

Analyzing the Effectiveness of AI Tools in Academic Writing for ESL Learners

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Abstract

Many ESL learners are now using AI tools such as Grammarly, QuillBot and ChatGPT for academic writing. AI-powered features, such as grammar correction, vocabulary enrichment, and content organization, are available to users. The purpose of this study was to evaluate how AI writing tools affect the academic writing performance of ESL university students. Mixed-method design involved 60 ESL students who were either allocated experimental group or control group. In the experimental group, the respondents received a four-week writing intervention through the use of AI tools, whereas the control group proceeded with their routine work on assignments. The quantitative measure used was writing performance before intervention and after intervention and qualitative data were obtained using interviews to explain the perceptions of the learners. The experimental group recorded a huge boost in their confidence and interest as they scored their answers. According to qualitative results, the usage of AI had both advantages and threats, such as overdependence. One can write in English as a second language with the provision of AI tools, but with a critical approach. Improved educational performances are promoted by reflective participation and guided learning.

Keywords

Academic Writing, AI Tools, ESL Learners, Mixed Methods, Writing Improvement.

Introduction

Artificial intelligence (AI) has gained integration in the educational circle over the last several years, especially on academic writing (Khalifa & Albadawy; Aljuaid, 2024). Grammarly as well as ChatGPT, QuillBot among many others have been extensively utilized by students and educators who belong to AI-based writing software (Raheem et al. 2023).

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Grammar, vocabulary, ideas production, and paraphrasing of content is also possible by the application of AI controlled writing tools. The writing services that were powered by artificial intelligence offered promising prospects for English learners who had difficulty learning the English language (Khan et al, 2024; AbuSahyon d'almath, 2020).

ESL learners face unique challenges in academic writing, particularly in terms of ideas, vocabulary, coherence, and grammatical accuracy (Baharudin et al., 2023). Such struggles emerged due to limited language proficiency, unfamiliarity with academic conventions, and low confidence (Hyland, 2019; Li & Pei, 2024).

For the aforementioned reasons, many students have begun using AI tools to assist them with their writing process, thereby improving the overall accuracy of language and content. Grammarly, QuillBot, and ChatGPT were among the most widely used tools that assisted in identifying grammar and style issues, provided rephrasing and summarizing capabilities, and offered instant feedback, content suggestions, and idea development, respectively (Zawacki-Richter et al., 2019; Anis & Khalid, 2024).

Their increasing applications in academic settings indicated an emerging trend toward digital writing companions as a regular part of language learning and instruction. However, although the tools offered additional value in support of learners, we could not determine their efficacy in developing writing skills.

Despite the popularity of AI writing tools, there was limited empirical evidence showing how much these tools helped ESL learners improve their writing skills. Most existing studies were either general or focused on native English speakers (Wei, 2023; Khan et al., 2024). As a result, there was a gap in understanding the real impact of these tools on ESL students in academic environments.

Moreover, many ESL learners depended heavily on these tools without fully developing their independent writing skills. This raised concerns about whether AI tools were promoting learning or merely correcting errors on a surface level. There was a strong need to evaluate whether these tools contributed meaningfully to long-term writing improvement or merely served as short-term writing crutches (Imran & Almusharraf, 2023).

Objectives of the Study

- To assess the effectiveness of AI tools on academic writing skills among ESL learners
- To understand learners experiences and attitudes toward these tools

Research Questions

1. What was the impact of AI tools on the academic writing performance of ESL learners?
2. How did ESL learners perceive the usefulness and challenges of using AI writing tools?

Significance of the Study

This study was important for several reasons. First, it provided evidence-based insights into how AI tools affected academic writing outcomes for ESL learners. By examining the actual changes in writing performance, educators could better decide how and when to integrate these tools into their teaching (Al Mahmud, 2023; Marzuki et al., 2023).

Second, the research provided important feedback for instructors who teach ESL, helping them understand how to capitalize on the strengths of AI tools while simultaneously addressing the weaknesses (Song & Song, 2023) and adjust their teaching accordingly. Third, the results may have helped some AI developers make adjustments to their tools so that they better assist the act of language learning, rather than the act of text correcting. Ultimately, the study aimed to strike a balance between technological support and skills development, with the intention that AI would facilitate language learning without creating a reliance on it.

Literature Review

AI Tools in Education

Artificial Intelligence (AI) has changed the educational landscape, particularly in writing instruction. AI tools have typically been categorized into four main types: grammar checkers, paraphrasing tools, writing generators, and feedback systems. These tools were designed to assist learners in various ways, such as correcting grammar, refining sentence structure, generating ideas, and expanding vocabulary (Wei, 2023; Akhtar & Tuba, 2015).

Some of the most commonly used AI platforms include Grammarly, ChatGPT, and Write & Improve by Cambridge University Press. Grammarly was designed to assist learners specifically in correcting grammar, punctuation, and style; the tool provided immediate feedback. OpenAI developed ChatGPT, a dialogue-based AI assistant that helped learners generate, organize, and revise content. ChatGPT could also help learners develop ideas for written strategies associated with organizing ideas (e.g., brainstorming). Write & Improve produces structured writing tasks and then generates feedback at the relevant CEFR level, making it suitable to help English language Learners (Al Mahmud, 2023; Ahmed & Akhtar, 2021). Each of the above tools was increasingly integrated into classroom contexts and self-study contexts, especially in cases where writing development was the priority.

AI tools have the potential to personalize learning, lessen the workload on teachers, provide timely feedback, and are therefore more advantageous with large classes and distance learning (Zawacki-Richter et al., 2019; Akhtar, Hussain, Raja, & Tuba, 2020). However, their effectiveness would depend on the effective interaction that learners have with the technology, as well as how the tools themselves are adopted for pedagogical purposes (Akhtar, 2020)

Challenges Faced by ESL Writers

English as a Second Language (ESL) learners often face a range of challenges when writing at an academic level. One of these common challenges generally involves grammatical and syntactical errors, often due to verb tenses, as well as articles and prepositions. The significant difficulties arise from differences between the learners' native languages and English, which results in many mistakes (Hyland, 2019; Ahmed et al, 2020).

Moreover, the limitations of vocabulary and difficulty in selecting the appropriate academic words negatively impacted the efficacy and persuasiveness of ESL students' writing. Coherence and cohesion were also significant problems. Many ESL students discussed ideas without employing logical organization. Additionally, ESL students struggled to use effective transition signals, which made it challenging for them to create essays that followed a logical flow and appeared more polished and formal. (Zhang & Hyland, 2018; Akhtar, 2014).

In addition, writing anxiety is a significant concern because it is prevalent among ESL learners. Most students were concerned about making mistakes, and this often diminished their confidence and led to writing avoidance (Geng et al., 2021; Hussain, Fareed, & Akhtar, 2020). They also exhibited a lack of autonomy and relied heavily on external support (such as translation apps or a peer), which would smartly inhibit their development into independent academic writers. These express concerns illustrate the need for not only error correction tools but also learner-centered tools conducive to writing development. (Hashmi, Hussain, Adeel, Arshad, & Akhtar, 2021)

AI Integration in ESL Contexts

The literature has also highlighted the benefits of AI tools for ESL learners in writing. Tools like Grammarly and QuillBot have been utilized by ESL learners, who have found that the automated feedback and error correction offered by these tools improve their accuracy and fluency. For example, learners using Grammarly were given real-time suggestions that helped reinforce grammar rules and aided in self-correction (Khan et al., 2024; Akhtar & Tuba, 2015). QuillBot also helped learners paraphrase and develop their vocabulary, which in turn supported idea development and lexical diversity (Akhtar, Aslam, & Hussain, 2021).

With these potential benefits, researchers have also highlighted the challenges associated with over-reliance on AI tools. When ESL learners use AI tools without awareness or understanding of the feedback and do not stop to reflect on their writing, they become reliant on these tools and fail to learn to internalize writing skills (Imran & Almusharraf, 2023). Some of the AI-generated feedback was generic or inaccurate, which led to misdirection or confusion for students. Finally, writers deemed the ethical implications of using AI tools in writing assignments undetermined or debated (Wei, 2023; Akhtar & Tuba, 2015). Some educators expressed concern that students were using AI as a tool to fulfill assignments without ever doing actual writing of any kind.

However, when applied appropriately, AI tools further improved the ESL writing process for learners by providing instantaneous, personalized, guided support. Incorporating AI tools into classrooms with the help of teachers helped to minimize any potential risks of using the technology while taking advantage of the benefits of these tools, as learners could reflect and

improve based on the feedback over time (Al Mahmud, 2023; Akhtar et al., 2020).

Theoretical Framework

The Sociocultural Theory of Vygotsky has been operationalized within the current research since the study assumes that social interaction within the learning process and the use of cultural artefacts mediates the learning process. Hereby, AI writing programs served as a medium, which helped learners, orient themselves within their ZPD, which is a range between tasks that they can independently complete and those that they can accomplish with the assistance of mediation (Vygotsky, 1978). Through the provision of scaffolding through multimodal interface, these tools provided instant feedback that guided learners in the identification, understanding, and/or rectification of errors hence inducing higher levels of agency in writing (Reinhardt, 2019; Akhtar, 2020).

To explain this further the Technology Pedagogical Content Knowledge (TPACK) framework has been used to explain how the relationship between AI and teaching English as a Second Language (ESL) exists. According to the model, content knowledge (CK) on the one hand, pedagogical knowledge (PK) on the other and technological knowledge (TK) have to come together in a balanced apposition to enable an individual to possess instructional efficacy (Ali et al., 2023). The requirements thus mean that teachers in the ESL writing sphere have to be well-skilled in writing pedagogy, grammar, and the application of the strategic use of AI tools to better the learners. TPACK represented the interplay of all three domains to develop lessons where AI tools were able to support language development and critical thinking (Akhtar et al., 2021).

While the popularity of AI writing tools continued to grow, few studies had adopted a mixed-method approach to evaluate their effectiveness for ESL learners. Most existing research has focused on either quantitative writing improvements (e.g., grammar scores) or qualitative feedback from learners, but rarely both (Wei, 2023; Ahmed & Akhtar, 2021). This limited our understanding of how learners perceived AI tools and how these tools truly impacted their writing development (Hashmi et al., 2021).

Moreover, there had been limited exploration of long-term effects—whether students continued to improve their writing after using AI tools or if their progress plateaued due to over-dependence. Research was also lacking on the differences in outcomes based on language proficiency, tool usage patterns, or instructional support (Akhtar, 2014). This study aimed to address these gaps by analyzing writing samples, learner perceptions, and tool interaction in a real ESL context, offering a more comprehensive view of AI's role in writing education (Akhtar & Tuba, 2015; Ahmed, Akhtar, & Aslam, 2020).

Methodology

This study followed an explanatory sequential mixed-methods design, which allowed the researcher to first collect and analyze quantitative data and then follow up with qualitative data to explain or expand on the results (Robinson, 2007). In Phase 1, the quantitative phase, a pre-test and post-test writing assessment was conducted to evaluate the effect of AI writing tools on

ESL students' academic writing. Semi-structured interviews were conducted in Phase 2 to explore the students' experiences and beliefs, allowing for a better understanding of their experiences and a good elaboration of the findings from the use of statistics. The rationale for this method was to combine the strengths of statistical analysis with the collection of personal narratives.

The participants of the study were 60 ESL university students. They were divided into two equivalent groups of 30 students. One group was experimental and allowed to use AI writing tools. The other group was a control group that completed the tasks without any AI help. The selection of students was done by stratified purposive sampling to diversify the language proficiency level, and specifically select intermediate to upper-intermediate learners based on CEFR guidelines. This approach assists equitable comparison and contrasts between students with similar abilities in similar backgrounds.

At the start of the study, all students completed a pre-test academic writing task. Over four weeks, each group participated in weekly writing assignments. During those weeks, the experimental group received assistance from AI tools like Grammarly, QuillBot, and ChatGPT while the control group also relied on non-AI tools such as grammar handbooks and peer feedback. At the end of four weeks, the students wrote a post-test essay of a similar difficulty level, which was scored using the same rubric.

After the quantitative phase, 10 to 12 students from the experimental group were chosen to be interviewed semi-structuredly. The aim was to look at their personal experiences, including the difficulties they encountered, how they used the AI tools, and whether they perceived any improvement in their writing. This part deepened the understanding of how students interacted with the tools and whether they developed more self-efficacy and skills in academic writing.

The writing prompts in the pre- and post-tests met IELTS and CEFR B2 level standards for academic relevance. An analytical scoring rubric was used to examine grammar, vocabulary, coherence, cohesion, and response to the task. The AI tools used for the study included Grammarly for grammar corrections, QuillBot for paraphrasing and/or replacing vocabulary, and ChatGPT to expand ideas and use content. (Wei, 2023) A semi-structured interview guide was established to allow for consistency in qualitative data collection while giving the participants the flexibility to provide individual expression.

Results

Quantitative Findings

The quantitative analysis results were conducted to explore the effectiveness of AI tools for ESL learners' academic writing improvement. Pre-test writing scores and post-test writing scores of both experimental and control groups (N = 60) were analyzed using descriptive statistics, paired and independent t-tests, ANOVA, and Cohen's d for effect size.

Descriptive Statistics for Pre- and Post-Test Scores

Group	n	Pre-Test Mean (SD)	Post-Test Mean (SD)	Mean Gain
Experimental	30	5.80 (± 0.60)	7.20 (± 0.50)	+1.40
Control	30	5.70 (± 0.70)	6.10 (± 0.60)	+0.40

Interpretation: Both groups have reported positive differences from pre-test to post-test scores. However, the experimental group of adult ESL students using AI tools Grammarly, QuillBot, and ChatGPT demonstrated a greater gain (+1.40) from pre- to post-test on average than the control group of adult ESL students (+0.40). This suggests that there might be a net positive effect using AI tools on adult ESL academic writing proficiency.

Within-Group Differences: Paired Samples t-Test

Group	t(df)	p-value	Interpretation
Experimental	9.56 (29)	< 0.001	Statistically significant
Control	2.13 (29)	0.042	Statistically significant

Interpretation: Paired t-tests demonstrated that both groups experienced statistically significant improvements from pre- to post-test, but the experimental group's improvement was statistically highly significant ($p < 0.001$), suggesting that the improvement from the experimental group was even more meaningful, likely due to the AI writing tools.

Between-Group Differences: One-Way ANOVA (Post-Test Scores)

Source	SS	df	MS	F	p-value
Between Groups	7.84	1	7.84	16.45	< 0.001
Within Groups	27.92	58	0.48		
Total	35.76	59			

Interpretation: ANOVA results confirmed a statistically significant difference in post-test performance between the experimental and control groups ($F = 16.45$, $p < 0.001$), supporting the hypothesis that access to AI tools resulted in greater improvement.

Effect Size Calculation (Cohen's d)

Group	Mean Gain	SD	Cohen's d	Effect Size Interpretation
Experimental	1.40	0.62	2.26	Very Large
Control	0.40	0.70	0.57	Moderate

Interpretation: Effect size analysis shows a huge practical impact of AI tools on writing improvement ($d = 2.26$) in the experimental group, compared to a moderate effect in the control group ($d = 0.57$). This reinforces the inference that AI assistance notably enhances grammar, coherence, and writing structure.

Qualitative Findings

Theme 1: Increased Writing Confidence

A recurring narrative among participants was a noticeable rise in self-assurance while engaging in academic writing tasks. While writing essays, many students have reported a decrease in anxiety and reluctance because of instant feedback provided to them through AI tools. It improved their confidence in the correctness of the grammar used in their writing and the clarity of their arguments.

One student was heard saying:

"I used to get very nervous just before submitting any of my writings, but once I would see suggestions from either Grammarly or ChatGPT, I felt as though I had a second opinion for support, thus giving me further confidence".

This perception shift created a student who was indeed taking up more initiatives in his writing work, making the response somewhat proactive in task completion as well.

Theme 2: Improved Vocabulary and Sentence Structure

The participants also felt that the use of the AI tools contributed to their lexical range and syntactic fluency. For example, a program like QuillBot was beneficial in offering up alternatives for wording or rephrasing a text, which students had not previously contemplated. Sometimes, students had an idea of what they wanted to write, but did not know how to say it better. As the participants noted, as time went on, students felt their language became more formal and academic.

"Sometimes I had an idea but didn't know how to say it better - when I used QuillBot or ChatGPT, I found new words and better ways of writing."

This, in turn, would have not only improved writing quality but also contributed to the students' active vocabulary and grammatical awareness.

Theme 3: Dependence on AI vs. Skill Development Nevertheless, many participants reported worries about becoming enslaved to AI advice. Some would admit that they accepted changes suggested by the tool, without knowing the rationale, raising the question whether this was really learning.

"Honestly, I just clicked accept on most of the suggestions. I didn't always know why the tool was correcting something."

This theme shows the conflict between immediate improvement and long-term skill acquisition. Using the AI tools as scaffolds through proper mediation may not risk skipping learning.

Theme 4: AI as a Revision and Learning Tool

Several students depicted a mixed strategy under which AI tools could be involved in the revising part rather than the initial drafting phase. In such cases, such aids were taken rather as educational assistants than as mere correctors.

Students engaged with feedback actively, sometimes comparing the suggestions of several instruments or asking for clarification in the form of additional prompts.

"I utilized Grammarly in the end, functioning like a spell checker, but also for style."

I further asked ChatGPT about the error in my sentence. It made me comprehend grammar more conveniently. Such activity on learning promoted self-observation and an increased sense of language practice and awareness as a part of the goals of producing independent academic writers.

Mixed-Methods Integration The study used a mixed-methods design to investigate how the use of artificial-intelligence (AI) writing tools affects the academic writing output of English as a Second Language (ESL) learners. Combining the quantitative and qualitative data assisted in interpreting the statistically significant improvements better in the experimental group and helped clarify the mechanisms of these improvements.

Convergence of Quantitative and Qualitative

The experimental group scored big when it came to academic writing: the effect size measures Cohen's $d = 2.26$, as quantitative analyses show. The strongest improvements in grammatical correctness, coherence, and adherence to the rules of the academic written style were realized.

Similar qualitative data provide a better insight into the experience of learners when using an AI-assisted writing aid. Grammarly, especially, was always remarked on for its ability to identify and correct the same grammatical errors. One respondent reported that he /she stopped making the same grammatical errors after a few essays because he /she saw those errors that he /she consistently made, hence demonstrating the effect of recurring, corrective feedback and pattern awareness.

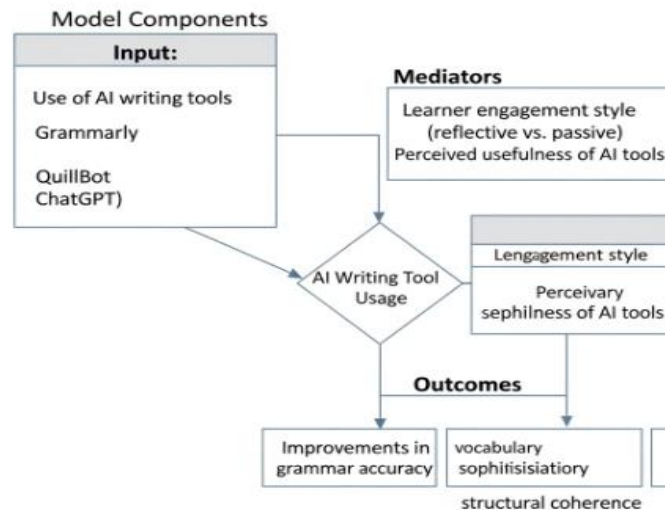
Additional tools like QuillBot and ChatGPT have repeatedly been mentioned as tools to help support vocabulary acquisition and lexical diversity. Several respondents talked about their experiences working with AI-driven recommendations, evaluating them, and incorporating those suggestions only to some extent.

The given reflective practice is in line with the theory of sociocultural development by Vygotsky, especially the Zone of Proximal Development (ZPD), where the learning process is mediated by cooperation with more experienced people, in this case, more intelligent digital assistants.

Overall, these qualitative descriptions suggest that the progress recorded is not only the result of automated correction but also due to the involved metalinguistic activities of the learners. Feedback was acquired rather than received, and language awareness was developed, leading to long-term and significant improvements in academic writing by students.

Findings Conceptual Model of AI Use and Writing Outcomes

Based on the existing body of literature, the conceptual model was constructed to describe the interrelation between using the tools of AI, engagement of learners, and academic writing proficiency. The model outlines major processes by which writing assisted by AI has an impact on the learning outcomes.



Interpretation of the Model

In the current research, AI-based inventions acted as online scaffolds in the creation of real-time feedback and different wording. The effects of these, however, were subject to two moderating variables, which determined the magnitude of the effects. Students in the reflective engagement style were able to achieve stronger learning improvements as compared to students who used less critical approaches towards the use of AI tools.

Moreover, learners who found AI software helpful demonstrated increased amounts of active engagement as well as more efficiently used AI-recommended changes in their writing.

The combination of all these factors, including the use of tools, cognitive involvement, perceived utility, led to the measurable increase of the academic writing performance, as the most significant improvement was noticed in regard to such aspects as grammatical correctness, vocabulary enrichment, and cohesion, both overall and among the students with high involvement and the positive attitude toward AI-enhanced writing.

Educational Implications

A study of AI writing tools of an integrated nature demonstrates a significant degree of variability in tool effectiveness among learners. Results of performance metrics prove that the outcome of impact depends on engagement patterns and the attitude of learners.

These results have important pedagogical implications: teachers should thus aim at implementing reflective learning and strengthening their digital literacy to ensure that students take advantage of existing AI assistance in the best way.

The endorsement of learners to question and interrogate the feedback they are given and critically assimilate it, as an alternative to blindly accepting recommendations, is presumably to stimulate

metacognitive competence and make meaningful, lasting progress with and on the academic writing levels.

Discussion

This exploration indicates that the resources that have AI capabilities, such as Grammarly, ChatGPT, and QuillBot, enhance the academic writing skills of English learners as a second language considerably. The quantitative dataset proves the effect on both grammar accuracy, vocabulary range, and logical organization, with an enormous effect size (Cohen $d = 2.26$) on the participants of the experimental group. Such results are supported by qualitative ones, which display the increase of writing confidence and the enhanced ability of revising and presenting complex ideas (Wei, 2023; Imran & Almusharraf, 2023).

Participants stressed that immediate writing-related feedback provided by Grammarly and ChatGPT helped to eliminate anxiety associated with writing tasks and enable a desire to explore variety in linguistic options (Zawacki-Richter et al., 2019; Geng et al., 2021). The students also admitted the structural and lexical suggestions offered by QuillBot, and it resulted in a higher syntactic fluency and a scholarly tone (Akhtar, Aslam, & Hussain, 2021).

Some groups of learners, however, complained of over-reliance on such tools, sharing that they regularly accepted the correction without complete understanding (Imran & Almusharraf, 2023). This disposition is able to contribute to superficial learning, and this fact dictates the importance of making intentional design as a mode of creating critical involvement in feedback.

Comparison with Existing Studies

The current paper confirms the past evidence and shows the usefulness of AI tools in improving grammar and vocabulary in a second-language writing (Khan et al., 2024; Al Mahmud, 2023). In particular, it demonstrates that the scaffolding that AI affords to learners at the stage of composing a draft and the stage of revision is beneficial (Akhtar & Tuba, 2015; Zhang & Hyland, 2018).

This study brings some new knowledge with a complete analysis of perception among learners that has disclosed motivational impact and learning engagement patterns. The participants also claimed that they used AI as a learning companion, that they asked ChatGPT questions to help them clarify, and that they referred to Grammarly to see what mistakes they made frequently. These kinds of actions are indicative of the fact that the individual has transitioned to reflective tool use (Song & Song, 2023; AbuSahyon et al., 2023).

In addition, the study builds on the precedents by placing the dangers of a dependency on automated assistance in the foreground and highlighting the ethical considerations of such tools in academic settings (Wei, 2023; Raheem et al., 2023).

Implications for Theory

The Sociocultural Theory elaborated by Vygotsky shall be confirmed by the present study, which will manifest that AI tools performed the role of cognitive mediator in a Zone of Proximal Development (ZPD) (Vygotsky, 1978; Reinhardt, 2019).

The functionalities of the tools contributed to the growth of the learners as they provided immediate

personalized feedback, making them independent and capable of functioning on their own in tasks involving writing. Further, the findings also support the Technological Pedagogical Content Knowledge (TPCK) framework due to its evidence of successful use of digital tools to provide ESL writing instruction.

In the case of the balance of technological, pedagogical, and content knowledge, teachers create more efficient interventions, making AI tools pedagogically significant (Ali et al., 2023; Akhtar et al., 2021).

Implications for Practice

A variety of practical implications are demonstrated in the findings. Most importantly, AI technologies like Grammarly and ChatGPT can be used by ESL teachers as a complementary tool, which will enhance the involvement of students and perfect the revision of their writing. Writing tools should be implemented in a well-structured process of writing, but not as an isolated job.

Second, there is no education without digital literacy. Students should be taught how to not just use AI tools but also critically assess the information, question it, and use it meditatively. Without this teaching, students will be exposed to a thoughtless sense of reliance that might undermine the growth of lifelong skills.

Third, a writing education to promote metacognitive skills that can help learners to identify when and how AI tools could be effectively utilized should be created with an aim of establishing a healthy balance between automation and human decision-making.

Conclusion and Recommendations

The current research has analyzed the effects of SE writing assistants on the academic prose writing skills of English as a Second Language (ESL) students. The study participants were 60 university students randomly divided into two groups, the experimental and control ones; the former was the only one who could use Grammarly, QuillBot, and ChatGPT. After a 4-week period of interventions, the effect of the interventions was statistically significant and improved writing scores of the experimental group as compared to those of the control group.

In addition to these quantitative results, the participants mentioned increases in confidence, motivation, and responsiveness to writing assignments. In qualitative data, it was found that a relatively high percentage of students used automatically generated feedback to enhance grammar, develop vocabulary, and structural clarity. However, in some cases, those who responded acknowledged using suggestions without understanding the corrections, which meant that the passive participation was a hindrance to long-term skill development.

Recommendations for Practice

The results of the research justify the following recommendations to increase the implementation and pedagogical use of AI writing support in the educational process in ESL:

- 1. Include AI tool training in the process of teaching writing:** AI-related knowledge should be tested and integrated as part of the pedagogic course compulsory modules to make the students familiar with the actual mechanics of running AI, as well as understanding the educational value of the feedback the system produces.

2. Encourage active instead of passive tool use: Students must be indoctrinated to evaluate the AI-suggested recommendations critically, an activity that not only leads to a better comprehension of linguistics but also to an internalization of several recurring language forms.

3. Implement AI tools at the revising phase foremost: The tools should be implemented to notify and direct revisions, but not as a replacement or alteration to the original drafting process, as it is considered important that the students should be allowed to develop independent and unique work, and only then should they be offered feedback.

4. Coordinate AI use and comments made by the teacher: The AI guidance should help to enhance the comments made by the teacher, but not replace them. Human monitoring is still essential when it comes to such intricate aspects as argumentation, structural integrity, and development of an academic style.

5. Incorporate digital literacy in the ESL curriculum:

The Curriculum should incorporate the aspects that enable students in the course to understand the ethical, academic, and strategic consequences of using AI in academic writing.

6. Keep track of AI tool utilization: Regular tracking of AI tool use will ensure that it stays a supplement to learning, not a replacement, by means of assessment, eg, student weekly reflective journals or a logging of AI tool use, or general classroom discussion.

Future Research Suggestions

The findings of this study suggest that future research should consider the following directions:

1. Longitudinal design: Find out whether AI-assisted writing gains have the staying power; the learners will have their performance and retention of skills measured during successive semesters.

2. Scale and diversity: Consider diversifying and extending the pool of potential participants and enrolling more heterogeneous samples of participants, in terms of the institution (institutions, rather than a single institution), region, and linguistic background, to enhance external validity and contextual sensitivity.

3. Comparison of particular instruments: Use controlled, paired Comparisons to analyze discrete benefits (grammar, lexicon, coherence, and organization structure) on specific instruments (Grammarly, Quillbot, and ChatGPT).

4. Differentiation of the proficiency level: Explore the level of interaction with AI systems and possible differences in the final results of writers of different proficiency levels.

5. Teacher attitudes and curricular fit: contrast how teachers view AI tools and how they are ready to incorporate them into instruction and the instructional models they use to support meaningful use of AI.

6. Cognitive and behavioral impacts: Find out the impacts of AI-supported writing of

metacognitive monitoring, writing behavior, and autonomous motivation to learning more language.

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