokus karena harus benar-benar memperhatikan." (NB)
["With lecturers, I am more focused because I really have to pay attention."]

Emotional support emerged as another key advantage of human tutors. Learners perceived their tutors as empathetic and patient, which helped reduce anxiety and increase confidence. Additionally, students noted that tutors frequently contextualised grammar explanations using everyday examples, making learning more meaningful and memorable.

Taken together, these findings suggest that chatbot instruction excels in promoting autonomy and lowering anxiety, whereas human tutors provide richer pedagogical scaffolding, emotional support, and opportunities for reflective learning.

3.3 Affordances and Limitations of Chatbot and Human Tutors

Despite generally positive perceptions, learners also identified limitations in both instructional modes. Several students in the Chatbot Group reported that chatbot explanations were sometimes too complex or insufficient when dealing with deeper grammatical confusion:

"Jawabannya perfect, tapi kadang saya masih bingung. Bahasanya pun enggak sederhana." (TWF)
["The answers are perfect, but sometimes I am still confused. The language is also not simple."]

This suggests that while chatbots are effective for surface-level correction, they may struggle to diagnose deeper conceptual misunderstandings, especially for learners with weaker foundations.

Conversely, students in the Human Tutor Group identified limited time and accessibility as key constraints:

"Sama dosen enggak bisa konsultasi 24 jam." (FA)
["You can't consult with lecturers 24 hours a day."]

"Waktunya terbatas, jadi enggak bisa bahas semuanya." (AA)
["The time is limited, so not everything can be discussed."]

These findings indicate that both instructional modes possess distinct affordances and constraints shaped by pedagogical and institutional contexts.

3.4 Pedagogical Implications

Overall, the findings suggest that chatbot-led and human-led instruction should not be viewed as competing approaches but as complementary pedagogical tools. Chatbots are particularly effective for autonomous practice, immediate feedback, and anxiety reduction, which supports learners' willingness to engage with grammar. Human tutors, on the other hand, remain essential for facilitating deeper conceptual understanding, responding flexibly to learner needs, and providing emotional and interpersonal support.

A blended instructional model that strategically integrates chatbot-based practice with teacher-guided explanation therefore appears to offer the most pedagogically sound approach, especially in higher education EFL contexts where instructional time and individual feedback are often limited.

4. Conclusions

This study indicates that both chatbot-led and human-led instruction effectively support EFL learners' grammar development. Chatbots promote engagement, reduce anxiety, and encourage autonomous practice, while human tutors contribute to deeper understanding through adaptive explanation and emotional support. These findings suggest that AI tools are best positioned as complementary to, rather than replacements for, human teachers.

This study is limited by its small sample size, short duration, and focus on a single grammatical feature. Future research should involve larger samples, longer interventions, and explore broader language skills, as well as investigate blended instructional models that integrate chatbot and human tutoring.

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