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teach teachers and students to use AI tools effectively so learning gains increase while problems like plagiarism are avoided.

The present study offers evidence that generative AI tools can be integrated into EFL writing instruction. These tools not only improved students' linguistic and structural writing skills but also helped them become more independent learners. With careful integration and ongoing study, AI tools have the potential to transform how writing is taught in EFL contexts, preparing students for success in their academic and professional work.

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Hossain, M. K., & Al Younus, M. A. Teach-

brid procedure allowed learners to use AI support while retaining responsibility for their content and skill development.This strategy aligns with expert recommendations to use AI responsibly (Miao et al., 2023; Kotsis, 2024).

Although results were positive, they pointed to the need for cautious use of AI in writing instruction. Teachers and curriculum designers should plan AI integration deliberately. Clear guidelines and practical training can reduce misuse. Students must be taught that AI serves as a practice tool for improvement rather than a way to avoid effort. Costa et al. (2024) warned that excessive dependence on AI may develop. The findings therefore indicate a need for training and policy measures that keep AI use ethical and educational.

7.Conclusion

This research found that generative AI tools improved the academic writing of EFL students. Students who used AI tools in writing tasks scored higher in coherence, grammatical accuracy, and organization than students who used only traditional methods. The results indicate that AI tools act as effective supports for writing development. The findings show improved accuracy and structural control in student texts. These results carry practical implications. EFL teachers may introduce AI tools in writing classes to provide personalized feedback. Instructors can concentrate on higher-order skills such as argument development and critical thinking while AI addresses routine grammar and vocabulary issues. For learners, AI offers an accessible way to detect and correct errors. It can also promote learner autonomy by letting students practice revisions on their own. Curriculum planners should consider including AI writing tools in their programs. This ensures students learn both writing skills and useful technology skills. Adding AI tools to instruction can help bridge the gap between classroom practice and the demands of academic and professional writing. Several limitations are noted in this study. First, a small sample of 60 students was used. The generalizability of the results may be limited by this small sample size. Second, only intermediate-level EFL learners were sampled. Similar responses from beginners or advanced students cannot be confirmed. Third, the intervention lasted six weeks. Different outcomes might be produced by longer interventions. Finally, specific AI tools were used. Results may vary with other tools or with different writing tasks.

Future research may address these limitations. Larger samples should be recruited. The intervention period should be extended. Studies could examine how learners at different proficiency levels respond to AI support. Researchers might also compare effects across writing genres, such as argumentative essays and research reports, to determine whether benefits depend on task type. Another important topic is training: research should investigate how best to

Table 5

Independent Samples t-Test for Post-Test Scores of Experimental and Control Groups

	F	Levene's Test for Equality of Variances	t-test for Equality of Means						
		.Sig	T	Df	Sig. ((2-tailed	Mean Difference	Std. Error Difference	Confidence 95% Interval of the Difference	
								Lower	Upper
	Equal variances assumed	0.014	0.907	8.33	58	00.	12.93	3.042	-1.453	5.865

The independent samples t-test showed a statistically significant difference (t = 8.33, p < .05) between the post-test scores of the experimental group (Mean = 87.93, SD = 5.94) and the control group (Mean = 75.00, SD = 5.88).

6.Discussion

Results showed that generative AI tools improved academic writing among EFL students. Larger gains in writing quality were made by the experimental group than by the control group. The findings indicate that AI tools helped students produce clearer and more accurate texts. The improvements likely stemmed from immediate grammar feedback and suggestions for clearer phrasing. For example, detailed grammar and vocabulary feedback was delivered rapidly by the tools. Errors were corrected by the students. Learning occurred from that feedback. Over time, writing improvement was supported by this process.

AI tools also helped students become more active learners. Hanafi et al. (2025) reported that AI tools improve grammar, cohesion, and coherence in student writing. Our study adds to these findings by showing that even students with moderate English levels made large gains when AI tools were used with guidance. Panda and Kaur (2024) found limits for lower-level learners, but our structured intervention (guided AI use plus writing instruction) seems to mitigate this issue. The combination of teacher guidance and AI feedback gave students the benefits of both approaches.

Miao et al. (2023) and Kotsis (2024) raised concerns about plagiarism and excessive reliance on AI. To address these issues, students were taught to treat AI as a learning aid rather than as a shortcut. Each student had to review AI suggestions and decide whether to accept or reject them. This hy-

The tests suggested non-significant results ($p > .05$) confirming that the data followed a normal distribution. Paired sample t-tests were conducted. A comparison was made between the pre-test and post-test scores within each group. The purpose was to determine if significant improvements in academic writing performance occurred. This analysis evaluated the impact of the generative AI tools on the experimental group. The natural progression of writing skills in the control group was also assessed without such tools.

Table 4

Paired Sample t-Test Results for Pre-Test and Post-Test Scores in Experimental and Control Groups

Group	Mean Difference	Std. Deviation	t	df	(Sig. (2-tailed
Experimental Group	-18.83	1.29	-62.30	29	00.
Control Group	-6.57	0.94	-26.64	29	00.

The results of the paired sample t-tests indicate significant improvements in writing performance for both groups from the pre-test to the post-test. For the experimental group, the mean difference between pre-test and post-test scores was 18.83 ($t = -62.30$, $p < .05$), demonstrating a substantial improvement in academic writing performance following the use of generative AI tools. In contrast, the control group showed a smaller, yet still significant, mean improvement of 6.57 ($t = 26.64$, $p < .05$). An independent samples t-test was conducted. A comparison was made between the post-test scores of the experimental and control groups. The purpose was to determine if the use of generative AI tools had a statistically significant impact on academic writing performance.Prior to the t-test, Levene's test for equality of variances was performed to assess whether the variances of the two groups were equal.

These descriptive statistics suggest that both groups benefited from their respective instructional methods. To ensure consistency between the two raters, inter-rater reliability was calculated using Pearson's correlation coefficient for each test (pre-test and post-test) in both groups. The results are summarized in Table 2.

Table 2

Inter-Rater Reliability

Test	Group	Pearson Correlation	(Sig. (2-tailed
Pre-Test	Experimental	98.	000.
	Control	97.	000.
Post-Test	Experimental	99.	000.
	Control	98.	000.

The results indicate that the scoring process for the pre-test and post-test was highly reliable. Consistency was observed across the two raters. This reliability remained high for both the experimental and control groups. The evaluation criteria and procedures were affirmed as robust. Observed differences in scores can therefore be attributed to the instructional interventions. Inconsistencies in scoring were ruled out as a factor.

Following the inter-rater reliability analysis, the mean of the scores from the two raters was calculated. This mean was used as the final score for both the pre-test and post-test assessments. A balanced evaluation was provided by this approach. Potential individual rater biases were minimized. A more reliable representation of writing performance in both groups was obtained..

A normality test was conducted. The distribution of scores in each test was checked against the assumptions of parametric tests. The Shapiro-Wilk test was employed, and the results are presented in Table 3.

Table 3

Shapiro-Wilk Test for Normality

Group	Test	Statistic	df	.Sig
Experimental	Pre-Test	972.	30	544.
	Post-Test	978.	30	672.
Control	Pre-Test	969.	30	492.
	Post-Test	975.	30	624.

ticed brainstorming ideas with ChatGPT. The ideas were used to write their essays. Grammarly was introduced in Week 3 as a tool for checking grammar. EFL learners prepared short drafts then used the software to identify and correct grammatical errors.

After each demonstration, students in the experimental group applied the strategies to their writing tasks. The AI tools were used to write drafts of essays. Ideas were generated with ChatGPT. Sentences were revised with Grammarly. Word choice was improved with Quillbot. Each AI suggestion was evaluated by the student. Revisions were made accordingly. In both groups, drafts were exchanged with peers for feedback. A discussion followed the exchange of feedback. This discussion reflected on the writing process. Targeted feedback on common issues was provided by the instructor. Tips for improvement were also offered by the instructor.

The control group completed tasks on a similar timeline. Only traditional methods were used by this group. These methods included brainstorming, self-editing, peer review, and weekly instructor feedback. No AI tools were used by the control group. The writing post-test was administered in the final week. All participants took the test under the same conditions as the pre-test..

5. Results

The writing scores were evaluated by two independent raters. The descriptive statistics for the first and second raters' scores in the pre-test and post-test for both groups are presented in Table 1.

Table 1

Descriptive Statistics of Writing Scores by First and Second Raters

Group	Test	Rater	N	Mean	Std. Deviation	Minimum	Maximum
Experimental	Pre-Test	First	30	65.40	6.73	50	75
		Second	30	65.53	6.97	50	75
	Post-Test	First	30	83.10	6.00	70	92
		Second	30	83.30	5.85	70	92
Control	Pre-Test	First	30	65.00	6.48	52	74
		Second	30	65.07	6.56	52	74
	Post-Test	First	30	71.20	6.85	55	80
		Second	30	71.47	6.78	55	80

- **Coherence and Cohesion:** Logical organization of ideas, use of connecting words, and clarity of the argument.
- **Grammatical Range and Accuracy:** Correctness of sentence structure, verb forms, punctuation, and use of varied grammar.
- **Lexical Resource:** Range and precision of vocabulary, including use of academic terms and avoiding repetition.
- **Task Achievement:** Relevance and depth of the response to the prompt, strength of arguments, and use of evidence.

Two experienced raters scored all essays independently using this rubric. We calculated inter-rater reliability with Cohen's kappa to check consistency. If the raters' scores differed, they discussed the essay until they agreed on a final score.

This assessment process gave a clear picture of each student's writing skills in coherence, grammar, vocabulary, and task response. The pre-test/post-test design allowed us to compare the experimental and control groups directly and see how AI tools specifically contributed to writing improvement.

4.Procedure

This study was conducted in six weeks. An orientation session was held in the first week. The purpose and procedures of the study were explained to all participants. Both groups attended a session on basic academic writing principles. The session covered essay structure, coherence, grammar, and the use of supporting evidence. Specific uses of AI tools were demonstrated to the experimental group. The tool ChatGPT was shown for brainstorming and outlining essays. The tool Grammarly was shown for identifying and correcting grammar errors. The tool Quillbot was shown for improving vocabulary and paraphrasing. Students were advised to evaluate AI suggestions critically rather than accept them without thought. This approach ensured active engagement in the writing process. The control group did not use AI tools. That group received printed writing guides, sample essays, and self-editing checklists.

A writing pre-test was administered to all participants in Week 2. Students were given 40 minutes to write a 250 to 300 word essay on a given academic prompt. The essays were scored with a standard rubric. This scoring provided a baseline measure of each student's writing proficiency.

Weekly writing tasks were done in four weeks. Each task addressed a different writing skill such as essay organization, argument development, or grammatical accuracy. The importance of each skill for academic writing was explained by the instructor. Clear objectives for the writing task were set. In the experimental group, the instructor also provided a demonstration. The demonstration showed how AI tools could support the targeted skill. Topic sentences were created and ideas were organized with the tool. Students prac-

sign to examine the impact of generative AI tools on the academic writing performance of EFL learners. Two intact classes were selected rather than randomly assigning individuals, which is typical in educational settings where class restructuring is not feasible.

3.1 Participants

Sixty students (undergraduate and graduate) took part in this research. They were assigned to two groups of 30 each: an experimental group and a control group. The experimental group used generative AI tools (ChatGPT, Grammarly, Quillbot) in their writing tasks.Structured training on the use of these tools was provided to one group. The tools were then applied during writing exercises. A separate control group used traditional writing methods. That group relied on resources such as textbooks, guides, and feedback from instructors or peers for the same writing tasks.

Participants were chosen by purposive sampling to represent typical students engaged in academic writing. All were enrolled in university programs and had at least intermediate English proficiency (confirmed by self-report or records). They also had some experience with academic writing but had not used generative AI tools much before. Students who were already advanced users of AI writing tools or who were in programs with little writing were excluded. Volunteers were recruited through emails and announcements in academic writing workshops. We balanced gender and academic level between the groups to make them comparable. The participants had an average age of 23 years, and their ages ranged from 20 to 30. The sample was chosen to reflect the broader student population involved in academic writing.

3.2 Instruments

We used a pre-test/post-test design to measure writing improvement. Both tests required students to write an essay on a standardized academic prompt. The prompt was drawn from validated sources (such as IELTS Academic Writing Task 2 or TOEFL Independent Writing Task) to ensure it reliably assesses academic writing (Ali, 2021; Johnson & Hunter, 2019). Each student wrote a 250–300 word essay on a topic relevant to academic life (for example, "The role of technology in education" or "Pros and cons of collaborative learning in academia").

The pre-test was given at the start of the study and measured each student's baseline writing ability without AI tools. After the intervention period, the post-test (with a similar prompt) measured each student's writing after using AI tools (experimental group) or traditional methods (control group). Using the same prompt format for both tests ensured that improvements could be compared fairly, focusing on writing content rather than topic knowledge.

We scored essays with a standard academic writing rubric adapted from Weigle (2002). The rubric had four equally weighted criteria (25% each):

AI support was used.

Despite these benefits, ethical and pedagogical concerns appear in the literature. Miao et al. (2023) and Kotsis (2024) raised issues related to plagiarism, loss of originality, and overreliance on generated content. Easy integration of AI into writing practice raises questions about acceptable levels of use in academic work. Hanafi et al. (2025) proposed that institutions adopt clear policies to guide appropriate use. Policy frameworks can offer principles for instructors and students to follow so that AI aids learning rather than replacing student effort.

AI tools also offer classroom advantages for teachers. When routine issues such as grammar and spelling receive automated feedback, instructors can focus attention on higher-level skills such as argument development and critical reasoning. Hossain and Al Younus (2024) reported that many teachers regard AI as a useful complement to conventional methods. AI-generated feedback enables iterative revision and self-correction, which supports deeper engagement with writing tasks. Panda and Kaur (2024) recommended integrating AI into EFL curricula to promote varied writing strategies and creative exploration.A warning was also issued that excessive dependence on AI tools could stall the acquisition of basic writing competencies. Therefore, a balanced approach is considered necessary.

Most empirical work examines short-term outcomes. Malik et al. (2023) and Santos (2024) measured short-term improvements in grammar and sentence-level accuracy among students. A concern exists that heavy dependence on AI tools could reduce the ability of learners to write without assistance. Limited guidance is provided by institutions on acceptable AI use. Hanafi et al. (2025) determined that many universities lack clear policies. Practical frameworks for instructors and students were offered by these researchers. The frameworks promote transparency about AI use. They also establish rules for attribution. Scaffolded tasks are suggested to prevent the direct copying of generated text.

Generative AI tools show promise for writing instruction, but their implementation must be careful. Panda and Kaur (2024) suggested such tools can connect traditional instruction with new forms of practice if teachers provide support. This study addresses gaps in knowledge about long-term outcomes and policy guidance. The effects of generative AI on the academic writing of EFL students and on their sense of idea ownership were investigated. It is hoped that the findings will provide useful information to instructors, curriculum designers, and policymakers. This information may support the use of AI in ways that do not undermine the development of independent writing skills.

3.Methodology

This study used a quantitative quasi-experimental pretest–posttest control group de-

suggests that such tools assist in idea development, clarity enhancement, and stylistic improvement in academic writing (Santos, 2024; Malik et al., 2023). In addition, time efficiency in drafting and editing improves (Oliveira et al., 2024). The increasing integration of AI in academic settings necessitates conducting studies to investigate how these tools can address language-related challenges for students and researchers..

At the same time, using AI in writing raises ethical dilemmas. For instance, plagiarism and loss of academic integrity are major concerns (Miao et al., 2023; Kotsis, 2024). Teachers are concerned about appropriate use of AI content and avoiding overreliance. In addition, lack of clear guidelines for AI use in academic writing makes these issues worse (Costa et al., 2024). These issues suggest a need to understand exactly how AI tools affect writing processes and outcomes.

This study examined how generative AI tools support academic writing. It investigated how these tools improve writing skills for students. The findings inform educators, policymakers, and researchers on using AI and provide them keeping academic integrity and ensuring fair access to writing support. We asked this research question:

- To what extent do generative AI tools affect the development of academic writing quality among EFL learners compared to traditional instruction?

2.Literature Review

Recent advances in artificial intelligence reshaped writing instruction and academic research. Generative systems such as Grammarly and ChatGPT provide functions that help produce more polished academic texts. These systems proved especially helpful for EFL learners, who often face difficulties with grammar, textual coherence, and academic register. Santos (2024) showed improvements in coherence and structure for writers with limited language resources. Fathi and Rahimi (2024) found that EFL students produced drafts with higher grammatical accuracy and greater fluency after receiving AI feedback. In settings with limited instructor input, AI tools provide learners with more opportunities to revise drafts. These tools assist with the improvement of cohesion and wording in written work.

Hossain and Al Younus (2024) provided further evidence that AI tools can reduce sentence-level errors and improve cohesion across paragraphs. The availability of alternative phrasing and vocabulary suggestions increased the confidence of participants during the drafting of academic texts. Increased confidence can affect academic performance and motivation. Studies of higher education show similar effects. Oliveira et al. (2024) and Kumar and Gunn (2024) observed doctoral students. Lower cognitive load was reported by the students. Faster progress was also noted during the drafting and synthesizing of research material when

gest limited use of generative AI tools. Such tools should act as a supporting resource and not replace teacher instruction or students' independent work. Supervision and well-structured tasks help learners use the tools while they develop an authentic voice and improve critical reasoning.

Keywords: generative AI tools, academic writing, EFL learners, writing instruction, AI-assisted learning, writing assessment, ChatGPT

ملخص

كشفت هذه الدراسة عن تأثير أدوات الذكاء الاصطناعي التوليدي على جودة الكتابة الأكاديمية لدى متعلمي اللغة الإنكليزية كلغة أجنبية (EFL). قُسّم ستون طالبًا جامعيًا من متعلمي اللغة الإنجليزية كلغة أجنبية إلى مجموعتين الاولى تجريبية (٣٠) طالبا و الثانية (٣٠) طالبا من مجموعة التحكم . أكملت كلتا المجموعتين اختبارًا قبليًا واختبارًا بعديًا باستخدام تقييم كتابة أكاديمي موحد. تلقت المجموعة التجريبية تدريبًا على الكتابة بمساعدة الذكاء الاصطناعي باستخدام أدوات مثل ChatGPT، بينما اتبعت مجموعة التحكم الأساليب التقليدية. حُللت البيانات باستخدام اختبار t للعينات المتعلقة والعينات المستقلة لقياس التحسن في أداء الكتابة. كشفت النتائج أن المجموعة التجريبية أظهرت تحسنًا ملحوظًا في التماسك والبنية والدقة النحوية مقارنةً بالمجموعة التحكم. بالإضافة إلى ذلك، تم تأكيد موثوقية التقييم المتبادل لعملية التقييم، وحققت جميع الاختبارات افتراضات الاعتيادية.

أظهرت النتائج أن أدوات الذكاء الاصطناعي عالجت التحديات اللغوية بفعالية وحسّنت جودة الكتابة، مما يدعم إمكاناتها كمورد تكميلي في سياقات تعلم اللغة الإنكليزية كلغة أجنبية. ومع ذلك، سلطت الدراسة الضوء على المخاوف بشأن الاعتماد المفرط على الذكاء الاصطناعي وآثاره على الأصالة والتفكير النقدي. ويتم تشجيع الأبحاث المستقبلية على دراسة التأثيرات طويلة المدى للذكاء الاصطناعي على تطوير المهارات الأكاديمية عبر مختلف المستخدمين والسياقات.

الكلمات المفتاحية: أدوات الذكاء الاصطناعي التوليدية، الكتابة الأكاديمية، متعلمو اللغة الإنجليزية كلغة أجنبية، تعليم الكتابة، التعلم بمساعدة الذكاء الاصطناعي ChatGPT ، تقييم الكتابة.

1.Introduction

Artificial intelligence (AI) is changing many scholarly tasks, including writing. Generative AI tools like ChatGPT offer new ways to assist with theses, research papers, and other academic texts. These tools can improve grammar, coherence, and structure of non-native English speakers' writing ability (Li et al., 2024). They may also bridge gaps in writing style and language (Hanafi et al., 2025; Kumar & Gunn, 2024). Questions about academic rigor, originality, and ethics have been raised due to these developments (Miao et al., 2023; Kotsis, 2024). AI tools demonstrate potential in supporting student writing. Evidence

Exploring the Impact of Generative AI Tools on Academic Writing Improvement Among EFL Learners

استكشاف تأثير أدوات الذكاء الاصطناعي التوليدي على تحسين الكتابة الأكاديمية بين متعلمي اللغة الإنكليزية كلغة أجنبية

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Abstract

The effects of generative artificial intelligence tools on academic writing development among English as a foreign language learners are examined. Sixty undergraduate EFL students participate in this quasi-experimental study. They are randomly divided into an experimental group and a control group, with thirty students in each group. Both groups complete a standardized academic writing test before and after instruction. The experimental group receives six weeks of training that used AI-supported tools such as ChatGPT. The control group follows a conventional teacher-led program that emphasizes process-based writing without technological assistance. Paired-sample and independent-sample t-tests measure change in writing performance. Students in the experimental group show larger gains in clarity of ideas, paragraph organization, and grammatical accuracy than students in the control group. Statistical analysis indicate that these differences were significant. Teachers' notes and students' reflections raise a concern. Students who rely heavily on AI suggestions show less ownership of argument development and of choosing supporting evidence. These results sug-