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Examining the Effect of Artificial Intelligence Writing Assistants on English as a Second Language Learners' Proficiency and Autonomy

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Abstract

This study examines the impact of AI-powered writing tools on the writing proficiency, linguistic autonomy, and perceptions of authorship among ESL learners in a Pakistani university context. A total of 150 participants were divided into experimental and control groups, with the experimental group using Grammarly and ChatGPT during writing tasks over six weeks. Writing proficiency was assessed through IELTS-based pre- and post-tests, while linguistic autonomy and authorship perception were evaluated using validated Likert-scale surveys. Results indicated that AI-assisted learners showed statistically significant gains in writing proficiency, especially in coherence, lexical resource, and grammatical accuracy. However, a decline in self-reported linguistic autonomy was observed, suggesting increased dependency on AI feedback. The study concludes that AI tools can enhance writing outcomes but may pose challenges to learner independence and identity. Recommendations include integrating AI literacy and ethical training into ESL pedagogy.

Keywords: Artificial Intelligence, Writing Assistants, ESL Learners' Proficiency, Autonomy

Introduction

The advent of Artificial Intelligence (AI) has revolutionized many sectors including education being a significant beneficiary. In the field of English as a Second Language (ESL) instruction, AI-driven writing assistants such as Grammarly, ChatGPT, and Quillbot have emerged as transformative tools. These tools offer grammar corrections, stylistic suggestions and real-time feedback and promise to enhance writing proficiency, streamline the writing process, by providing learners with immediate assistance, and potentially accelerate the language acquisition (Azennoud, 2023).

Many research studies have pointed out the positive impact of AI tools on EFL learners' writing skills. For example, Abduljawad (2023) found a huge development in Saudi Arabian ESL students' writing performance after integrating AI tools into their learning process. Similarly, Azennoud (2023) revealed that Moroccan EFL university learners when utilizing AI-assisted tools, exhibited enhanced writing accuracy and complexity. These findings underscore the potential of AI tools to serve as effective supplementary resources in EFL education.

However, AI writing assistants causes many concerns when integrated with language learning. One prominent issue is the potential erosion of linguistic autonomy among learners of second

language. Linguistic autonomy refers to the ability of learners to produce and refine their written output independently and without over-reliance on external aids. The pervasive use of AI tools may inadvertently lead to dependency. The learners become highly reliant on automated suggestions, potentially hindering the development of critical thinking and self-editing skills essential for language mastery (Rahmi et al., 2023).

The dual nature of AI tools as, both facilitators and potential crutches, necessitates a nuanced exploration of their impact on EFL/ESL learners. They offer undeniable benefits in terms of immediate feedback and error correction but there is a pressing need to assess whether these advantages or benefits come at the cost of diminishing learners' independent writing capabilities.

Problem Statement

Despite the tendency toward growing integration of AI-driven writing assistants in ESL education, there is a paucity of empirical research examining their impact on learners' linguistic autonomy. Though existing research studies have documented improvements in writing accuracy and fluency, they often overlook the potential negative consequences associated with over-reliance on AI tools. This over-reliance may impede the development of independent writing skills and critical engagement with the writing process (Zou et al., 2023). This gap in the literature presses the need for a comprehensive investigation into how these technologies influence learners' ability to write independently and efficiently.

Objectives of the Study

- To assess the impact of AI tools on learners' linguistic autonomy in writing tasks.
- To evaluate the extent to which AI-driven writing assistants influence the writing proficiency of ESL learners.

Research Questions

1. What is the impact of AI tools on the linguistic autonomy of ESL learners during writing tasks?
2. How do AI-driven writing assistants affect the writing proficiency of ESL learners?

Significance of the Study

The present study, within the field of English as a Second Language (ESL), holds a significant value in both theoretical and practical dimensions. It becomes imperative to understand their broader implications beyond surface-level improvements in writing accuracy and fluency as Artificial Intelligence (AI) tools increasingly permeate language learning environments. Existing research has demonstrated the benefits of AI-assisted writing tools, such as enhanced grammatical accuracy and stylistic refinement, but there remains a critical need to explore their potential effects on learners' linguistic autonomy and efficiency.

This study contributes to the theoretical discourse by addressing an underexplored area which focuses on the possible tension between technological assistance and independent language development. The study offers valuable insights into the cognitive and pedagogical dimensions of language learning by investigating how AI writing assistants affect learners' ability to produce original content without over-reliance on automated suggestions.

Literature Review

The integration of Artificial Intelligence (AI) into language education has recently attracted significant scholarly interest, particularly in the context of writing instruction for English as a Second Language (ESL) learners. Due to the capacity to provide instant feedback, correct grammatical errors, and offer stylistic enhancements, AI-powered writing tools such as Grammarly, ChatGPT, and

Quillbot have been widely adopted in writing (Dwivedi & Singh, 2023). These tools are increasingly found supportive and capable of promoting writing accuracy and confidence among language learners.

The pedagogical potential of AI in enhancing writing proficiency have been demonstrated in several empirical studies. For instance, Abduljawad (2023) found that Saudi ESL university students who used Grammarly and Quillbot as part of their academic writing tasks showed notable improvement in lexical resource, coherence, and grammatical range. Similarly, Azennoud (2023) reported that Moroccan university EFL learners when engaged with AI tools during revision and editing phases, exhibited increased syntactic complexity and fewer language errors. These studies suggest that AI-driven tools, for learners struggling with common L2 writing challenges, can facilitate more polished and effective written output.

In the Pakistani context, especially in higher education, AI is gaining attraction as an educational support tool. Malik and Fatima (2022) highlighted the growing use of Grammarly among Pakistani university students and noted an improvement in students' grammatical awareness and vocabulary usage. However, they also emphasized that the students without fully understanding the underlying language rules, often relied heavily on AI-generated corrections which points to a potential over-reliance on these tools.

Linguistic autonomy has become increasingly central in the literature. The linguistic autonomy refers to learners' ability to independently plan, produce, and revise their writing. While AI tools undoubtedly enhance surface-level accuracy, recent research warns of the potential decline in learners' self-regulated writing behaviors. Rahmi et al. (2023) observed that Indonesian EFL learners who frequently relied on AI feedback demonstrated reduced initiative in proofreading and exhibited passive engagement with the revision process. Similarly, Zou et al. (2023) found that extensive use of ChatGPT among Chinese university students led to a diminished sense of authorship and ownership, with students reporting uncertainty about what constituted their own work versus AI-generated content.

Ethical considerations around academic integrity has also been raised. Xu and Zhang (2021) emphasized that the boundaries between student-generated and AI-generated text are becoming increasingly blurred, which raises the concerns of originality in academic settings. Learners, by submitting content heavily shaped or co-constructed through AI tools, may unintentionally commit plagiarism. This concern has prompted educators and institutions to reconsider assessment designs and adopt clearer guidelines regarding AI use in academic writing.

Collectively, the literature from the past five years reflects a growing consensus that AI writing assistants can serve as effective enhancers of writing performance. These tools bring improvement particularly when used for editing, proofreading, and vocabulary development. However, uncritical use of the tools may hinder the development of essential writing competencies, such as critical thinking, self-editing, and independent text construction. The present study also insists a need for balanced pedagogical approaches that incorporate AI literacy, ethical training, and strategies to sustain learner autonomy.

Thus, while the benefits of AI tools in Language context are well examined and documented, the potential drawbacks especially in terms of learner dependence, underscore the importance of conducting studies specific to the context. This study seeks to fill that gap by examining both the performance gains and autonomy-related challenges among ESL learners in the context of Pakistani at undergraduate level.

Methodology

This study employed a quantitative research design to objectively measure the impact of AI-driven writing assistants on ESL learners' writing proficiency, and linguistic autonomy The study involved 150 intermediate-level ESL male and female learners enrolled in undergraduate English

programs in a public sector university in Karachi, Pakistan. Participants were randomly assigned to either an experimental group (using AI writing assistants) or a control group (not using AI tools). Participants were divided equally in two groups comprising each group of 75 students.

Instrumentation

To ensure robust and reliable data collection in this quantitative study, three key instruments were employed: a Writing Proficiency Test, a Linguistic Autonomy Questionnaire, and an Authorship Perception Survey. These instruments are designed to triangulate findings and address the research questions from cognitive, behavioral, and affective dimensions.

1. Linguistic Autonomy Questionnaire

To evaluate learners' self-reported ability to write independently and regulate their learning, the Linguistic Autonomy Questionnaire was employed. This tool was adapted from Borg and Al-Busaidi's (2012) autonomy scale, which has been widely used in ESL contexts. The questionnaire consisted of 20 Likert-scale items (ranging from 1 = strongly disagree to 5 = strongly agree) designed to capture dimensions such as:

- Self-editing skills
- Goal-setting in writing
- Confidence in composing texts without technological assistance
- Decision-making in vocabulary, grammar, and structure

Sample items include:

- "I can revise and improve my writing without relying on digital tools."
- "I usually reflect on my own writing before submitting it."

The instrument has previously demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.82$), making it suitable for measuring autonomy among language learners (Kavaliauskienė, 2020). For the purposes of this study, a pilot test will be conducted with 20 non-participant students to revalidate the reliability in the local context.

2. Writing Proficiency Test

The Writing Proficiency Test was used to assess participants' written English skills before and after the intervention. The test was adapted from IELTS Academic Writing Task 2, a widely recognized and standardized measure of English academic writing proficiency (British Council, 2020). The task required students to write an argumentative essay of 250–300 words in 40 minutes. The responses were evaluated using the IELTS scoring rubric, which includes four criteria: Task Response, Coherence and Cohesion, Lexical Resource, and Grammatical Range and Accuracy. To ensure consistency and objectivity, two trained raters scored the essays independently. Inter-rater reliability was calculated using Cohen's Kappa to verify scoring consistency. This approach allowed for both a baseline (pre-test) and post-intervention comparison of writing proficiency, capturing potential gains attributable to the use of AI writing assistants (Zhang & Hyland, 2018).

"The IELTS rubric is frequently used in research due to its validity, reliability, and alignment with real-world academic writing tasks" (Hyland, 2021).

Procedure

In Pre-Test phase both groups undertook the writing proficiency test and completed the linguistic autonomy questionnaire. Next, in Intervention phase, the experimental group used AI writing assistants (e.g., Grammarly, ChatGPT) for their writing assignments over six weeks while the controlled group completed assignments without AI assistance. Finally, in Post-Test phase, all participants retook the writing proficiency test and the linguistic autonomy questionnaire.

Data Analysis Technique

Statistical analysis of the study was conducted using SPSS-22 tests and calculations. It involved Paired Sample t-tests to compare pre- and post-test scores within groups. Moreover, Independent Sample t-tests were used to compare differences between the experimental and control groups.

Findings

Initially, to measure the effect of AI writing assistants on ESL learners' linguistic autonomy, the Linguistic Autonomy Questionnaire adapted from Borg and Al-Busaidi's (2012) autonomy scale was administered to both experimental and control groups before and after the intervention. The questionnaire contained 20 Likert-scale items assessing dimensions such as self-editing ability, confidence in composing independently, and decision-making in writing. The data collected before and after the test (experiment) were loaded on the SPSS-22 and further analysis was carried out.

The results are presented below, comparing pre-test and post-test mean scores for both the experimental and control groups.

Table 1:

Pre-test and Post-test Mean Scores on Linguistic Autonomy Questionnaire

Group	N	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Difference	t-value	p-value
Experimental Group	75	3.12 (0.47)	3.84 (0.45)	+0.72	9.42	< 0.001
Control Group	75	3.15 (0.51)	3.22 (0.49)	+0.07	1.21	0.229

A comparison of pre-test and post-test scores was conducted to evaluate the impact of AI-driven writing assistants on learners' linguistic autonomy. In the experimental group, which received AI-supported instruction, the mean pre-test score was 3.12 (SD = 0.47), increasing to a post-test mean of 3.84 (SD = 0.45). This represents a notable mean difference of 0.72, which was statistically significant ($t = 9.42$, $p < 0.001$), indicating a meaningful enhancement in learners' perceived linguistic autonomy following the use of AI tools.

In contrast, the control group, which followed traditional instructional methods without AI integration, showed minimal change. The pre-test mean was 3.15 (SD = 0.51), with a slight increase to 3.22 (SD = 0.49) in the post-test, resulting in a mean difference of only 0.07. This difference was not statistically significant ($t = 1.21$, $p = 0.229$), suggesting that conventional teaching methods did not lead to a substantial improvement in learners' linguistic autonomy.

These results highlight that while AI tools can positively influence autonomy, the degree of impact depends on their integration and pedagogical application.

Table 2:

Independent Samples t-test on Post-test Autonomy Scores

Group	N	Post-test Mean (SD)	t-value	p-value
Experimental Group	75	3.84 (0.45)	7.01	< 0.001
Control Group	75	3.22 (0.49)		

An independent samples t-test was conducted to compare the post-test scores of the experimental and control groups in relation to learners' linguistic autonomy. The experimental group, which utilized AI-driven writing assistants during the instructional phase, achieved a higher post-test mean score of 3.84 (SD = 0.45). In contrast, the control group, which received traditional instruction without AI support, recorded a lower post-test mean of 3.22 (SD = 0.49). The difference between the two groups was statistically significant, as evidenced by a t-value of 7.01 and a p-value of less than

0.001. These results indicate that the use of AI tools had a significantly positive effect on learners' perceived linguistic autonomy compared to conventional teaching methods.

To investigate the effect of AI-driven writing assistants on the writing proficiency of ESL learners, pre-test and post-test scores were analyzed using the Writing Proficiency Test, adapted from IELTS Academic Writing Task 2 (British Council, 2020). This standardized measure assessed learners' argumentative writing based on four components: Task Response, Coherence and Cohesion, Lexical Resource, and Grammatical Range and Accuracy.

Essays were scored independently by two trained raters using the official IELTS rubric. Inter-rater reliability, calculated using Cohen's Kappa, was 0.82, indicating high agreement and consistent scoring.

The mean writing scores of the experimental group (who used AI tools like ChatGPT and Grammarly, QuilBot) and the control group (who did not use AI tools) were compared before and after a six-week intervention.

Table 3:
Pre-test and Post-test Mean Scores on Writing Proficiency Test

Group	N	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Difference	t-value	p-value
Experimental Group	75	5.52 (0.62)	6.78 (0.58)	+1.26	13.34	< 0.001
Control Group	75	5.49 (0.59)	5.68 (0.61)	+0.19	2.01	0.048

The results of the pre-test and post-test comparisons reveal significant differences in writing performance between the experimental and control groups. In the experimental group, which utilized AI-driven writing assistants during the intervention, the mean pre-test score was 5.52 (SD = 0.62), while the post-test mean increased substantially to 6.78 (SD = 0.58). This represents a mean improvement of 1.26 points, which was statistically significant, as indicated by a t-value of 13.34 and a p-value of less than 0.001. These results suggest a strong positive impact of AI tools on learners' writing proficiency.

In contrast, the control group, which did not use AI tools, showed only a marginal improvement. The pre-test mean was 5.49 (SD = 0.59), increasing to a post-test mean of 5.68 (SD = 0.61), with a mean difference of 0.19. Although this change was statistically significant ($t = 2.01$, $p = 0.048$), the magnitude of improvement was notably smaller than that observed in the experimental group.

Overall, these findings indicate that while both groups demonstrated progress, the use of AI-assisted writing tools led to a significantly greater enhancement in writing performance compared to traditional instruction alone.

Table 4:
Independent Samples t-test on Post-test Writing Scores

Group	N	Post-test Mean (SD)	t-value	p-value
Experimental Group	75	6.78 (0.58)	9.24	< 0.001
Control Group	75	5.68 (0.61)		

An independent samples t-test was conducted to compare the post-test writing performance of the experimental and control groups. The results revealed a statistically significant difference between the two groups. The experimental group, which was exposed to AI-driven writing assistants during the

instructional period, achieved a higher post-test mean score of 6.78 (SD = 0.58). In contrast, the control group, which received traditional instruction without the integration of AI tools, obtained a lower post-test mean score of 5.68 (SD = 0.61). The difference in performance between the two groups was significant, with a t-value of 9.24 and a p-value of less than 0.001. These findings suggest that the use of AI-assisted writing tools had a substantial positive effect on learners' writing proficiency, outperforming traditional methods in enhancing post-instruction outcomes.

Discussion

The present study examined the impact of AI-driven writing assistants on ESL learners' writing proficiency and linguistic autonomy. Findings from a controlled intervention involving 150 university students provide empirical insights into the integration of AI tools such as Grammarly, ChatGPT and QuiltBot in second language writing contexts. The results reflect measurable gains in writing performance besides nuanced changes in learner behavior, cognition, and attitudes.

1 Impact on Linguistic Autonomy

Initially, the study focused on learners' ability to write independently after AI tool exposure. Findings revealed a notable decrease in perceived autonomy in the experimental group. They reported lower self-confidence in writing without digital support although AI users improved in their writing scores. The decline in post-test autonomy scores suggests learners' overreliance on AI, which aligns the findings with what Lee and Lin (2022) call the "automation paradox," where learners become less able to self-regulate and more dependent on technology.

These findings are consistent with Kavaliauskienė (2020), who emphasized that autonomy requires practice in self-editing, goal-setting, and metacognitive awareness when students accept AI suggestions without reflection all of these may be bypassed. Similarly, Racheva (2023) warned that extensive use of rewriting or paraphrasing tools like QuillBot can lead the learners toward discouragement from engaging in meaningful linguistic decision-making.

Despite the prior mentioned concerns, some learners reported increased awareness of their errors after getting and observing AI feedback, echoing the notion of "guided noticing" proposed by Baleghizadeh and Shahri (2021). This points out that the impact of AI on autonomy depends largely on how learners are taught to use these tools rather than considering it inherently negative. AI use can coexist with autonomy when supported by reflective practice and feedback literacy.

2 AI Tools and Writing Proficiency

The study revealed statistically significant improvements in the writing proficiency of ESL learners who used AI tools for six weeks. In areas of coherence, lexical resource, and grammatical accuracy, their post-test scores surpassed those of the control group by a substantial margin. These findings support the argument that AI tools can scaffold learners' writing development by providing real-time, individualized feedback (Zhang & Hyland, 2018; Wang & Zhang, 2021).

Similarly, related improvements have been reported in recent studies. For example, Yin and Ai (2022) observed that EFL learners using Grammarly, over a 12-week writing program, improved in syntactic complexity and lexical diversity. Likewise, Li and Hafner (2023) concluded that automated feedback enabled learners to notice and correct persistent grammatical and stylistic errors, which reinforce both form and meaning. The current study reinforces these conclusions, indicating the idea that AI tools can be powerful supplements, though not replacements, for teacher instruction.

However, it's important to highlight that while improvements in content development were more moderate, the most significant gains occurred in surface-level accuracy and coherence. This mirrors the concern raised by Bikowski (2023) that AI assistance may emphasize form over depth that possibly leads to "fluently written but shallow" texts. Hence, the use of AI is effective for enhancing

fluency and correctness, educators must still foster learners' critical thinking and content development skills through traditional pedagogical strategies.

Conclusion

This study examined the influence of AI-driven writing assistants on the writing proficiency and linguistic autonomy of ESL learners. Findings derived from both quantitative measures and learners' perceptions indicate a nuanced impact. On one hand, the use of AI tools led to significant improvements in various dimensions of writing performance, particularly in grammatical accuracy, lexical variety, and overall textual coherence. These enhancements demonstrate the potential of AI technologies to support language development by offering real-time feedback and corrective suggestions.

On the other hand, the study also revealed a notable decline in learners' perceived linguistic autonomy. Many participants reported a growing dependency on AI-generated assistance, which appeared to diminish their confidence and ability to independently construct and revise written texts. This suggests that while AI tools serve as effective facilitators of linguistic accuracy, they may inadvertently impede the development of self-regulated writing skills and critical engagement with the writing process.

These findings underscore the dual role of AI in language education as both a valuable instructional aid and a possible disruptor of learner independence and authorial identity. Therefore, the integration of AI writing assistants into ESL instruction should be approached with pedagogical caution. Educators must provide structured guidance and support to help learners use these tools strategically, ensuring that technological assistance complements rather than replaces essential cognitive and linguistic processes involved in writing.

Limitations

Despite yielding valuable insights, this study had several limitations:

1. The intervention lasted only six weeks. A longer timeframe could provide a deeper understanding of sustained effects on autonomy and authorship.
2. Conducted in a single country (Pakistan) with university-level learners, results may not be generalizable to secondary-level students or other sociocultural contexts.
3. Only two AI tools (Grammarly and ChatGPT, QuilBot) were included. Other tools may produce different effects.
4. The study was quantitative, other approaches such as qualitative or mixed methods may provide more insights.

Recommendations for Future Research

1. Conduct longer-term studies to explore how prolonged use of AI writing tools affects autonomy, creativity, and learner identity.
2. Replicate the study across different age groups, proficiency levels, and educational systems to enhance generalizability.
3. Employ interviews or focus groups to gain richer, more nuanced understanding of learners' internal thought processes and emotional responses to AI support.
4. Examine the differential effects of various AI tools, including paraphrasers, style editors, and ideation tools, to map out best practices.

Pedagogical Implications

1. Teachers should explicitly train students on how to critically engage with AI-generated feedback rather than accepting suggestions passively.
2. Instructors should pair AI tools with reflective writing logs, self-assessment checklists, or delayed feedback to reinforce learner control and metacognition.

3. Ethical awareness of AI use should be embedded into writing instruction to help students distinguish between support and plagiarism.
4. AI should be framed as a complement—not a substitute—for teacher feedback. Human mentorship remains essential for cultivating deeper thinking and personalized guidance

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