



# Enhancing Undergraduate Essay Writing through AI-Assisted Instruction: Evidence from a Quasi-Experimental Study

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**Abstract.** As artificial intelligence (AI) has become more widely used in higher education, there are numerous potentials to utilize AI to enhance academic writing and language learning. Using a quasi-experimental mixed-method approach, this study sought to assess how AI-assisted instructional technology affected undergraduate students' essay-writing skills. Eighty students from the Department of English at the American International University–Bangladesh, all enrolled in English writing courses, participated in an AI-assisted training module. Among them fifty-four students were placed in the experimental group and twenty-six in the control group. The experimental group received essay writing training using AI assistance, while the control group received traditional teaching. Grammar, vocabulary, topic sentence development, paragraph coherence, thesis statement formulation (limited to one complete sentence with a single full stop), and conclusion writing were all areas of focus for the intervention. A pre-test and post-test were administered to both groups, and essays were assessed based on predefined criteria that prioritized the quality of the thesis statement, paragraph development, coherence, grammar, and conclusion. Effectiveness and predictive validity were evaluated using statistical methods, such as regression, correlation and independent and paired t-tests. By giving students timely and targeted feedback on their grammar, vocabulary, organization, and academic expression, the results showed that AI-assisted training greatly enhanced students' writing. In line with previous studies on AI-assisted language acquisition, the results offered empirical proof that academic writing performance can be improved by AI-assisted tools for both proficient and struggling learners.

**Keywords:** Artificial Intelligence (AI); Quasi-Experimental Method; Language Learning Technology First Section

## 1. Introduction

Artificial Intelligence, which is considered as a significant development in education technology, is rapidly transforming higher education. Originated in the middle of twentieth century, AI is taking a major role in many universities of the world. Regarding AI Zawacki-Richter et al. (2024) asserts “The study [of artificial intelligence] is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to

simulate it” (3). Being able to understand and use human languages the technic can grasp big ideas and concepts and thus able to solve critical human problems. Around the world, universities are starting to use AI to teach writing. These tools help students write more accurately, build stronger arguments, and get instant, personalized feedback. This is especially helpful for students learning English (EFL/ESL), who often struggle with language and feel less confident in their writing.

As universities try to find out how to apply AI in the best possible way, it requires more research work. It is also necessary to figure out what works, what does not, and the long-term effects of its applications is especially important for nonnatives English language users. As English is the most relevant language for higher education it is mandatory to learn the proper use of it. This is particularly important in places like Bangladesh, where classes are often large, resources are limited, and students' writing skills largely vary.

For university students in Bangladesh, academic writing in English is a great problem. Even after twelve years of English classes in school and college, many still struggle with key aspects such as:

- Developing a strong main argument (thesis statement)
- Structuring their essays logically
- Developing clear topic sentences for paragraphs
- Ensuring paragraphs flow smoothly
- Using appropriate academic vocabulary

Traditional teaching methods, in spite of being laborious, often cannot provide the individual feedback that struggling students need because teachers have so many students and so little time. To highlight poor English language concept of the students Al Amin mentions in his doctoral dissertation , “English teaching in Bangladesh: the lived experiences of secondary teachers in the process of change and innovation” some important factors which are responsible for it “Because of factors including disputed secondary education policy, continued political influences, weak management of schools, and the huge number of untrained and unskilled teachers, the whole education system is compromised” (57). So, universities are looking to AI to fill this gap, hoping it can provide instant, targeted, and repeated feedback to help students improve.

Studies in language and education technology suggest several benefits of AI writing tools. For example, students get corrections immediately which allow them to learn from mistakes and improve their writing. It helps students practice and explore language on their own schedule, building their independence. AI can pinpoint specific weaknesses for each student (like grammar or word choice) and offer tailored suggestions. Studies from Asia, Europe, and North America consistently show that when AI tools are used wisely, students become more engaged, motivated, and their

writing quality improves. This fits with broader trends in language learning, where personalized feedback helps students with both accuracy and meaning in their writing.

There is a significant lack of research on AI-assisted writing in the Global South, especially in Bangladesh. While Bangladeshi students are increasingly using AI tools informally, they do not have much academic evidence about how effective they are in university writing courses. This is a crucial gap because English is not only important for academics in Bangladesh but also for career opportunities. Figuring out if AI can really help students write better has huge consequences across the entire education system. It will influence:

**Teachers:** How they plan lessons and teach in the classroom.

**Universities:** How they decide where to spend money and what rules to put in place.

**Governments:** How they strategize to bring digital technology into education nationwide.

Furthermore, teachers in Bangladesh often worry about students cheating, relying too much on AI-generated content, and the ethical boundaries of using AI. These concerns highlight the urgent need for clear, evidence-based guidelines on how to responsibly use AI in teaching writing. This project explores to identify which key aspects of academic writing—ranging from grammar and vocabulary to developing strong thesis statements, coherent paragraphs, and effective conclusions—show the greatest improvement when students use AI tools to support their writing.

## 2. Literature Review

Digital technology is really shaking up how we learn and teach. According to researchers (Haleem et al., 2022), it is causing a major shift. Digital tools are not just giving us information anymore; they are helping us create it, guiding us, and even assessing our work. This makes learning much more accessible and engaging. Instead of just relying on old-school pen-and-paper, students can now use cool software and tech gadgets like iPads for presentations and projects, which makes them more interested in learning and research.

Haleem et al. (2022) also highlight how popular smartphones and wireless technology are becoming in schools. These digital tools can make education more affordable and easier to get, boosting its reputation. They are also effective for helping students build essential skills needed for future careers, like problem-solving. By getting students comfortable with technology, these tools not only make classrooms more engaging but also allow lessons to be customized for each student's unique needs.

Today's students practically grew up with electronic devices, so bringing that tech into the classroom naturally makes them more interested and involved. Technology makes learning exciting, can reduce distractions, and sparks curiosity. Adding cutting-edge tools, like AI, makes learning even more captivating. Students become active

participants in their own education, with teachers stepping into the role of guides rather than being the sole source of knowledge. This encourages students to learn independently, using online resources and digital classrooms for their own self-directed exploration.

As students become more comfortable with digital tools, they gain more control over their own learning journeys. Technology also empowers teachers to improve their teaching methods and effectively track how students are progressing. Haleem et al. (2022) suggest that digital tools help students develop strong, independent learning habits, sharpening their critical thinking and analytical skills, often without them even realizing how much they are actively learning.

Looking specifically at AI in education, tools like ChatGPT are proving incredibly useful. Mahapatra (2024) notes its role in evaluating writing and providing feedback, which can significantly boost student performance, especially in large classes. ChatGPT helps solve a big challenge: giving immediate feedback, as pointed out by Golzar et al. (2022). This makes it a valuable resource in crowded classrooms, common in many developing countries. It can even generate writing examples and adjust its difficulty level, making learning truly personalized.

Other studies (like Bozorgian & Yazdani, 2021; Taskiran & Goksel, 2022) emphasize the importance of "formative assessment"—where students assess their own work or their peers'. These methods deepen students' understanding of language and writing. The instant feedback from AI tools like ChatGPT helps students quickly understand what is expected and improve their writing skills (Winston & Carless, 2020).

However, it is not all positive. Some researchers worry that students might rely too much on AI tools, which could potentially stifle their motivation and creativity (Yan, 2023). So, a careful balance is essential when using AI in classrooms. Mahapatra (2024) suggests thoughtfully integrating tools like ChatGPT into academic writing instruction, making sure to keep traditional teaching methods in the mix.

All this research points to a clear need for smart, new ways to help university students in Bangladesh with their academic writing. Creating and testing an AI-powered writing checker could fill this gap. It would give students personalized help, instant feedback, and opportunities to learn together, significantly boosting their writing skills. This kind of initiative has the potential to truly empower students, helping them learn on their own and improve their grades, especially in settings where educational resources might be limited. By strategically using AI, the goal is to enhance the writing abilities of undergraduate students, creating a model that other schools in similar regions could use too.

### 3. Methodology

#### 3.1 The research design

The research employs a 'nearly experimental' trial, a quasi-experimental design, along with a mixture of different methods to gather information (a mixed-method approach). The purpose of this research was to experiment with how AI-powered instructions/tools can better support university students in their academic writing. This type of research design, featuring an AI-powered tool, is suitable for school research settings because in large university classrooms, teachers cannot always randomly assign tasks to student groups (Cresswell & Cresswell 2018, McMillan and Schumacher 2014). The research methodology was based on the concept of Sociocultural Theory (Vygotsky, 1978), which established that learners learn best when given access to tools and opportunities for interaction. In his book, *Mind in Society*, learning is determined by the learners' degree of organic development and their mastery in the use of tools (Vygotsky, 1978). In this research, the AI-powered tool acts as a 'thinking and language coach.'

We also drew inspiration from "Formative Feedback Theory" of Sadler (1989) and Hattie and Timperley (2007). This theory emphasizes that students learn much better and faster if they receive feedback from an instructor. This feedback should have several qualities, such as reaching them quickly right when they need it. The feedback should tell them exactly what is good in their writing and what needs to be worked on; furthermore, it should be actionable, guiding them on how to improve. AI writing tools are appropriate for putting these learning principles into action, as they provide instant, personalized feedback and directly apply the core ideas of "Formative Assessment."

The mixed-method approach allowed us to combine solid data, such as writing scores displaying improvement, with personal insights from students and teachers on their experience in this type of research and learning. Cresswell & Clark (2017) indicate that this type of learning is a great way to fully understand complex educational projects.

#### 3.2 Sampling

The sample comprised 71 university students from American International University-Bangladesh, who were attending an academic writing module in the Department of English and belonged to three different sections<sup>1</sup>. We included all students from the chosen three sections. These sections were chosen purposively because two of the authors of this paper were teaching the module to these sections, allowing for the convenient implementation of the AI-powered tool that we developed without any financial support. The students were divided into two groups: sections A & B formed the experimental group, comprising 55 students, and section C served as the control group, comprising 16 students. The experimental group was given access to the AI writing tools, while the control group had access to regular, traditional teaching methods. It is a common and appropriate practice to keep all students in a particular section or class within one group (either experimental or control) to avoid spillover of experimental tools (Cresswell & Creswell, 2018).

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<sup>1</sup> We started the experiment with 80 students, later 7 students dropped, mostly from the control section.

### 3.3 The AI-powered tools: What Instruments and Materials were used

The AI writing assistant, which the experimental group used, was an AI-powered advanced writing tool. This tool provided them with feedback on writing aspects such as grammar, word choice, sentence structures, and paragraph organization. The researchers had the students write essays containing around 300 to 350 words at the beginning and end of the study and graded them using a detailed scoring guide called an 'analytic rubric.' This analytic rubric guide helped the teachers to evaluate different aspects of the students' writing, such as grammar, vocabulary, the clarity of main points (e.g., Thesis Statement), the flow of ideas, and the quality of the conclusions. In this way, a detailed scoring method is, according to Hyland and Hyland (2006), very effective for truly understanding all the different parts of writing. Two experienced teachers graded the essays and, at every step, ensured grading consistency by checking their inter-rater agreement using ICC, following standard procedures (Tabachnick & Fidell, 2019).

The researchers also asked the students to fill out a short questionnaire regarding their background and other demographic information, such as their family's economic condition, their parents' educational level, and whether they had attended an English-speaking school. They collected this information so that they could consider if these factors might have influenced the students' writing skills, ensuring their results were as accurate as possible (Creswell & Creswell, 2018).

Apart from the scores, the teachers also wanted to hear directly from the students. The students filled out reflection forms, and the researchers conducted in-depth interviews with the instructors. This helped them to get a full picture of how the students felt about the tools and how the teachers experienced using them (Miles et al., 2019).

The study ran for 12 weeks, a full semester at AIUB. All students wrote their first essay, which served as a pre-test. From week 2 to 10, the AI group used the AI assistant in their classes, while the other group (the control group) continued with regular instruction provided by the teachers. The teachers showed the students how to use the AI feedback tools wisely (Zhung & Hyland, 2018). In week 11, all students wrote their final essay, which served as a post-test task. In the 12th week, the teachers collected all feedback from the students and interviewed them. During data analysis, the number-based data (e.g., essay scores), the researchers used various statistical tests. This helped the researchers to describe the data, compare scores within the same group (before and after), compare scores between the two different groups, and also account for the background information they had collected. They also calculated the magnitude of the impact, as suggested by Cohen (1988), and ensured that the statistical methods used were sound (Tabachnick & Fidell, 2019).

### 3.4 Qualitative Analytical Methods

With open-ended feedback and interview responses from students in the experimental group, the researchers used the systematic method of Thematic Analysis (Braun &

Clarke, 2006) to identify recurring ideas and patterns. To capture salient themes about participants' experiences and perceptions, demographic information (e.g., gender, family background, secondary and higher secondary results) was recorded, and students' development in producing grammatically correct sentences, composing effective thesis statements, and evaluating textual cohesion was also examined. To ensure that the researchers' interpretations were accurate and trustworthy, they cross-checked the findings with other researchers and looked for consistent themes across different types of qualitative data (Miles et al., 2019).

### **3.5 Quantitative Analytical Methods**

The quantitative analysis evaluated the impact of the AI-powered writing tool on students' academic writing scores. Descriptive statistics were first generated to summarize pre- and post-test performance. Baseline equivalence between the experimental and control groups was examined using paired sample t-tests. Within-group improvement was assessed through paired-samples t-tests, while between-group differences in post-test and change scores were analyzed using independent-samples t-tests.

### **3.6 Validity, Reliability, and Ethical Considerations**

The researchers took several steps to ensure that their study was sound and trustworthy. They confirmed that their measuring tools were accurate, their grades were consistent, and their different types of data (such as scores and feedback) followed the same pattern. They maintained strict ethical rules, ensuring the students' information was kept private and that participation in the research was voluntary (Creswell and Creswell, 2018).

## **4. Justification of methodology**

The researchers chose a mixed method because it perfectly aligned with established ideas about how people learn, such as Vygotsky's (1978) emphasis on tool use and Sadler's (1989) and Hattie and Timperley's (2007) focus on quick and useful feedback. By combining quantitative data (numbers) and qualitative data (personal experience), the researchers gained a complete picture of whether the AI assistant's writing instructions not only improved student scores but also demonstrated how it actually feels and works for students and teachers. This approach is highly recommended for evaluating how well new technology can aid learning (Cresswell & Plano Clark, 2017; Li et al., 2015)

## **5. Results**

The findings of this study reveal clear and consistent improvements across all measured areas of academic writing following the intervention.

Table 1. Mean, standard deviation of scores by dimensions and paired t tests of the difference with base scores.

Variable	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
Thf (Thesis statement, final)	71	61.27	2.12	17.88	57.03	65.50
thb	71	42.54	3.14	26.44	36.28	48.79
diff	71	18.73	2.74	23.05	13.28	24.19
Paired t test		6.85***				
grf	71	60.85	2.06	17.38	56.73	64.96
grb	71	42.82	3.08	25.98	36.67	48.97
diff	71	18.03	2.21	18.64	13.62	22.44
Paired t test		8.15***				
thq	71	57.57	2.49	20.81	52.61	62.53
thb	71	43.57	3.19	26.70	37.20	49.94
diff	71	14.00	2.67	22.35	8.67	19.33
Paired t test		5.24***				
grq	71	56.00	2.51	21.02	50.99	61.01
grb	71	44.00	3.11	26.01	37.80	50.20
diff	71	12.00	1.94	16.21	8.14	15.86
Paired t test		6.20***				

\*\*\* significant at less than 1% level

Table 1 summarizes these gains for the entire group. In every category measured (e.g., thf/thb, grf/grb, thq/thb, grq/grb), the post-test averages (thf, grf, thq, grq) were substantially higher than the pre-test averages (thb, grb). The mean differences (diff) were statistically significant ( $p < .001$  for all paired t-tests), and the 95% confidence intervals were entirely above zero. For example, in the thf/thb dimension, the average score increased about 19% with (95% CI: 13.28–24.19), confirming a reliable improvement across the group. Overall, these results demonstrate the effectiveness of the teaching environment in enhancing multiple aspects of writing performance.

Average post-test scores increased in all domains, and they are statistically highly significant. This indicates that the benefits of the intervention were widely shared among students rather than limited to a few high achievers. The close alignment between the mean and standard deviation suggests a balanced distribution of improvement, minimizing the chance that outliers influenced the results (Field, 2018). In educational research, such convergence typically signals consistent progress across the cohort (Fraenkel, Wallen, & Hyun, 2019). Furthermore, the reduced variation in post-test scores—shown by tighter clustering around the mean—suggests that the intervention not only raised performance levels but also reduced achievement gaps.

This pattern aligns with the effects of scaffolded, feedback-driven instruction (Hattie & Timperley, 2007). Together, these upward shifts reinforce that the intervention promoted meaningful and equitable improvement.

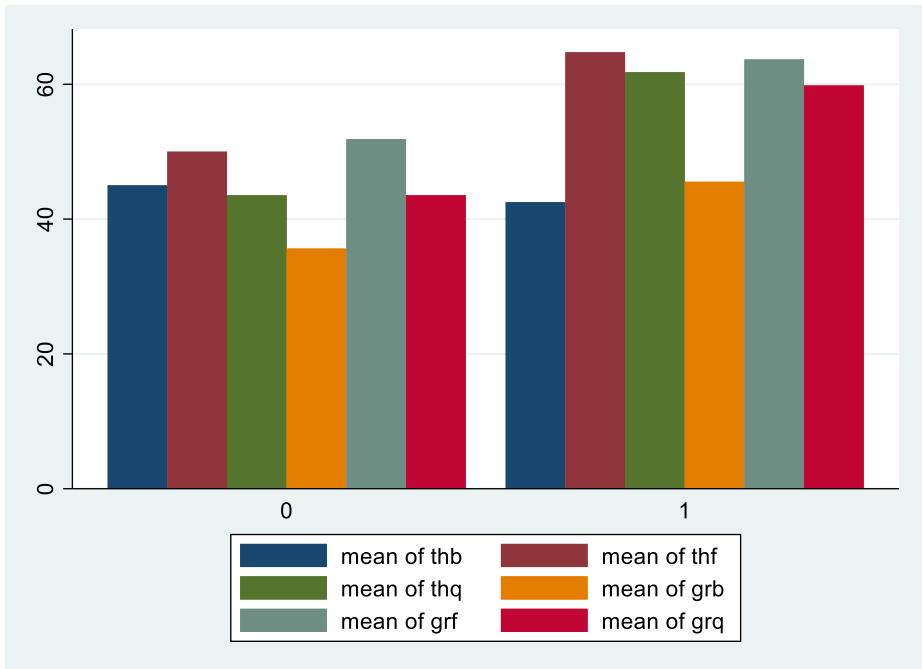
A more detailed breakdown of the results (Table 2) highlights clear differences between the experimental group (which used the AI writing tool) and the control group (which received traditional instruction).

Table 2. Mean, standard deviation of scores by dimensions and paired t tests of the difference with base scores by experiment group.

Variable	Obs	Mean	Std. dev.	Obs	Mean	Std. dev.
	Control			Experiment		
Thf	16	50.00	10.95	55	64.55	18.24
Thb	16	45.00	15.92	55	41.82	28.87
Diff	16	5.00	18.26	55	22.73	22.89
Paired t test		1.095ns			7.36***	
Control				Experiment		
Grf	16	51.88	11.09	55	63.45	18.08
Grb	16	35.63	14.13	55	44.91	28.28
Diff	16	16.25	19.28	55	18.55	18.60
Paired t test		3.37***			7.39***	
Control				Experiment		
Thq	16	44.38	15.04	55	61.48	20.78
Thb	16	45.00	15.92	55	43.15	29.26
Diff	16	-0.63	20.48	55	18.33	21.17
Paired t test		0.12ns	ns		6.36***	
Control				Experiment		
Grq	16	44.38	12.09	55	59.44	21.93
Grb	16	35.63	14.13	55	46.48	28.23
Diff	16	8.75	18.57	54	12.96	15.50
Paired t test		1.88	*		6.15	***

Initial checks confirmed that both groups were similar at the start in terms of pre-test writing scores and demographic characteristics, reducing the risk that initial differences influenced the outcomes. Although both groups improved, the experimental group showed much greater and more consistent gains in writing scores.

Specifically, across the four measured dimensions (thf/thb, grf/grb, thq/thb, grq/grb):



- Dimension 1 (Thesis Focus and quality):** The experimental group improved by 22.73 points ( $p < .001$ ), while the control group improved by only 5.00 points (not significant,  $p > .05$ ).
- Dimension 2 (Grammar quality):** The experimental group improved by 18.55 points ( $p < .001$ ), outperforming the control group's 16.25 points ( $p < .001$ ).

These results indicate that the AI-supported intervention produced stronger and more consistent gains across nearly all areas of writing, particularly where the control group's progress was minimal. Comparing pre- and post-test changes between the two groups provides solid evidence that the AI tool played a distinct role in driving improvement.

The varying degrees of progress across domains also provide insights into how change occurred. Larger gains appeared in skills that respond best to immediate and actionable feedback—such as grammar accuracy, vocabulary use, and sentence clarity. These micro-skills benefit greatly from rapid feedback cycles that allow learners to make quick revisions and internalize rules. Moderate improvements in more complex areas, such as thesis clarity, organization, and coherence, reflect the deeper cognitive processes these skills require (Hyland & Hyland, 2006). Even so, the experimental group outperformed the control group in these challenging areas.

The study's methodological rigor further supports the credibility of its findings. An analytic rubric, applied by two trained researchers and validated through inter-rater reliability checks (ICC), ensured that the improvements reflected genuine learning rather than inconsistent scoring. Analytic rubrics are known for accurately capturing detailed aspects of writing and tracking subtle progress over time (Brookhart, 2018). Although the quasi-experimental design was not randomized, it was appropriate for the educational setting, where intact classes were used. Given the established baseline similarity between groups and clear outcome differences, the study provides convincing evidence that the AI-based intervention significantly enhanced student performance.

Qualitative data from student reflections and instructor interviews reinforce these quantitative results. Thematic analysis revealed that students using the AI tool appreciated its “instant feedback,” “clear suggestions,” and ability to help them “see mistakes right away.” Many described the AI as a “patient coach,” helping them revise effectively before final submission—reflecting key principles of Formative Feedback Theory. Instructors of the experimental group observed greater student engagement in the revision process, attributing it to the AI's specific, non-judgmental guidance. By contrast, control group students valued teacher feedback but noted that it was less frequent and slower to receive in traditional large-class settings. These observations suggest that the AI tool functioned as a valuable support mechanism, fostering self-regulation and accelerating learning.

From a theoretical perspective, these findings align with sociocultural learning theory (Vygotsky, 1978), which highlights the importance of mediating tools and interaction in learning. The AI writing tool acted as such a mediational device, extending learners' zones of proximal development by providing structured and

scaffolded guidance. The intervention also reflects core ideas of formative feedback theory, which emphasizes timely, specific, and actionable feedback as key to effective learning (Sadler, 1989; Shute, 2008). The observed improvements in means, medians, and overall distributions, especially the experimental group's superior performance, align with these feedback-based learning principles.

Despite these promising findings, certain limitations remain. The use of intact groups limits causal conclusions, and future studies should incorporate randomization or multilevel modeling to better isolate the intervention's effects. Long-term follow-up research would also help determine whether the improvements persist and transfer to other writing contexts. Students expressed that the AI tools provided "instant feedback" and "clear suggestions," significantly enhancing their learning experience. Many highlighted the AI as a "patient coach," which fostered a sense of accessibility and support, particularly benefiting those who struggled with English academic writing. Additionally, the equitable nature of the AI tools was noted, as they allowed all students, regardless of their writing proficiency, to receive personalized guidance. This inclusivity made it easier for students to engage with academic content and develop their writing skills effectively.

## **6. Conclusion**

In short, both the statistical and pedagogical evidence point to meaningful, consistent gains in academic writing performance resulting from the AI-supported intervention. The simultaneous highly significant improvements across all dimensions confirm that the AI-assisted academic writing tool can effectively enhance academic writing skills. Improvements were seen in areas ranging from grammar and vocabulary to crafting strong thesis statements, coherent paragraphs, and effective conclusions, indicating that students benefit most when utilizing AI tools in their writing processes. Qualitative analysis further supports these quantitative results; students reported valuing the "instant feedback" and "clear suggestions," which significantly enriched their learning experiences. Many described the AI as a "patient coach," fostering accessibility and support that encouraged engagement with academic content. Finally, the experimental group's significantly stronger results confirm that this AI-enhanced approach is both effective and equitable—offering strong potential for wider adoption in university writing instruction.

## Acknowledgments

The authors acknowledge the use of limited AI-assisted tools for language editing and grammar support during manuscript preparation. All aspects of the research design, data collection, analysis, interpretation, and conclusions were conducted independently by the authors.

## References

1. Abduljawad, S. A. (2024). Investigating the impact of ChatGPT as an AI tool on ESL students' writing proficiency. (*conference/journal article indexed on ScienceDirect*)  
<https://www.sciencedirect.com/org/science/article/pii/S2155709824000148>
2. Bozorgian, H., & Yazdani, A. (2021). Direct written corrective feedback with metalinguistic explanation: Investigating language analytic ability. *Iranian Journal of Language Teaching Research*, 9(1), 65–85.  
<https://files.eric.ed.gov/fulltext/EJ1282285.pdf>
3. Brookhart, S. M. (2018). Appropriate criteria: Key to effective rubrics. *Frontiers in Education*, 3, 22. <https://doi.org/10.3389/educ.2018.00022>
4. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–100.  
<https://doi.org/10.1191/1478088706qp063oa>
5. Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.
6. Carless, Boud. (2018). The development of student feedback literacy: enabling uptake of feedback.
7. Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
8. Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.
9. Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). SAGE Publications.
10. Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2019). *How to design and evaluate research in education* (10th ed.). McGraw-Hill Education.
11. Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3, 275–285.
12. Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81–112. <https://doi.org/10.3102/003465430298487>.
13. Hyland, K., & Hyland, F. (Eds.). (2006). *Feedback in second language writing: Contexts and issues*. Cambridge University Press.  
<https://doi.org/10.1017/CBO9781139524742>
14. Li, J., Link, S., & Hegelheimer, V. (2015). Rethinking the role of automated writing evaluation (AWE) feedback in ESL writing instruction. *Journal of Second Language Writing*, 27, 1–18. <https://doi.org/10.1016/j.jslw.2014.10.004>
15. Mahapatra, S. (2024). Impact of ChatGPT on ESL students' academic writing skills: A mixed-methods intervention study. *Smart Learning Environments*.
16. McMillan, J. H., & Schumacher, S. (2014). *Research in education: Evidence-based inquiry* (7th ed.). Pearson.

17. Miles, M. B., Huberman, A. M., & Saldaña, J. (2019). *Qualitative data analysis: A methods sourcebook* (4th ed.). SAGE Publications.
18. Rahman, Saidur.(2019). *English teaching in Bangladesh: The lived experiences of secondary teachers in the process of change and innovation* (Doctoral dissertation). University of Brighton.
19. Sadler, D. R. (1989). Formative assessment and the design of instructional systems. *Instructional Science*, 18(2), 119–144. <https://doi.org/10.1007/BF00117714>
20. Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research*, 78(1), 153-189. <https://doi.org/10.3102/00346543037313795>
21. Taskiran, A. (2022). Automated feedback and teacher feedback: Writing achievement in learning English as a foreign language in an open and distance learning context. *Turkish Online Journal of Distance Education (TOJDE)*, 23(2). <https://dergipark.org.tr/en/pub/tojde/issue/69182/1096260>
22. Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics* (7th ed.). Pearson.
23. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
24. Zhang, Z., & Hyland, K. (2018). Student engagement with teacher and automated feedback on L2 writing. *Assessing Writing*, 36, 90–102. <https://doi.org/10.1016/j.asw.2018.02.004>.
25. Zawacki-Richter et al. (2024). New advances in artificial intelligence applications in higher education? *International Journal of Educational Technology in Higher Education*, 21(32), 1-4. <https://doi.org/10.1186/s41239-024-00464-3>.

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