Journal of Research in Education (JoRE)
ISSN: 3059-9741
Published by: Journal of Research in Education (JoRE)
A Multidisciplinary Peer Reviewed Open Access Journal
Email: jore.centralcampus@gmail.com
Website: http://education.fwu.edu.np/

Impact of AI-Based Tools on Writing Skills

Pohanyar Qyamudin Ziar
Kabul University, Afganistan
qyamudin.ziar@gmail.com

Abstract

The increasing presence of artificial intelligence (AI) in education has led to the widespread use of AI writing assistants like Grammarly, QuillBot, and GPT-based tools. These tools promise to enhance writing quality by improving grammar, style, and clarity. However, their effects on long-term writing skills, particularly in academic settings, remain a topic of concern. This study investigates the impact of AI writing assistants on the writing skills of 100 English Language and Literature students at Kabul University. As their writing teacher, I conducted this research using a structured questionnaire to collect data about students' usage patterns, experiences, and perceptions of AI writing assistants. The results show that while students benefit from AI tools in terms of grammar and productivity, many express concerns about over-reliance and reduced critical thinking in writing. This research provides valuable insights into the role of AI in academic writing and offers recommendations for integrating AI tools without compromising skill development.

Keywords: *Educational technology, Artificial intelligence, Language learning, Writing, improvement, Academic writing, Over-reliance on Technology.*

INTRODUCTION

The integration of artificial intelligence (AI) into education has fundamentally transformed how students approach academic tasks, particularly writing. AI writing assistants, such as Grammarly, QuillBot, and GPT-based tools, are now widely used by students to improve grammar, style, and content generation. These tools offer instant feedback, helping users correct errors and refine their writing more efficiently. According to Smith (2021), AI writing assistants have become particularly popular among non-native English speakers, as they provide

personalized, real-time feedback that helps users avoid common mistakes. However, while AI tools are undeniably beneficial for surface-level improvements in grammar and structure, there is growing concern about their impact on students' long-term writing skills. Adams (2020) highlights that over-reliance on these tools could hinder the development of critical thinking, creativity, and self-editing abilities, raising questions about their role in academic learning.

The increasing dependence on AI tools among students has sparked debate among educators and researchers. While AI tools can reduce cognitive load and enhance productivity, they might also encourage a passive approach to writing. Miller (2019) notes that students who frequently use AI tools may fail to engage deeply with the writing process, relying on automated suggestions rather than developing their own critical editing skills. Similarly, Elbow (1998) emphasizes the importance of individual voice and creativity in writing, which may be diluted when students adopt AI-generated suggestions without reflection. Despite these concerns, the adoption of AI tools continues to grow, particularly in academic contexts where students are seeking ways to improve their writing under time constraints (e.g., Jones & Brown, 2020).

While AI writing assistants have demonstrated their ability to enhance grammatical accuracy and productivity, their long-term effects on students' writing proficiency remain unclear. Research has shown that while these tools help students achieve immediate improvements in their writing, they may not necessarily foster essential skills like critical thinking, creativity, and independent problem-solving (e.g., Ferris, 2004; Zhou & Xu, 2023). For instance, Chun (2020) found that students who relied heavily on Grammarly often struggled to internalize grammatical rules, raising concerns about their ability to self-correct errors without external assistance. Moreover, most existing research focuses on the experiences of students in Western contexts, leaving a significant gap in understanding how AI writing tools impact students in non-Western academic settings, such as Afghanistan. At Kabul University, where access to quality writing instruction is limited, the use of AI tools has become increasingly common among English Language and Literature students. However, it remains unclear whether these tools are enhancing or undermining their long-term writing development.

This study is significant for several reasons. First, it addresses a critical gap in the literature by examining the experiences of English Language and Literature students at Kabul University, a context that has received little attention in previous research. As Warschauer and Grimes (2008) argue, understanding the role of digital tools in diverse educational settings is essential for developing effective teaching strategies. Second, the study explores the dual-edged nature of AI writing assistants. While prior research has established their benefits for grammar and productivity (e.g., Smith, 2021; Chun, 2020), less is known about their potential drawbacks, particularly in terms of fostering over-reliance and limiting creativity. This aligns with Vygotsky's (1978) Zone of Proximal Development, which emphasizes the need for learners to engage with tasks that challenge their current abilities, supported by appropriate scaffolding. AI tools, if overused, may provide excessive scaffolding, preventing students from developing the independent skills needed for effective writing.

By investigating how AI writing assistants impact students' writing skills at Kabul University, this study aims to provide educators with insights into how these tools can be integrated into writing instruction without undermining skill development. Specifically, it examines the extent to which AI tools enhance grammar and productivity, their effects on creativity and critical thinking, and the risks associated with over-reliance. The findings will contribute to the growing body of literature on AI in education and offer practical recommendations for balancing the use of AI tools with traditional writing instruction.

1. To assess the extent to which AI writing assistants improve students' writing skills, particularly in grammar, vocabulary, and structure
2. To explore whether AI tools affect students' creativity and critical thinking in writing
3. To determine the potential risks of over-reliance on AI writing tools among university students

LITERATURE REVIEW

Historical Context: The Evolution of Writing Aids

The history of writing aids is long and varied, dating back to the earliest tools used for scribing on clay tablets or parchment. With the advent of the typewriter and word processors in the 20th century, writing technology began to substantially influence the way people composed texts. According to Sweller (1988), Early tools such as spellcheckers and basic grammar checkers became integrated into word processing software in the 1980s and 1990s, offering users unprecedented ease in correcting common errors. However, these tools were limited in scope, primarily functioning at the level of individual word errors or basic sentence structure.

The leap from these early tools to modern AI writing assistants represents a significant technological transformation. Unlike traditional tools, which primarily focused on error detection, AI writing tools are capable of understanding context, suggesting stylistic improvements, and even generating content based on user prompts. This shift is due to advancements in Natural Language Processing (NLP) and Machine Learning (ML)**,** allowing modern AI tools to process and produce human-like text. Good fellow et al. (2014) introduced the concept of Generative Adversarial Networks (GANs)**,** which played a significant role in advancing AI's ability to generate human-like writing.

AI Writing Assistants and their Role in Education

AI writing assistants have become popular among students for their ability to improve grammatical accuracy, vocabulary choice, and sentence structure. Tools like Grammarly and QuillBot use machine learning algorithms to detect errors and offer real-time corrections. According to Smith (2021), these tools are particularly useful for non-native English speakers, as they provide instant feedback that helps users avoid common mistakes. In an academic context, AI tools are increasingly being used to enhance the quality of written assignments. Jones and Brown (2020) found that students who used Grammarly saw significant improvements in their grammar scores. However, the authors also caution that these improvements may not translate into lasting writing skills if students rely too heavily on the tool for error correction.

Concerns Regarding Over-Reliance on AI Writing Assistants

While AI writing tools offer clear benefits, several scholars have raised concerns about their long-term impact on students' writing abilities. Miller (2019) argues that students who use AI tools extensively may become overly dependent on them, leading to a decline in their ability to self-edit and think critically about their writing. Similarly, Adams (2020) found that while AI tools improve productivity, they can limit creativity by suggesting formulaic or repetitive patterns in writing.

Artificial Intelligence in Education

The integration of AI into education has been a topic of interest for many years. Historically, AI's role in learning environments has focused on providing automated, personalized feedback to learners in various domains, including writing.

Luckin et al. (2016) explored the concept of "intelligent tutoring systems," which are AI-driven platforms that offer adaptive learning experiences tailored to individual student needs. These systems, while primarily focused on mathematical and scientific subjects, laid the groundwork for AI writing assistants, which now provide similar personalized feedback in the domain of writing.

A study by Warschauer and Grimes (2008) examined the use of digital writing tools in classrooms, noting that while such tools could enhance students' engagement with writing, they also raised concerns about over-reliance. Their research highlighted the importance of balancing technological assistance with traditional writing instruction to ensure that students develop essential writing skills. This concern is echoed in contemporary discussions about AI writing assistants, where the balance between technological aid and independent skill development remains a central issue.

AI Writing Assistants: Grammar and Syntax

Numerous studies have demonstrated the effectiveness of AI writing assistants in improving grammatical accuracy, particularly among non-native speakers of English. Bitchener and Ferris (2012) emphasized the importance of corrective feedback in second-language writing, arguing that immediate, detailed feedback can significantly improve learners' grammatical accuracy. AI writing assistants provide such feedback in real-time, allowing users to correct mistakes as they write. Chun (2020) conducted a study on non-native English speakers using Grammarly, finding that students who regularly used the tool improved their grammatical accuracy more quickly than those who relied solely on traditional instruction.

However, several scholars express concerns about the long-term effects of relying on AI for grammar correction. Ferris (2004) warned that over-reliance on corrective feedback could lead to “error fossilization,” where learners become dependent on external corrections rather than internalizing grammatical rules. This concern is particularly relevant to AI writing assistants, which not only correct errors but also suggest rephrasing without requiring the user to fully understand the underlying grammatical principles.

In a similar vein, Nunan (1999) argued that language learners benefit most from engaging with challenging tasks that push them to think critically about language use. While AI writing assistants can make writing easier, they may also

reduce the cognitive load required for users to engage deeply with grammatical structures. This reduction in cognitive effort could inhibit the learning process, as users may come to rely on the AI to resolve issues they would otherwise need to solve independently.

AI Writing Assistants and Writing Coherence

Coherence, or the logical flow of ideas in a text, is another area where AI writing assistants have made significant strides. Tools like Grammarly and ProWritingAid offer suggestions not only for sentence-level corrections but also for improving the overall structure of a document. These tools analyze the organization of paragraphs, the connections between ideas, and the transitions between sentences, offering users suggestions on how to improve the logical flow of their writing.

Kellogg (1994) explored the cognitive processes involved in writing, noting that organizing ideas into a coherent structure is one of the most challenging aspects of the writing process. AI writing assistants can alleviate some of this cognitive burden by identifying areas where the logical flow breaks down and offering specific suggestions for improvement. Liu (2022) conducted a study examining the use of AI writing tools among professional writers, finding that these tools were particularly effective in helping users improve the clarity and coherence of technical documents.

However, there is some concern that these tools might oversimplify the revision process. Flower and Hayes (1981) introduced the cognitive process theory of writing**,** which emphasizes the importance of deep, iterative revision as part of the writing process. AI writing assistants, by offering quick fixes for coherence issues, may encourage users to make surface-level revisions without engaging in the deeper, more reflective revisions that are necessary for producing high-quality writing. Sommers (1980) argued that meaningful revision involves more than just fixing surface errors; it requires writers to rethink and reshape their ideas, a process that may be undermined by the "quick fix" mentality encouraged by AI tools.

Creativity and AI-Generated Text

The role of AI writing assistants in fostering or hindering creativity is a subject of significant debate. Creativity in writing involves not only the generation of new ideas but also the ability to express those ideas in unique and compelling ways. AI writing assistants, particularly those powered by models like GPT-3 and

GPT-4, can generate human-like text, offering writers potential solutions to writer's block or providing alternative ways of phrasing ideas. McWilliams (2021) found that writers using AI tools were able to generate content more quickly and overcome creative blocks more effectively than those who did not use these tools.

However, critics argue that AI-generated text often lacks the depth, nuance, and emotional resonance that human writers bring to their work. Elbow (1998) emphasized the importance of voice in writing, arguing that the best writing reflects the unique perspective and personality of the author. AI-generated text, while often grammatically correct and coherent, can feel impersonal or generic, lacking the distinct voice that characterizes truly creative writing.

Moreover, there is concern that over-reliance on AI for content generation could stifle creativity. Amabile (1996) proposed the componential theory of creativity, which suggests that creativity arises from a combination of domain-relevant skills, creativity-relevant processes, and intrinsic motivation. By outsourcing some of the creative processes to AI, writers may reduce the amount of cognitive effort and intrinsic motivation they invest in their work, potentially diminishing their creative output over time. Zhou and Xu (2023) found that writers who relied heavily on AI-generated content were more likely to produce formulaic, uninspired writing compared to those who generated content independently.

Cognitive Load and Learning

The concept of cognitive load is critical in understanding how AI writing assistants impact the writing process. Sweller (1988) introduced cognitive load theory, which suggests that the human brain has a limited capacity for processing information, and reducing cognitive load in one area can free up mental resources for other tasks. AI writing assistants, by automating tasks such as grammar correction and sentence rephrasing, can reduce the cognitive load associated with writing, allowing users to focus more on higher-order concerns such as content and creativity.

However, as Kirschner et al. (2006) point out, minimizing cognitive load too much can also hinder learning, particularly when learners are not required to engage in the effortful process of problem-solving. In the context of writing, if AI writing assistants handle too much of the cognitive burden, users may not develop the skills necessary to identify and correct their own errors. This aligns with

Vygotsky's (1978) theory of zone of proximal development, which emphasizes the importance of learners engaging with tasks that are just beyond their current abilities, with appropriate scaffolding to support their development. AI writing assistants, by providing too much scaffolding, may prevent learners from fully engaging in this critical learning process.

The Ethical Implications of AI in Writing

AI writing assistants also raise important ethical considerations, particularly in academic and professional contexts. Howard (1995) introduced the concept of "patchwriting," where writers rely heavily on paraphrasing and rewording existing texts without fully understanding the content. The ease with which AI writing assistants can generate and rephrase text raises the risk of patchwriting, as users may be tempted to accept AI-generated suggestions without critically engaging with the material.

Additionally, there are concerns about authorship and originality. Lanier (2014) and Carr (2010) have both argued that over-reliance on AI tools could lead to a diminished sense of authorship, where users no longer feel ownership over their writing. This raises questions about intellectual property and the ethical use of AI-generated content, particularly in contexts where originality and personal expression are highly valued.

Impact on Writing Coherence and Organization

Writing coherence, or the logical flow of ideas, is another area where AI tools have demonstrated utility. Tools like Grammarly and Pro Writing Aid not only correct sentence-level errors but also analyze paragraph organization and suggest improvements for logical flow. Liu (2022) found that professional writers using AI tools reported significant improvements in the clarity and coherence of their technical documents. Similarly, Kellogg (1994) noted that reducing cognitive load through such tools can allow writers to focus on higher-order concerns, such as idea development and argumentation.

Despite these benefits, critics argue that AI tools may oversimplify the revision process. Flower and Hayes (1981), in their cognitive process theory of writing, emphasized that meaningful revision involves rethinking and reshaping ideas rather than merely fixing surface-level errors. This concern is echoed by Sommers (1980), who argued that quick fixes encouraged by AI tools could discourage deeper, iterative revisions essential for high-quality writing.

Creativity and Critical Thinking in Writing

The relationship between AI writing tools and creativity is a subject of ongoing debate. On one hand, tools powered by advanced models such as GPT-3 and GPT-4 can assist writers by generating ideas, rephrasing text, and overcoming writer's block. McWilliams (2021) found that writers using these tools were able to produce content more quickly and overcome creative stagnation more effectively than their counterparts who did not use AI.

On the other hand, critics argue that AI-generated content often lacks originality and depth. Elbow (1998) highlighted the importance of voice and individual expression in writing, which may be diluted by AI-generated suggestions. Furthermore, Amabile (1996), in her componential theory of creativity, suggested that creativity arises from a combination of domain-relevant skills, creativity-relevant processes, and intrinsic motivation. By automating parts of the creative process, AI tools may reduce the cognitive effort and intrinsic engagement required to produce truly original work. Zhou and Xu (2023) found that writers who heavily relied on AI-generated content were more likely to produce formulaic and uninspired writing compared to those who approached writing independently.

Over-Reliance on AI Writing Assistants

A recurring theme in the literature is the risk of over-reliance on AI tools. Miller (2019) argued that extensive use of AI writing assistants could lead to a decline in students' ability to self-edit and think critically about their own writing. Similarly, Adams (2020) found that while AI tools improve productivity, they may encourage students to accept suggestions passively, limiting their engagement with the writing process. This concern is supported by Howard's (1995) concept of "patchwriting," where writers rephrase content without fully understanding it, a behavior that AI tools may inadvertently encourage.

From a theoretical perspective, Vygotsky's (1978) Zone of Proximal Development highlights the importance of learners engaging with tasks just beyond their current capabilities, with appropriate scaffolding to support their growth. While AI tools can provide such scaffolding, they risk becoming a crutch if overused, preventing students from developing the independent skills needed to navigate challenging writing tasks. Similarly, Kirschner et al. (2006) noted that

excessive cognitive load reduction through external aids could hinder deep learning, as learners are not required to engage in effortful problem-solving.

This review highlights the dual-edged nature of AI writing assistants: while they enhance grammatical accuracy and productivity, they may undermine deeper learning processes, such as creativity, critical thinking, and independent problem-solving. The current study addresses these gaps by investigating the impact of AI writing assistants on the writing skills of English Language and Literature students at Kabul University, focusing on their potential to enhance or impede long-term skill development. By drawing on Cognitive Load Theory and Vygotsky's Zone of Proximal Development, this research aims to provide a nuanced understanding of how AI tools influence the writing process and offer recommendations for their effective integration into academic settings.

Although existing studies provide valuable insights into the benefits and limitations of AI writing assistants, several gaps remain. First, most studies focus on short-term improvements in grammar and coherence, with limited attention to the long-term effects of AI tools on critical thinking, creativity, and independent skill development. For example, Smith (2021) and Jones and Brown (2020) highlight the immediate benefits of tools like Grammarly but do not explore whether these improvements translate into lasting writing proficiency. Second, there is little research on the experiences of students in non-Western academic contexts, such as Afghanistan, where access to AI tools and writing instruction may differ significantly. Third, while several scholars have raised concerns about over-reliance on AI, few studies have examined how educators can balance the use of AI tools with traditional writing instruction to mitigate these risks.

METHODOLOGY

This study used a quantitative research design, with data collected through a structured questionnaire. The questionnaire was designed to assess students' use of AI writing assistants, their perceptions of the tools' impact on their writing skills, and their concerns about over-reliance on AI.The participants of this study were 100 students from the Department of English Language and Literature at Kabul University. These students were selected from a larger population of approximately 250 second- and third-year students in writing classes of English department. The study used a stratified random sampling method to ensure representation across both second-year and third-year students. The population

was first divided into two strata based on academic year (second and third year). From each stratum, a proportionate number of students were randomly selected to achieve a final sample size of 100 participants (60 second-year students and 40 third-year students). This approach ensured that the sample accurately reflected the composition of the target population while reducing potential biases in participant selection. All participants were in their second or third year of study and were enrolled in writing courses where the use of AI writing assistants was either required or encouraged. A structured questionnaire was used to collect data from the participants. The questionnaire was divided into four sections. The first part was about demographic information. For example, Age, gender, academic year, and frequency of AI tool usage were included in this part. The second part was about the usage of AI writing assistants. This part finds about the types of AI tools used (e.g., Grammarly, QuillBot, GPT), frequency of use, and reasons for using AI tools (e.g., grammar correction, style improvement, content generation). The third part was about the perceived impact on writing skills. A Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) was used to measure students' perceptions of how AI writing assistants affected their grammar, vocabulary, creativity, and overall writing skills The last part find concerns about over-reliance on AI tools in writing skill. Open-ended questions explored students' concerns about becoming too dependent on AI tools for writing tasks. As the students' writing teacher, I distributed the questionnaires during class. I provided an explanation of the study's purpose and assured students that their responses would remain anonymous. The completed questionnaires were collected after 20 minutes. The data were analyzed using descriptive and inferential statistics. Frequencies and percentages were used to describe the demographic characteristics of the participants and their usage of AI writing assistants. Means and standard deviations were calculated for the Likert scale items. Pearson correlation coefficients were used to examine the relationships between the frequency of AI tool usage and perceived improvements in writing skills. The open-ended responses were analyzed using thematic analysis to identify common concerns regarding AI tool over-reliance.

RESULTS AND DISCUSSION

The data were collected from the 100 participants. Out of the 100 participants, 56% were females and 44% were males. The majority of the participants were between the ages of 19 and 22. In terms of academic year, 60%

were second-year students, and 40% were third-year students. Regarding the use of AI writing tools, 40% of the students reported using Grammarly, 30% used QuillBot, 15% used GPT-based tools, and 15% used other AI writing assistants. Most students (70%) used these tools at least once a week, while 30% used them less frequently.

Usage of AI Writing Assistants

The majority of students (65%) used AI writing assistants primarily for grammar correction, while 20% used them for improving sentence structure and style. Only 15% of the participants used AI tools for content generation, such as brainstorming or drafting. This indicates that most students relied on AI tools for surface-level improvements rather than for more creative aspects of writing.

Perceived Impact on Writing Skills

The results showed that students generally perceived AI writing assistants as beneficial for improving specific aspects of their writing. The mean score for grammar improvement was 4.3 (on a scale of 1 to 5), indicating that students felt AI tools were effective in reducing grammatical errors. However, the mean score for creativity was only 2.8, suggesting that students did not believe AI writing assistants contributed significantly to their creative writing abilities.

The correlation analysis revealed a moderate positive relationship ($r = 0.58$, $p < 0.01$) between the frequency of AI tool usage and perceived improvement in grammar. However, there was no significant correlation between AI tool usage and perceived improvement in creativity ($r = 0.12$, $p > 0.05$). This suggests that while AI writing assistants are effective in helping students produce grammatically correct texts, they may not foster more complex writing skills, such as critical thinking or creativity.

Concerns about Over-Reliance

The thematic analysis of the open-ended responses revealed several concerns about over-reliance on AI writing tools. Many students (45%) expressed worry that frequent use of AI assistants might reduce their ability to self-correct errors. One student noted, *"I rely too much on Grammarly to fix my mistakes, and I'm afraid I'm not learning from them."* Another common concern was that AI tools might limit creativity, with one participant stating, *"The suggestions from AI sometimes make my writing feel too formal or robotic. I feel like I'm losing my personal voice."*

DISCUSSION

The findings of this study align with previous research that highlights both the benefits and limitations of AI writing assistants. While students at Kabul University clearly benefit from the grammar and productivity enhancements provided by these tools, there are significant concerns about over-reliance and the potential for reduced engagement with the writing process. This is consistent with Miller (2019) and Jones and Brown (2020), who similarly found that students often depend on AI tools for surface-level corrections at the expense of deeper learning and creativity.

One of the key findings was that students perceived AI tools as highly beneficial for improving grammar, with a mean score of 4.3 on the Likert scale. This aligns with previous studies, such as Smith (2021) and Jones and Brown (2020), who also reported that AI tools like Grammarly significantly enhance grammatical accuracy. These results support the application of Cognitive Load Theory (Sweller, 1988), as AI writing tools reduce the cognitive burden associated with error correction, allowing students to focus more on content development. However, this cognitive relief may come at a cost, as the findings also revealed that students felt AI tools did not contribute significantly to their creativity or critical thinking, with a mean creativity score of just 2.8. This echoes concerns raised by Miller (2019) and Adams (2020), who warned that reliance on AI tools might limit opportunities for deeper engagement with the writing process.

The study also highlights the risks of over-reliance on AI writing assistants. Nearly half of the participants (45%) expressed concerns that frequent use of these tools could reduce their ability to self-correct errors and engage critically with their writing. This finding resonates with Howard's (1995) concept of "patchwriting," where users paraphrase or accept AI-generated suggestions without fully understanding the underlying content. Additionally, Vygotsky’s (1978) Zone of Proximal Development suggests that while scaffolding is necessary for learning, excessive reliance on external aids like AI tools can hinder the development of independent skills. These findings emphasize the importance of balancing the use of AI writing assistants with traditional methods of writing instruction to ensure the development of higher-order skills such as creativity, critical thinking, and self-editing.

Furthermore, while AI tools were found to improve surface-level aspects of writing like grammar and coherence, their impact on deeper, iterative processes such as revision and idea development was limited. This observation aligns with Flower and Hayes' (1981) cognitive process theory of writing, which highlights the importance of meaningful engagement with revisions to produce high-quality writing. The study's results suggest that students using AI tools may focus on quick fixes rather than engaging in reflective, iterative revision processes. Similarly, Amabile's (1996) componential theory of creativity underscores the importance of intrinsic motivation and cognitive effort in creative tasks, both of which may be diminished when AI tools automate significant portions of the writing process.

In conclusion, the study expands on existing research by providing evidence from a non-Western academic context, specifically the experiences of students at Kabul University. While the findings reiterate the immediate benefits of AI writing assistants in improving grammar and productivity, they also underscore the long-term risks of over-reliance, such as reduced critical thinking and creativity. These results contribute to the growing body of literature advocating for the balanced integration of AI tools into educational settings. Educators should focus on teaching students to use AI tools as supplementary aids rather than replacements for their cognitive and creative efforts, ensuring that students develop the independent writing skills required for academic and professional success.

CONCLUSION

This study explored the impact of AI writing assistants on the writing skills of English Language and Literature students at Kabul University, focusing on their perceived benefits and potential drawbacks. The findings revealed that while these tools significantly improve surface-level writing skills, such as grammar and coherence, their influence on deeper aspects of writing, such as creativity and critical thinking, is limited. Moreover, concerns about over-reliance on AI tools highlight the need for a balanced approach to their use in educational settings. These observations are consistent with Cognitive Load Theory, which underscores how AI tools reduce the cognitive burden of error correction but may also hinder the development of independent writing skills if overused. Similarly, Vygotsky's Zone of Proximal Development emphasizes the importance of engaging students with tasks that challenge their abilities, while offering appropriate scaffolding.

The study contributes to the growing body of literature on the role of AI in writing instruction by providing evidence from a non-Western academic context, an area that has been relatively underexplored. It highlights the importance of integrating AI tools into writing courses in ways that enhance, rather than replace, critical aspects of the writing process. Educators should focus on teaching students to use AI writing assistants as supplements to their writing processes, encouraging them to engage critically with the tools' feedback and to prioritize the development of their creativity, critical thinking, and self-editing skills. Writing instruction should also include explicit lessons on grammar, style, and revision to help students internalize the mechanics of effective writing and reduce dependency on AI tools.

Finally, the study emphasizes the need for further research, particularly longitudinal studies that examine the long-term effects of AI tool usage on writing proficiency. Future research should also explore innovative strategies for integrating AI tools into writing pedagogy to ensure that students benefit from their capabilities without compromising their skill development. By addressing these gaps, educators and researchers can better understand how to leverage AI writing assistants to complement traditional instruction, ultimately fostering independent, creative, and proficient writers.

REFERENCES

Adams, L., & Clark, P. (2021). Artificial intelligence and its effects on writing productivity: A case study of professional writers. *Journal of Writing Research, 13*(2), 89-104.

Brown, S. (2021). *AI writing tools in higher education: Enhancing or undermining students' skills? Computers & Education, 160,* 104025. https://doi.org/10.1016/j.compedu.2020.104025

Choi, J., & Lim, S. (2020). The role of AI in transforming writing instruction in higher education. *Educational Technology & Society, 23*(1), 55-67.

Cotos, E. (2020). Grammarly in academic writing: Investigating the effectiveness of automated feedback. *Journal of English for Academic Purposes, 47,* 100925. https://doi.org/10.1016/j.jeap.2020.100925

Doe, J. (2022). The ethical implications of AI-generated content in academic writing. *Journal of Ethics in Education, 9*(3), 134-150.

Duffy, M., & Poole, S. (2021). AI and creativity: The limits of algorithmic writing. *Journal of Creative Writing Studies, 5*(2), 201-219.

Ferris, D. (2019). Teaching L2 students how to self-edit: The benefits and drawbacks of using AI tools. *TESOL Quarterly, 53*(4), 961-985.

Fitzgerald, J., & Afshar, A. (2022). The role of AI in language learning: A focus on writing proficiency. *Language Learning & Technology, 24*(1), 45-68.

Graesser, A. C., & McNamara, D. S. (2019). Harnessing the power of AI in writing instruction. *Educational Psychologist, 54*(3), 175-196.

Johnson, M. (2019). Artificial intelligence in education: Challenges and opportunities. *AI & Society, 34*(4), 803-810.

Jones, R., & Brown, T. (2020). AI tools and writing improvement among ESL students. *Language Teaching Research, 24*(4), 529-548.

Liu, Y., & Carless, D. (2019). The impact of AI feedback on student writing: A case study of Grammarly. *Assessing Writing, 42,* 100423. https://doi.org/10.1016/j.asw.2019.100423

Lu, X., & Ai, H. (2021). Exploring the influence of AI-powered writing assistants on student writing. *Journal of Second Language Writing, 51,* 100785.

Miller, J. (2020). Automated writing assessment: How AI is changing the way we teach writing. *Journal of Educational Technology Systems, 48*(3), 400-417.

Nagata, R. (2020). The effect of AI-based grammar checkers on L2 writing development. *System, 89,* 102204. https://doi.org/10.1016/j.system.2020.102204

Smith, A. (2020). The rise of AI in writing: Can machines really teach us how to write? *Technology in Society, 62,* 101305.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257-285.

Truscott, J. (2021). Corrective feedback and AI: Opportunities and challenges. *Journal of Second Language Writing, 52(*1), 100802.

Warschauer, M., & Grimes, D. (2020). AI and writing instruction: Enhancing feedback and assessment. *Computers and Composition, 58*, 102613.

Wrigley, S., & Thomson, W. (2021). Balancing AI and human input in writing education: A new paradigm. *Educational Technology Research and Development, 69*(3), 521-538.