REGISTER JOURNAL – Vol 17, No 02 (2024), pp. 352-382
DOI: http://dx.doi.org/10.18326/rgt.v17i2.352-382
p-ISSN: 1979-8903; e-ISSN: 2503-040X

Students' Perceptions of the Impact of AI Chatbots on Vocabulary and Grammar in EFL Writing

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DOI: 10.18326/rgt.v17i2.352-382

Submission Track:
Received: 30-07-2024
Final Revision: 01-10-2024
Available Online: 22-10-2024

ABSTRACT
The rapid integration of AI technologies in education necessitates a deeper understanding of their potential effects on language acquisition and proficiency, particularly in writing, a critical skill for English as a Foreign Language (EFL) learners. This study aimed to investigate the types of Artificial Intelligence (AI) chatbots used by students and examine their perceptions of the impact of these tools on vocabulary and grammar in EFL writing. Using a mixed-methods approach, this study involved 100 undergraduate EFL students from five universities in Indonesia, highlighting the various AI

chatbots they employed in their digital activities. Data collection comprised questionnaires, interviews, and observation sheets, analyzed through quantitative descriptive statistics and qualitative thematic analysis. ChatGPT, Gemini, Perplexity, Bing Chat, Ernie, Character AI, Discord Bot, Wren, and Ginger emerged as the most widely used chatbots, with motivation such as usefulness, task simplification, skill and knowledge enhancement, and ease of use. The findings revealed that a significant majority of students reported substantial improvements in their vocabulary range, syntactic variety, and overall writing quality through the use of AI chatbots. Furthermore, students consistently noted a major positive impact of AI chatbots on their language proficiency, particularly in vocabulary and grammar as applied in writing. The results suggest that incorporating AI chatbots can be advantageous for improving EFL students' writing skills. The study also addressed its shortcomings and offered recommendations for future research.

Keywords: AI chatbots, ChatGPT, EFL students, Writing.

INTRODUCTION

The integration of technology in education has increasingly become indispensable. In the context of EFL learning, technology significantly boosts students' confidence by providing opportunities for more interactive and independent engagement with English (Rintaningrum, 2023). It fosters a more efficient learning environment through a variety of resources and tools that enhance the learning process (Istiara & Hastomo, 2023). Educators can leverage technology to develop innovative teaching strategies and methods tailored to the diverse needs and abilities of students, including the use of language applications, online learning platforms, and digital communication tools (Donath et al., 2020). The application of technology in EFL education has been shown to improve students' comprehension of the subject matter. Several studies indicate that students better understand learning content when supported by technological tools (Hol & Aydın, 2020; Zhang & Zhang, 2024).

The extensive use of technology, particularly the integration of AI chatbots, represents a significant innovation in EFL education. AI chatbots, derived from the terms "chat," which refers to

conversational capabilities, and "bot," short for "robot," which denotes an automated program, have revolutionized the incorporation of technology in language learning (Lalwani et al., 2018). These chatbots offer personalized and adaptive learning experiences tailored to individual students' needs (Rane et al., 2023). Many students use AI chatbots such as ChatGPT, Gemini, and Perplexity to enhance their writing skills (Handley, 2024). ChatGPT, one of the most popular AI chatbots, provides various features beneficial to English learners, including explanations of grammar rules, interactive conversation practice, and clarification of vocabulary and phrases (Nugroho et al., 2023). Additionally, educators can employ AI chatbots such as Gemini to facilitate brainstorming for writing (Jinowat et al., 2024), Perplexity to assist in synthesizing literature (Utami et al., 2024), and TalkPal to offer suggestions for improving speaking skills (Hidayatullah, 2024). The integration of AI chatbots enables both students and teachers to enhance learning efficiency, deepen content comprehension, and create more engaging and interactive educational experience

AI chatbots are increasingly being integrated into various sectors, with education being one of the most prominent areas of adoption. These technological advancements have created opportunities for innovation and scalability, benefiting a diverse global student population (Hasbi et al., 2024; Lin et al., 2023). By accommodating individual thinking speeds and unique learning preferences, AI chatbots are able to tailor the educational experience to the specific needs of each student. Numerous studies have examined the implementation of AI chatbots and observed how they have transformed classroom teaching methodologies. This transformation includes the use of AI chatbots to assist educators with administrative tasks and provide direct, personalized feedback to students. For example, EFL students have used ChatGPT, Bing Chat, Bard, Ernie, Gemini, and Perplexity as digital tools for language practice (Rudolph et al., 2023). However, despite these advancements, educators have expressed mixed

opinions about the potential of AI chatbots to reshape existing educational paradigms and practices (Rasul et al., 2023).

The implementation of AI chatbots in English Language Teaching (ELT) has garnered mixed responses. While some students find AI chatbots engaging, others perceive them as less effective than human interaction. The absence of emotional intelligence and personalized feedback in chatbot interactions often results in students feeling disconnected, which can diminish the perceived reliability of chatbots as educational tools (Morales-Chan et al., 2024). Limited interaction and lack of human elements may cause students to view chatbots as unreliable tools for learning (Yang et al., 2022). Furthermore, the effectiveness of chatbots in improving English language learning outcomes remains a subject of debate. Some studies have reported positive impacts of AI chatbots on English language proficiency (Liu & Ma, 2024), while others indicate only slight increases in student engagement and motivation (Rudolph et al., 2023). Conversely, certain studies suggest that over-reliance on AI chatbots may hinder the development of critical thinking and creativity, as students may become accustomed to automated feedback rather than cultivating their own problem-solving skills (Hsu et al., 2023). In addition, the integration of AI chatbots into ELT presents technical challenges. These include ensuring smooth interaction, maintaining coherent dialogues, and aligning chatbot responses with curriculum goals. Technical issues such as misinterpretation of language input, lack of contextual understanding, and inconsistent feedback can frustrate learners and hinder their progress (Mageira et al., 2022). Addressing these challenges requires continuous technological advancements and thoughtful implementation strategies. Therefore, while the integration of AI chatbots in EFL has potential benefits, it is crucial to consider their limitations and possible negative impacts to maximize their effectiveness in the learning process.

Research in a global context highlights the growing integration of AI chatbots into various aspects of ELT. For example, a study conducted in Iraq found that AI chatbots enhance personalized learning and real-time practice by offering immediate

feedback and customized lessons, which significantly improve student engagement and proficiency (Amin, 2023). Similarly, in Benin, AI-based chatbots have ensured educational continuity and fostered collaborative EFL learning environments (Toboula, 2023). However, the effective integration of AI is largely dependent on teachers' technological pedagogical content knowledge (TPACK). In Indonesia, EFL teachers with high TPACK have successfully incorporated AI chatbots into their instruction (Hastomo et al., 2024). In Korea, students reported improvements in English proficiency, motivation, and interest in learning, alongside reduced anxiety, though challenges with chatbot speed, complexity, and response limitations were noted (Daeun, 2021). Likewise, Indonesian students found ChatGPT useful for enhancing language competency and personalized learning but expressed concerns over language accuracy and the potential over-reliance on technology (Slamet, 2024). In Taiwan, students using AI chatbots for grammar learning reported improved understanding of grammatical tenses and significantly better learning outcomes compared to traditional methods, while also experiencing reduced anxiety related to learning English (Chen & Lin, 2023). Meanwhile, Turkey students perceived little difference between AI and human feedback on writing, although analysis revealed variations in style, content, and accuracy, prompting the need for caution when relying on chatbots for evaluation (Toscu, 2024). These findings suggest that refining AI chatbot implementation strategies can maximize their potential in language education, offering significant benefits to both educators and learners globally.

Recent studies on the adoption of AI chatbots among EFL teachers in Indonesia highlight significant benefits for students' English proficiency. AI tools such as ChatGPT enhance the content and organization of student writing by offering suggestions and corrections (Marzuki et al., 2023). Many Indonesian language teachers also recognize the potential of ChatGPT to enhance both oral and written skills. However, concerns persist about academic dishonesty and the need to balance AI integration with traditional

teaching methods (Widianingtyas et al., 2023). Moreover, chatbots help address the limited interaction often found in traditional classrooms by offering continuous, interactive language practice (Wahyuni, 2022). Integrating chatbots into social media platforms like Facebook has also proven effective for English learning, making the process more accessible and engaging (Sarosa et al., 2020). However, poorly implemented chatbots can demotivate students, underscoring the importance of thoughtful design and a user-friendly interface (Sumakul & Hamied, 2023). Overall, previous studies confirm that integrating AI can significantly enhance students' English language skills when effectively implemented.

Despite the growing interest in the use of AI chatbots among EFL teachers, limited research exists on students' perceptions of the impact of AI chatbots on their vocabulary and grammar in EFL writing. There is a pressing need to explore how EFL students use AI chatbots to enhance their English writing skills, particularly in the Indonesian context. While previous studies have examined the effects of AI chatbots on students' overall English proficiency, there is a lack of literature specifically addressing students' perceptions of their impact on the quality of writing, especially concerning vocabulary and grammar. To address this gap, the current study was designed to provide more in-depth insights into students' perceptions of the usefulness of AI chatbots in EFL classrooms. By addressing this knowledge gap, the study aims to contribute valuable findings through a carefully developed research framework. The primary objective of this study is to investigate the types of AI chatbots students use and their perceptions of the impact these tools have on writing skills, with a particular focus on vocabulary and grammar. To achieve this goal, following research questions were formulated:

1. What types of AI chatbots are commonly used by students to enhance their writing skills, particularly in terms of vocabulary and grammar?
2. How do students perceive the impact of AI chatbots on their writing skills, particularly in terms of vocabulary and grammar?

RESEARCH METHOD

This study employed a mixed-method research approach, integrating the collection, analysis, and integration of both quantitative and qualitative data to gain a comprehensive understanding of the research problem (Creswell & Poth, 2017). Various data collection methods were employed, including questionnaires, interviews, and observation sheets, with the researcher serving as a key instrument in the process. This approach aligns with the rationale for adopting a case study design, aimed at exploring the use of various AI chatbots and investigating their impacts on students' writing, with particular focus on vocabulary and grammar.

This research involved 100 Indonesian undergraduate students from five universities in Indonesia. Participants were selected using a combination of purposive and convenience sampling methods to ensure a varied sample, gathered through questionnaires. The selection criteria was based on the students' willingness to participate and prior experience with AI chatbots, rather than institutional accreditation, to avoid potential bias and ensure that student proficiency was not conflated with their university's ranking. Since this study focuses on students' perceptions, random sampling was not prioritized, as the goal was not to establish empirical causality but rather to explore subjective viewpoints. In the quantitative phase, purposive sampling was first employed to identify students who met specific criteria: undergraduate EFL students with prior experience using AI chatbots to enhance their writing skills, particularly in the areas of vocabulary and grammar. These students, with varying levels of experience using AI chatbots, were recruited through surveys distributed via campus bulletin boards, social media, and email invitations. From those who met the criteria, convenience sampling was then applied to select students who were readily available and willing to participate. Data for this phase was collected using questionnaires. For the qualitative phase, 20 participants were purposefully selected from the initial group based on their diverse

experiences with AI chatbots and their willingness to provide more in-depth insights through interviews and observations. Informed written consent was obtained after participants were briefed on the study's aims, procedures, risks, and benefits. Participation was voluntary, and participants were free to withdraw from the study at any time without consequences. The participants' demographic information is presented in Table 1.

To empirically validate the impacts of AI chatbot use on writing, students' baseline writing proficiency was assessed prior to their interaction with AI chatbots. This pre-test data was compared with post-test writing samples following their use of the AI tools, providing a clear measurement of any improvements. As a result, claims regarding the impact on writing quality – particularly in areas such as vocabulary and grammar - are grounded in empirical evidence, demonstrating changes in performance relative to baseline writing output. The study specifically focuses on academic writing proficiency, with an emphasis on formal writing skills. The grammar component includes aspects such as sentence structure, verb tense usage, and punctuation. This targeted approach enables a more in-depth investigation into how AI chatbots can facilitate improvements in these specific areas of writing and grammar.

Table 1. Participants' Demographic Information

Number	Gender	Range of Age
65	Female	19-21
35	Male	19-21

This study utilized questionnaires, interviews, and observation sheets for data collection. The questionnaire consisted of 20 items, divided into five sections: demographic information, knowledge and use of AI chatbots, frequency and perceived ease of use, reasons for using AI chatbots, and opinions on their user-friendliness. Each section was designed to elicit specific information, such as students' familiarity with AI chatbots (5 items), usage frequency (4 items), and perceived benefits (6 items). The

questionnaire was adapted from previous research (Deiniatur & Cahyono, 2024; Labadze et al., 2023; Mageira et al., 2022; Marzuki et al., 2023). The questionnaire began with a brief introduction and a consent form, followed by demographic questions covering age, gender, knowledge and use of AI chatbots. Additional open-ended questions were included to capture more in-depth perspectives. To evaluate the effectiveness of the questionnaire, a pilot test was conducted with 20 undergraduate students from a private university in Lampung, ensuring the items could be completed efficiently. The closed-ended items were measured using a five-point Likert Scale, ranging from 'Strongly Disagree' to 'Strongly Agree,', while open-ended questions gathered more nuanced views. The reliability of the questionnaire was confirmed with a Cronbach's Alpha of 0.916, indicating high internal consistency. Face validity was achieved by consulting with experts in the English language field, who provided feedback to refine the instruments and align them with the study's objectives. The questions were administered in the participants' native language to ensure clarity and accuracy in responses. To maintain confidentiality, pseudonyms (e.g., S1, S2) were used, and ethical guidelines were strictly followed. Additionally, Participants were asked to provide their WhatsApp numbers for potential follow-up if they expressed interest in further participation in the research.

Semi-structured interviews and observations were conducted to collect qualitative data. For the qualitative phase, 20 participants were purposefully selected from the initial 100 to represent a diverse range of experiences and perspectives related to the use of AI chatbots. The interview questions were adapted from previous research, with modifications to ensure relevance to the current study (Deiniatur & Cahyono, 2024; Labadze et al., 2023; Mageira et al., 2022; Marzuki et al., 2023). Each interview lasted approximately 10 minutes and was designed to create a relaxed and non-intimidating atmosphere. The researchers requested participants' consent to record the interview sessions for accuracy and thorough analysis. In addition to the interviews, participants'

interactions with AI chatbots were observed in real time. These observations aimed to capture the actual impact of AI chatbot use on students' writing quality, providing valuable insights into how these tools influence their writing processes.

The data analysis in this study employed a comprehensive approach, integrating both quantitative and qualitative data. Descriptive analysis was used to examine the quantitative data from the questionnaires, while thematic analysis was applied to the interview transcripts and observation notes. Thematic analysis was conducted manually through a systematic coding process to identify recurring themes and patterns. To ensure reliability and validity, multiple researchers independently coded the data and compared their findings to reach a consensus. Any discrepancies were discussed and resolved to refine the coding framework. Additionally, member checking was employed, wherein the identified themes were shared with a few participants to validate the accuracy of the interpretations. The descriptive analysis presented findings related to participants' knowledge and use of AI chatbots, the types of chatbots used, frequency of use, reasons for utilizing chatbots, and students' opinions on ease of use. In contrast, the thematic analysis aimed to uncover recurring themes and patterns from the interview responses. Observations provided additional context, helping to validate the qualitative findings from the interviews, and offering a deeper understanding of students' real-time interactions with AI chatbots.

RESULTS & DISCUSSION

Types of AI Chatbots Utilized by Students

To address the first research question, the researcher presented findings from the questionnaire, which included several key components. These sections covered students' knowledge and use of AI chatbots, the specific types of chatbots they employed, their frequency of use, reasons for using AI chatbots, and their opinions on ease of use. Before examining the types of AI chatbots utilized by students, the study first assessed the participants'

overall knowledge of AI chatbots in relation to their writing abilities. This preliminary analysis helped establish a baseline for understanding how familiar students were with AI technologies and their integration into language learning. Figure 1 provides a visual representation of students' knowledge and use of AI chatbots in improving their writing abilities, particularly in terms of vocabulary and grammar.

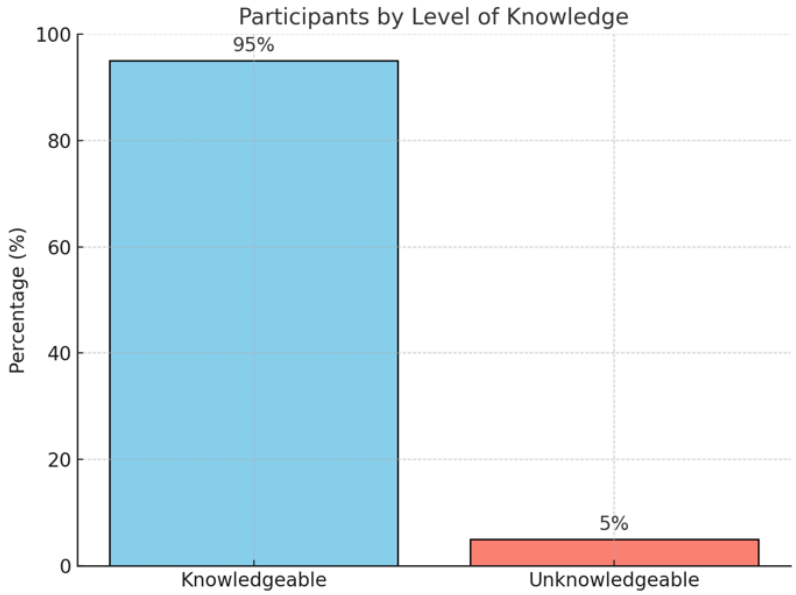

Figure 1. Knowledge of AI chatbots

The percentage distribution of participants' understanding of AI chatbots is illustrated in Figure 1, showing that the majority of participants had some level of familiarity with chatbots. Specifically, Figure 1 reveals that while most participants (95%) had at least a basic understanding of AI chatbots, a small portion (5%) were entirely unfamiliar with them. This finding aligns with previous research, which also found that most participants reported having some familiarity with chatbots due to their perceived ease of use

(Lancu & Lancu, 2023). This familiarity can be attributed to the intuitive interfaces and user-friendly design of many modern chatbots, which facilitate seamless interaction and minimize the learning curve for new users.

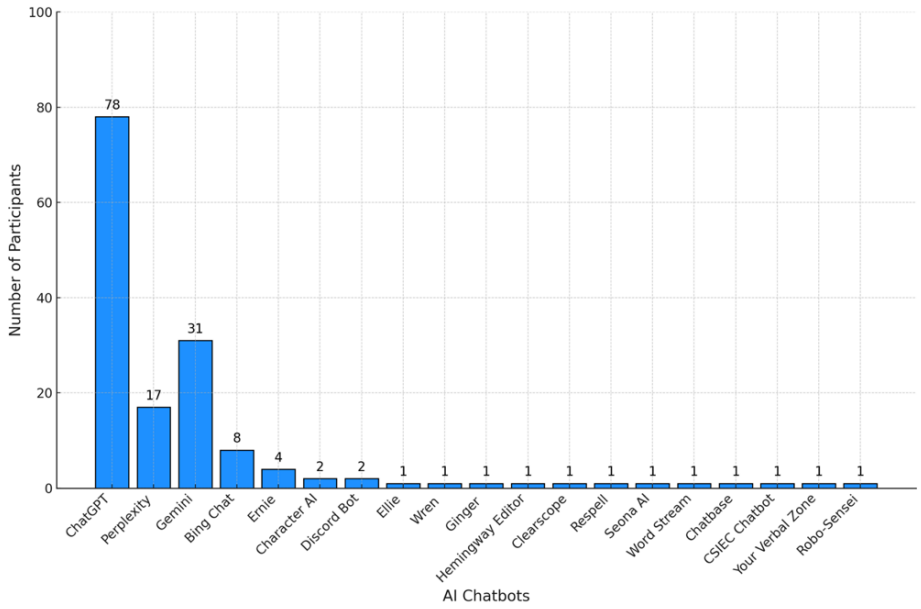

Figure 2. Types of AI Chatbots Utilized

Figure 2 illustrates the distribution of participants who used various AI chatbots. ChatGPT was the most widely utilized, with 78 participants, followed by Gemini with 31 participants, Perplexity with 17 participants, Bing Chat with 8 participants, and Ernie with 4 participants. These findings align with prior research, with suggests that ChatGPT is the most popular AI chatbot, as it assists users in identifying and correcting surface-level writing errors, providing immediate feedback, and enhances grammatical and syntactical accuracy (Algaraady & Mahyoob, 2023). Other AI chatbots, including Character AI, Discord Bot, Wren, and Ginger, were among the least frequently used. Overall, Figure 2 indicates that participants employed a diverse range of AI chatbots,

suggesting that these tools are becoming increasingly integrated into the everyday tasks of EFL students.

Table 2. Frequency of Use

AI Chatbot	Never	Rarely	Sometimes	Often	Always
ChatGPT	5	8	5	10	72
Gemini	15	20	19	20	26
Perplexity	10	12	10	30	38
Bing Chat	15	30	25	20	5
Ernie	20	25	25	20	3
Character AI	25	20	20	20	2
Discord Bot	20	25	35	20	0
Wren	25	22	28	25	0
Ginger	20	25	30	25	0

Table 2 results reveal that participants consistently used only three chatbots—ChatGPT, Perplexity, and Gemini—at the 'always' level. This indicates that these three chatbots are the most frequently utilized among all AI chatbots and are the most familiar to the participants. Previous research supports this observation, noting that EFL students use ChatGPT for brainstorming ideas and correcting grammar (Han et al., 2023), employ Perplexity to access information from up-to-date internet sources, including academic databases and news outlets (Safitri & Fithriani, 2024), and leverage Gemini to practice new vocabulary and grammatical structures in a supportive and safe environment (Jinowat et al., 2024).

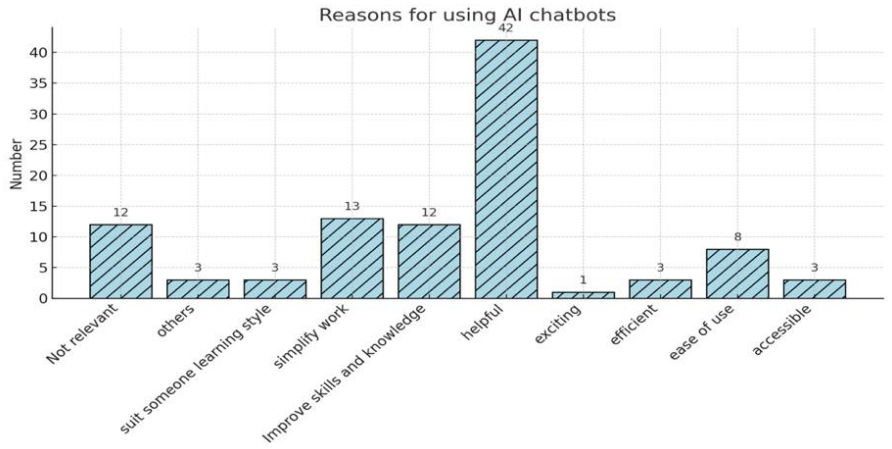

Figure 3. Reasons for Using AI Chatbots

The analysis reveals that the primary reason for using AI chatbots is their perceived helpfulness, with 42 respondents identifying this as a key factor, making it the most prominent feature in the data. AI chatbots offer essential tools and resources that assist students in enhancing their writing. Additionally, “simplify work” and “improve skills and knowledge” were also significant motivations for their use. This suggests that AI chatbots not only enhance students' writing abilities but also streamline their writing tasks. Moreover, AI chatbots contribute to self-development by fostering the gradual enhancement of users' skills. “Ease of use” was another highly rated reason, indicating that these tools are user-friendly and require minimal effort to operate. These findings align with previous research by Fyfe (2023), which suggests that when users perceive an application as beneficial or effective in task completion, they are more inclined to adopt it. Consequently, this data indicates that users favor AI chatbots for their ability to increase convenience, knowledge, and efficiency in accomplishing tasks.

Although these reasons were less prevalent than the previously mentioned ones, some respondents noted the accessibility and efficiency of AI chatbots as key factors. Three respondents highlighted that AI chatbots were readily available, easy to use, and helped reduce the time and effort required to

complete writing tasks. Additionally, a few respondents found AI chatbots "exciting" or believed they aligned with their learning style. Only a small number of participants, four in total, reported that AI chatbots made them feel enthusiastic or curious. AI chatbots also cater to various learning preferences by offering diverse functionalities. However, 12 participants described them as "not relevant." Some chose to leave the question unanswered, while others provided irrelevant responses. This suggests that certain respondents may view the topic as unimportant or uninteresting. The presence of such perceptions highlights potential challenges regarding the adoption of

The findings indicate a clear preference for AI chatbots being perceived as beneficial in completing various tasks, with factors such as enthusiasm or compatibility with students' learning styles playing a comparatively minor role. These results are consistent with previous research by Hastomo et al. (2024), which suggests that integrating AI chatbots into education enhances the quality of student learning and fosters interactive communication in the target language among EFL students.

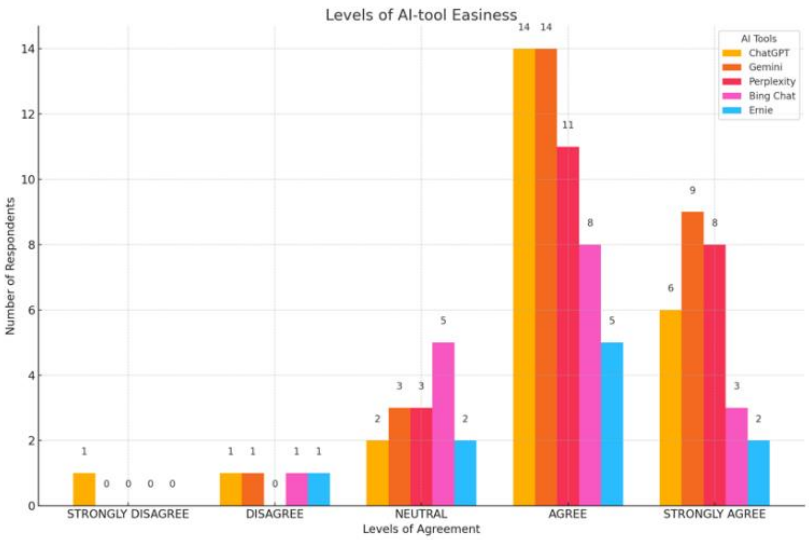

Figure 4. Levels of AI chatbots ease

According to Figure 4, many students agree or strongly agree that AI chatbots are easy to access and help improve their writing quality. ChatGPT, accessible via ChatGPT.com, is well-known for its conversational AI interface developed by OpenAI. Respondents likely favored ChatGPT over other AI chatbots for several reasons. First, its high familiarity, often introduced during writing classes, played a significant role, as reflected in the respondents' knowledge of AI chatbot. Second, ChatGPT's user-friendly interface, with intuitive features and quick responses, makes it preferable for grammar correction and writing assistance compared to other AI chatbots. Third, ChatGPT offers comprehensive feedback on grammar and writing mechanics, often surpassing the support offered by teachers or lecturers. This ease of use makes ChatGPT more appealing than alternatives like Gemini, Perplexity, Bing Chat, and Ernie. Although Gemini can be used for similar purposes, it lacks the same level of popularity and user-friendliness as ChatGPT due to its more limited features. Perplexity (https://www.perplexity.ai/) focuses on providing current literature sources when students are developing writing assignments, while Bing Chat assists with grammar and vocabulary suggestions. The collected data indicates that ChatGPT stands out for its comprehensive and user-friendly features, making it the top choice among respondents. Its ability to deliver detailed and useful feedback aligns with student needs, contributing to its popularity over other AI chatbot tools. These findings are consistent with prior research, which shows that students prefer ChatGPT for its effectiveness as a language learning tool that enhances writing skills (Liu & Ma, 2024). This encourages students to engage creatively and productively with the chatbot both inside and outside the classroom.

Students' Perspectives on the Impact of AI Chatbots

The researchers examined interview findings to explore students' views on the impact of AI chatbots on writing quality, specifically in relation to vocabulary and grammar. Three key sub-themes emerged regarding vocabulary: vocabulary enhancement,

contextual vocabulary learning, and maintaining a consistent voice. These sub-themes highlight the significant role AI chatbots play in improving students' vocabulary use in writing.

In terms of vocabulary, one student noted that a key impact of using AI chatbots on the quality of their writing was an increase in their English vocabulary. This reflects the primary influence of chatbot use on students' vocabulary development. S1, a female participant, provided a statement that supports this conclusion:

> *"Since using AI chatbots, I have become acquainted with much new vocabulary. As a result, I now use vocabulary and synonyms that I wouldn't normally use. This has made my writing more polished and sophisticated."*

Interview findings from S1 revealed that students often receive feedback from AI chatbots in the form of unfamiliar synonyms. This feedback enables students to express their ideas more accurately and engagingly while expanding their lexical repertoire. In the current study, student writing practices were assessed through credible evaluations conducted by trained human raters to ensure objectivity and mitigate bias. This process involved reviewing and rating writing samples based on criteria such as accuracy, clarity, and vocabulary use, thereby supporting claims of improvement in writing skills with objective, unbiased feedback. From a theoretical perspective, this aligns with Vygotsky's Sociocultural Theory, which highlights the importance of social interaction and scaffolding in language learning (Marginson & Dang, 2017). AI chatbots function as a form of digital scaffolding, offering immediate feedback and supporting learners' development within their Zone of Proximal Development (ZPD). Consequently, the study's findings demonstrate that AI chatbots significantly enhance vocabulary acquisition by providing a language learning experience distinct from traditional methods. This is corroborated by previous research, which indicates that students using AI chatbots find it easier to learn new vocabulary, thereby improving their language skills (Hasbi et al., 2024). Additionally, the use of AI chatbots

positively influences students' interest and motivation in learning, further contributing to vocabulary improvement (Marzuki et al., 2023). However, despite these positive outcomes, some studies have noted limitations in the effectiveness of AI chatbots for vocabulary enhancement. While chatbots can increase student engagement in English learning, the efficacy of vocabulary improvement is constrained by the design and performance of chatbot tasks (Yang et al., 2022).

Students are able to apply vocabulary contextually after using AI chatbots in English language learning, a finding that emerged from the researchers' thematic analysis. S2, a male participant, supported this observation within the following excerpt:

> *"One of the new things I have gained since using AI chatbots is the ability to know vocabulary that fits specific contexts. As a result, I no longer use vocabulary that is inappropriate for the theme or topic of writing."*

According to the interview findings, S2 noted that learning contextual vocabulary is a significant impact of using AI chatbots in this study. AI chatbots offer numerous opportunities for learners to discover and apply new vocabulary in relevant contextual situations. This observation aligns with the Contextual Learning Theory, which emphasizes the importance of learning in context to enhance retention and comprehension. When learners engage with vocabulary in meaningful and relevant situations facilitated by AI chatbots, they are more likely to internalize and effectively utilize new language forms (Brown et al., 1989). Consequently, this can significantly enhance their mastery of vocabulary (Young & Shishido, 2023). Conversely, findings from previous study contradicts this view, indicating that complex design and performance issues within AI chatbots can hinder students' effectiveness in learning contextual vocabulary. Such shortcomings may result in a less practical learning experience. Additionally, the capability of AI chatbots to cover multiple domains and provide diverse sentence structures remains limited, potentially impacting their effectiveness in contextually teaching vocabulary (Tu, 2020).

Furthermore, the researchers identified a third impact on vocabulary through thematic analysis, maintaining consistency in voice and vocabulary. This finding was supported by S3, a female participant, who stated:

> *"ChatGPT really helps me maintain a consistent voice in my vocabulary. It's made a noticeable difference in the quality of our writing."*

Based on the interview findings, S3 indicated that ChatGPT, as one of the AI chatbots, assisted her in maintaining consistency in vocabulary and tone. Previous research suggests that ChatGPT can provide responses tailored to individual student interaction and writing styles (Taecharungroj, 2023). This observation aligns with the Theory of Adaptive Learning, which posits that learning tools should adapt to the unique needs and styles of individual learners to maximize effectiveness (Johnson & Valente, 2011). By offering personalized feedback and suggestions that resonate with a student's distinct writing style, AI chatbots like ChatGPT create a customized learning environment that promotes consistency in language use and expression. This personalization enables the AI chatbot to emulate the student's unique voice and vocabulary, ensuring a consistent tone throughout different sections of their writing. Similar findings were reported in another study (Young & Shishido, 2023), which noted that the chatbot can provide suggestions for academic essays, casual blog posts, and professional emails. This versatility ensures that the writing remains authentic and recognizable in various contexts.

Following the evaluation of the impacts on vocabulary, this study also examines students' perspectives on how AI chatbots influence their writing quality, particularly regarding grammar. The analysis of syntactical aspects revealed three major sub-themes: improved grammatical accuracy, reduced repetition, and enhanced clarity and coherence.

Improved grammatical accuracy is the first major theme identified in the analysis of grammar. This finding emerged from the

thematic analysis conducted by the researchers. S4, a female participant, supported this argument with the following quote:

> *"Gemini, as one of Al chatbots, is really good at catching grammar mistakes that I might miss. This chatbot has helped me improve the accuracy of my writing significantly."*

S4 noted that she received valuable feedback from Gemini, which assisted her in correcting grammatical errors and enhancing the accuracy of her writing. Research indicates that AI chatbots like Gemini employ advanced natural language processing algorithms to accurately detect grammatical errors (Ono & Morita, 2024). Studies have demonstrated that the consistent use of such chatbots can lead to significant improvements in writing accuracy and language proficiency (Shikun et al., 2024). Additionally, users report increased confidence in their writing abilities due to the immediate feedback these chatbots provide (Kim et al., 2021). However, while Gemini is designed to identify grammar mistakes, its effectiveness may be overstated. Some studies suggest that AI chatbots can overlook context-specific errors and may not always deliver accurate corrections (Han et al., 2023). Moreover, students may develop an overreliance on technology, impairing their ability to independently correct their writing outcomes (Gozali et al., 2023; Okta et al., 2023). This overreliance is explained by Cognitive Offloading Theory, which posits that dependence on external tools for cognitive tasks can diminish the need for internal processing and skill development (Risko & Gilbert, 2016). Therefore, although Gemini has the potential to assist students in checking grammatical accuracy, its limitations underscore the importance of continuing to refine editing skills independently.

Students tend to minimize unnecessary repetition in their English writing after using AI chatbots, a finding that emerged from the thematic analysis conducted by the researchers. S5, a male participant, supported this conclusion with the following statement:

> *"One of my weaknesses in writing was constantly making unnecessary repetitions. Since using ChatGPT and Gemini, I*

have rarely done this. The feedback provided has made my writing better."

Based on the interview findings, AI chatbots such as ChatGPT and Gemini have significantly contributed to reducing repetition in writing and enhancing overall writing quality. In this current study, the researchers verified the reduction of repetition by conducting credible assessments of students' writing samples before and after using the AI chatbots. Human raters evaluated these samples for repetition, clarity, and quality, employing specific criteria to ensure objectivity. These chatbots provide diverse and innovative suggestions for restructuring sentences, which assist students in minimizing repetitive language and enhancing their text (Hawanti & Zubaydulloevna, 2023). This aligns with findings from other studies that indicate ChatGPT can enhance writing efficiency and quality by suggesting a variety of expressions and structures (Noy & Zhang, 2023). Additionally, educators have noted that AI chatbots positively influence students' writing by enhancing content and organization through a range of lexical choices (Marzuki et al., 2023). However, while AI chatbots offer potential benefits in writing, their impact on reducing repetition and improving writing quality may be overstated. Previous research indicates that AI chatbots sometimes lack an understanding of the unique context and style of human writers (Martono et al., 2023). This limitation is elucidated by Situated Cognition Theory, which posits that knowledge is constructed within and linked to the context in which it is learned (Brown et al., 1989). Due to their lack of human-like contextual awareness, AI chatbots may provide suggestions that are contextually irrelevant or less meaningful, potentially leading to recommendations that are occasionally inappropriate (Baskara, 2023). Therefore, the effectiveness of AI chatbots in significantly reducing repetition and improving writing quality is constrained by their inability to fully replicate human creativity and contextual understanding.

In terms of grammar, the quality of students' writing can improve due to enhanced clarity and coherence, which represents the third impact of using AI chatbots. This observation was supported by S6, a female participant, who made the following statement:

> *"Since using AI chatbots, my writing has become clearer and more coherent. I can organize my thoughts better and these chatbots help me to write various sentences more smoothly."*

In this study, AI chatbots have been shown to significantly improve the clarity and coherence of students' writing. Previous research supports this assertion, indicating that chatbots can provide direct feedback and suggest enhancements that foster text coherence (Belda-Medina & Kokošková, 2023). These tools not only identify grammatical errors but also offer suggestions for sentence restructuring, contributing to a more precise and coherent writing style (Athanassopoulos et al., 2023). This improvement in clarity and coherence is consistent with the Cognitive Theory of Writing, which posits that writing involves a series of complex cognitive processes, including planning, translating, and reviewing (Flower & Hayes, 1981). By offering structured and targeted feedback, AI chatbots facilitate the reviewing process, enabling students refine and organize their ideas more effectively, thereby enhancing coherence. his conclusion is further supported by data from the pre- and post-test documents maintained by their English faculty members, which indicated improvements in both clarity and coherence. Therefore, the use of AI chatbots has been demonstrated to enhance the clarity and flow of written communication.

CONCLUSION

This research aimed to investigate the various types of AI chatbots and their impacts on the attributes of students' writing, particularly concerning vocabulary and grammar, from the perspective of EFL learners. The results revealed a diverse range of AI chatbots utilized in writing and highlighted the methods students employed to leverage these tools to enhance their writing quality.

Specifically, chatbots such as ChatGPT, Gemini, Perplexity, Bing Chat, Ernie, Character AI, Discord Bot, Wren, and Ginger were found to positively influence students' writing skills. The study identified a consensus among students regarding the beneficial role of AI chatbots in refining the vocabulary and grammar of their writing. Consequently, the findings suggest that the integration of AI chatbots can be advantageous for improving the attributes of students' writing. the attributes of students' writing.

The findings of this study underscore the methodological advantages of employing mixed-method approaches to capture students' experiences regarding the impact of AI chatbots on their vocabulary and grammar in EFL writing. This suggests that future research could benefit from longitudinal designs to explore these experiences over time. From a pedagogical perspective, the integration of AI chatbots can enhance personalized learning and writing proficiency; however, educators must balance their use with traditional methods to mitigate the risk of over-reliance on technology. Theoretically, the findings contribute to the understanding of Cognitive and Sociocultural Learning Theories by illustrating how AI chatbots function as scaffolding tools that support language development and enhance the cognitive processes involved in writing, such as planning, revising, and organizing ideas.

Conversely, this study presents several research limitations. Firstly, it was conducted within a specific geographical area with a relatively small sample size, which may restrict the generalizability of the findings to a broader population. Additionally, the varying levels of understanding and experience with AI chatbots among participants could have influenced their perceptions and the effectiveness of these tools. The cross-sectional nature of the study further limits the ability to draw conclusions regarding the long-term impact of AI chatbot usage on students' writing skills. Consequently, additional research is warranted to enhance the generalizability of the findings, potentially by expanding the sample

size, including participants from diverse regions, and employing experimental or longitudinal designs to provide more comprehensive insights into the effects of AI chatbots in EFL education.

Acknowledgments

The researchers would like to express their sincere gratitude to the Directorate General of Higher Education, Ministry of Education and Culture of the Republic of Indonesia, for their support and funding provided to complete this research.

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