Journal of Composite Social Humanisme

USING AI-BASED WRITING ASSISTANTS TO FOSTER LEARNER AUTONOMY IN ACADEMIC WRITING

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Abstrak

This study explores the impact of AI-based writing assistants on learner autonomy and writing proficiency among EFL students. Utilizing a mixed-methods approach, the research involved a quasi-experimental design with pre- and post-tests, complemented by qualitative data from semi-structured interviews and reflective journals. The quantitative findings reveal a significant improvement in writing proficiency for students using AI-based tools, with post-test scores increasing markedly compared to those receiving traditional instructor feedback. The AI tools also contributed to a notable rise in learner autonomy, as evidenced by higher autonomy scores in the experimental group. Qualitative insights indicate that students perceived the AI tools as highly beneficial for boosting confidence, engagement, and motivation, though some concerns about over-reliance and data privacy were noted. The study underscores the potential of AI-based writing assistants to enhance academic writing instruction while highlighting the need for a balanced integration with traditional pedagogical methods.

Keywords: **AI-based writing assistants, learner autonomy, writing proficiency, ESL/EFL students, educational technology**

Abstrak:

Penelitian ini mengeksplorasi dampak asisten penulisan berbasis AI terhadap otonomi pembelajar dan kemampuan menulis diantara siswa EFL. Menggunakan pendekatan metode campuran, penelitian ini melibatkan desain kuasi-eksperimen dengan tes pra dan pasca, dilengkapi dengan data kualitatif dari wawancara semi-terstruktur dan jurnal reflektif. Temuan kuantitatif menunjukkan peningkatan signifikan dalam kemampuan menulis bagi siswa yang menggunakan alat berbasis AI, dengan skor tes pasca yang meningkat secara mencolok dibandingkan dengan siswa yang menerima umpan balik tradisional dari instruktur. Alat AI juga berkontribusi pada peningkatan otonomi pembelajar yang signifikan, seperti yang dibuktikan dengan skor otonomi yang lebih tinggi di kelompok eksperimen. Wawasan kualitatif menunjukkan bahwa siswa memandang alat AI sebagai sangat bermanfaat untuk meningkatkan kepercayaan diri, keterlibatan, dan motivasi, meskipun beberapa kekhawatiran tentang ketergantungan berlebihan dan privasi data dicatat. Studi ini menekankan potensi asisten penulisan berbasis AI untuk meningkatkan pengajaran penulisan akademik sambil menyoroti perlunya integrasi yang seimbang dengan metode pedagogis tradisional.

Kata Kunci: Asisten penulisan berbasis AI, otonomi pembelajar, kemampuan menulis, siswa ESL/EFL, teknologi Pendidikan

INTRODUCTION

Academic writing serves as a cornerstone of higher education, facilitating not only the dissemination of knowledge but also the development of critical thinking and scholarly communication skills (Hyland, 2019). It involves complex cognitive and linguistic processes that require students to express their ideas clearly, construct logical arguments, and adhere to disciplinary conventions. In English as a Second Language (ESL) or English as a Foreign Language (EFL) contexts, these demands are further compounded by additional linguistic and cultural challenges that can hinder students' ability to produce high-quality academic writing (Flowerdew & Costley, 2017). Consequently, many students experience difficulties in articulating their ideas effectively, which affects their academic performance and overall confidence in writing (Paltridge et al., 2016).

One of the key challenges in teaching academic writing is fostering learner autonomy, which is essential for developing self-directed learning skills that are vital in higher education (Benson, 2016). Traditional writing instruction often relies heavily on teacher feedback, which, while valuable, can limit opportunities for students to engage in self-assessment and independent revision (Little, 2006). Moreover, large class sizes and limited

instructional time often constrain the ability of educators to provide timely, individualized feedback, which is crucial for improving writing skills (Xu & Lee, 2021). These challenges have prompted educators and researchers to explore alternative methods that can support autonomous learning and enhance writing proficiency.

In recent years, the integration of Artificial Intelligence (AI) technologies in education has gained traction as a potential solution to these challenges. AI-based writing assistants, such as Grammarly, WriteLab, and GPT-powered tools, have emerged as promising tools that offer immediate, data-driven feedback to students (Zhang et al., 2020). Unlike traditional methods, these tools provide continuous, individualized feedback that can help students identify their mistakes, understand the underlying rules, and make revisions independently (Heidari et al., 2023). This capacity for real-time, adaptive learning presents a unique opportunity to foster learner autonomy in academic writing.

Despite the growing popularity of AI-based writing tools, there is a need for more research to understand their impact on learner autonomy. Most studies to date have focused on general improvements in writing quality and error correction (Li et al., 2021; Lee & Kim, 2020), with limited attention to their role in promoting independent learning. This study aims to address this gap by examining how AI-based writing assistants can support the development of autonomous writing skills, particularly in ESL/EFL contexts where learners may benefit most from these technologies.

By investigating the potential of AI-based tools to foster learner autonomy in academic writing, this study contributes to the broader discourse on innovative pedagogical practices in higher education. It seeks to provide empirical evidence on the effectiveness of these tools and offer practical insights for educators looking to integrate AI into their teaching methods.

AI-Based Writing Assistants: An Overview

AI-based writing assistants leverage advanced technologies, such as Natural Language Processing (NLP), machine learning, and deep learning, to offer a range of features that assist with various aspects of writing (McCarthy et al., 2020). These tools are designed to analyze text in real-time, providing suggestions for grammar correction, style improvement, vocabulary enhancement, and even plagiarism detection. For instance, Grammarly uses NLP algorithms to detect errors and offer context-specific recommendations, while WriteLab employs machine learning techniques to generate personalized feedback based on individual writing patterns (Ghosh et al., 2022).

The development and application of these tools have been driven by the need to provide scalable, efficient, and personalized writing support, especially in educational settings where instructors may not always be able to provide immediate feedback (Xu & Lee, 2021). AI writing assistants are capable of processing large amounts of data quickly, allowing them to deliver instant feedback to users. This capability is particularly beneficial in large classrooms or online learning environments, where personalized attention is often limited (Wang & Vasconcelos, 2021).

Furthermore, AI-based writing tools are designed to accommodate different learning styles and proficiency levels. For example, they can provide tailored feedback to advanced students on issues like tone, coherence, and conciseness, while offering more foundational support, such as grammar and vocabulary suggestions, to beginners (Zhou & Xu, 2019). This adaptability makes AI writing assistants versatile tools for enhancing writing instruction across diverse educational contexts (Johnson et al., 2018).

However, the effectiveness of these tools also depends on their design and the quality of their algorithms. Some AI writing tools, for instance, have been criticized for their limited ability to understand complex semantic nuances or provide feedback that aligns with specific academic writing conventions (Smith & Greaves, 2019). Additionally, there are concerns about data privacy and the ethical use of student data, as AI tools often require access to users' writing samples to function effectively (Nguyen & Pham, 2021).

Despite these challenges, the potential of AI-based writing assistants to revolutionize writing instruction is undeniable. As technology continues to advance, these tools are likely to become more sophisticated and capable of providing even more nuanced and context-sensitive feedback, making them valuable assets in the classroom (Zhuang & Li, 2022).

The Role of AI in Enhancing Learner Autonomy

Learner autonomy in language education refers to the capacity of learners to take charge of their own learning process, including setting goals, selecting learning strategies, and evaluating progress (Benson, 2016). In the context of academic writing, fostering autonomy involves encouraging students to engage actively in planning, drafting, revising, and editing their texts without relying solely on teacher input (Little, 2006). AI-based writing assistants can play a critical role in this process by providing tools that empower learners to make decisions and reflect on their writing independently (Heidari et al., 2023).

Research has shown that AI tools can significantly enhance learner autonomy by offering continuous, individualized feedback that helps students identify and correct their mistakes (Li et al., 2021). For example, a study by Ahmad and Sultana (2022) demonstrated

that AI-driven feedback enabled students to take greater ownership of their writing tasks, as they were able to revise their work independently based on the suggestions provided by the AI tool. This autonomy was further reinforced by the tool's ability to adapt its feedback to the specific needs of each learner, thus supporting differentiated instruction.

Moreover, AI tools can promote self-regulation, a key component of autonomous learning. Self-regulation involves setting goals, monitoring progress, and reflecting on learning strategies, all of which are essential for successful writing (Zimmerman, 2008). By providing real-time feedback and performance analytics, AI writing assistants help students develop metacognitive awareness, enabling them to assess their strengths and weaknesses and adjust their strategies accordingly (Heidari et al., 2023). This process of self-assessment and reflection is crucial for fostering long-term autonomous learning habits.

The use of AI-based tools also aligns with contemporary pedagogical approaches that emphasize learner-centeredness and personalized learning. By allowing students to interact with the tools at their own pace and according to their individual learning needs, AI writing assistants create opportunities for more personalized and engaging learning experiences (Chiu & Ko, 2020). This autonomy in learning is particularly important in ESL/EFL contexts, where students may have diverse linguistic backgrounds and proficiency levels (Flowerdew & Costley, 2017).

However, the extent to which AI tools can enhance learner autonomy also depends on how they are integrated into the learning environment. For instance, over-reliance on AI feedback can potentially diminish critical thinking skills, as students may become accustomed to accepting suggestions without fully understanding the underlying rules or principles (Smith & Greaves, 2019). Therefore, it is essential to use AI tools as a supplement to, rather than a replacement for, traditional teaching methods, ensuring that they contribute to, rather than detract from, the development of independent writing skills (Johnson et al., 2018).

Pedagogical Benefits and Challenges

The integration of AI-based writing assistants into the curriculum offers several pedagogical benefits that can enhance the teaching and learning of academic writing. First, these tools provide immediate feedback, which is crucial for maintaining student engagement and motivation (Chiu & Ko, 2020). Immediate feedback helps students recognize and correct errors in real-time, reinforcing learning and reducing the frustration associated with delayed feedback. This immediacy is particularly valuable in writing instruction, where timely intervention can prevent the reinforcement of incorrect writing habits (Wang & Vasconcelos, 2021).

AI tools also promote differentiated instruction by offering personalized feedback that caters to individual learner needs (Johnson et al., 2018). For example, advanced learners can receive more complex feedback on higher-order writing skills, such as argumentation and coherence, while beginners can focus on foundational skills like grammar and vocabulary (Zhou & Xu, 2019). This flexibility supports diverse learning styles and helps ensure that all students receive the support they need to improve their writing skills.

Moreover, AI-based writing tools can serve as effective resources for formative assessment. By providing detailed analytics on student performance, these tools enable educators to track progress, identify areas of difficulty, and tailor instruction accordingly (Heidari et al., 2023). This data-driven approach to assessment aligns with contemporary educational practices that emphasize evidence-based decision-making and personalized learning (Nguyen & Pham, 2021).

However, the use of AI-based writing tools is not without challenges. One of the primary concerns is the potential for over-reliance on these tools, which can undermine the development of critical thinking and problem-solving skills (Smith & Greaves, 2019

RESEARCH METHOD

Research Design

This study employs a mixed-methods research design to investigate the effectiveness of AI-based writing assistants in fostering learner autonomy in academic writing among EFL students. The mixed-methods approach integrates both quantitative and qualitative data to provide a comprehensive understanding of how AI tools influence students' writing performance and autonomous learning behaviours. The quantitative component consists of a quasi-experimental design with pre- and post-tests to measure the impact of AI-based tools on writing proficiency and autonomy levels. The qualitative component involves semi-structured interviews and reflective journals to explore students' perceptions and experiences with AI-based writing assistants.

The rationale for using a mixed-methods approach is to capture both the measurable effects of AI-based tools on students' writing skills and autonomy and the deeper insights into their personal experiences and attitudes toward these tools (Creswell & Plano Clark, 2017). This combination of methods allows for triangulation, enhancing the validity and reliability of the study findings by cross-verifying results from different data sources (Denzin, 2012).

Participants

The participants of this study include 20 undergraduate EFL students enrolled in an academic writing course. The students have varying levels of proficiency in English, ranging from intermediate to advanced, as determined by their scores pre-test. The participants are randomly assigned into two groups: an experimental group (n=10) that uses AI-based writing assistants (such as Grammarly and GPT-based tools) and a control group (n=10) that receives traditional instructor-led feedback without the use of AI tools.

Instruments

Several instruments were used to collect data for this study:

- **AI-based Writing Tools**: The primary instruments for the experimental group are two AI-based writing assistants: Grammarly and a GPT-powered tool. Grammarly is chosen for its popularity and advanced features in grammar checking, style suggestions, and vocabulary enhancement, while the GPT-based tool is selected for its ability to provide more context-aware feedback and writing prompts (Zhang et al., 2020).
- **Writing Proficiency Tests**: Pre- and post-tests are administered to both the experimental and control groups to measure changes in writing proficiency over the study period. The tests consist of academic essay writing tasks that are assessed using a standardized rubric focusing on grammar, coherence, organization, vocabulary, and overall writing quality (Heidari et al., 2023).
- **Learner Autonomy Questionnaire (LAQ)**: A modified version of the Learner Autonomy Questionnaire (LAQ) is used to measure students' levels of autonomy in writing before and after the intervention. The LAQ includes items related to self-regulation, self-assessment, goal-setting, and independent use of learning strategies (Benson, 2016).
- **Semi-Structured Interviews**: To gain qualitative insights, semi-structured interviews are conducted with 10 students from the experimental group. The interviews focus on their experiences using the AI-based writing assistants, perceived benefits and challenges, and their attitudes toward the impact of these tools on their writing skills and autonomy (Ahmad & Sultana, 2022).
- **Reflective Journals**: Participants in the experimental group are asked to maintain reflective journals throughout the study. These journals are used to capture their ongoing reflections, thoughts, and feelings about their experiences with the AI-based writing tools (Lee & Kim, 2020).

Data Collection Procedures

The data collection was conducted over a 10-week period. The procedure is divided into three phases: pre-intervention, intervention, and post-intervention.

- **Pre-Intervention Phase**: During the first two weeks, all participants complete the writing proficiency pre-test and the Learner Autonomy Questionnaire (LAQ). The results establish baseline data for both groups. Additionally, the experimental group receives an orientation on how to use the AI-based writing tools, including demonstrations and practice sessions to ensure familiarity and comfort with the tools (Xu & Lee, 2021).
- **Intervention Phase**: Over the next six weeks, the experimental group uses the AI-based writing assistants for all their writing assignments, while the control group receives traditional instructor feedback. The experimental group is required to use the AI tools for at least three writing assignments, each of which is submitted weekly. During this period, the students in the experimental group are also encouraged to document their experiences and reflections in their journals (Chiu & Ko, 2020).
- **Post-Intervention Phase**: In the final two weeks, all participants take the writing proficiency post-test and complete the LAQ again. Semi-structured interviews are conducted with selected participants from the experimental group to gather in-depth qualitative data. The reflective journals are collected and analyzed to supplement the interview data (Li et al., 2021).

Data Analysis

The quantitative data from the writing proficiency tests and the LAQ are analyzed using statistical methods. A paired-sample t-test is conducted to compare the pre- and post-test scores within each group, while an independent-sample t-test is used to compare the mean differences between the experimental and control groups. Effect sizes are calculated to determine the magnitude of the differences (Field, 2018). Additionally, a multiple regression analysis is conducted to explore the relationship between the use of AI-based tools and changes in learner autonomy, controlling for potential confounding variables such as gender, proficiency level, and discipline (Heidari et al., 2023).

The qualitative data from the semi-structured interviews and reflective journals are analyzed using thematic analysis. Thematic coding is employed to identify key themes and patterns related to students' perceptions, experiences, and attitudes toward the AI-based writing assistants (Braun & Clarke, 2006). This process involves several steps, including familiarization with the data, generating initial codes, searching for themes, reviewing themes,

and defining and naming themes. NVivo software is used to assist in managing and analyzing the qualitative data (Miles et al., 2014).

By combining quantitative and qualitative data, this study provides a holistic understanding of how AI-based writing assistants can foster learner autonomy in academic writing. The mixed-methods approach ensures that both the measurable impacts and the lived experiences of students are captured, providing a robust basis for drawing conclusions and making recommendations.

FINDINGS

1. Quantitative Findings

a. Improvement in Writing Proficiency

The results of the pre- and post-test writing proficiency tests show a statistically significant improvement in the writing performance of the experimental group, which used AI-based writing assistants, compared to the control group, which relied on traditional instructor feedback. The mean post-test score for the experimental group increased from 67.5 to 82.3, indicating a substantial improvement ($p < 0.01$). In contrast, the control group's mean score increased modestly from 68.1 to 72.4 ($p > 0.05$), which was not statistically significant. The effect size for the experimental group (Cohen's $d = 0.85$) suggests a large impact of AI-based tools on writing proficiency, while the control group showed a small effect size (Cohen's $d = 0.35$).

These results suggest that the AI-based writing assistants effectively improved students' overall writing quality, particularly in areas such as grammar, coherence, organization, and vocabulary. The tools provided continuous, individualized feedback that helped students identify and correct errors more efficiently than those in the control group who received delayed, generalized feedback from instructors (Ahmad & Sultana, 2022; Heidari et al., 2023).

b. Changes in Learner Autonomy

The results from the Learner Autonomy Questionnaire (LAQ) indicate a significant increase in autonomy levels among the experimental group compared to the control group. The mean score for learner autonomy in the experimental group increased from 3.2 (on a 5-point Likert scale) to 4.1, while the control group's mean score showed only a slight increase from 3.3 to 3.5. The difference between pre- and post-test scores for the experimental group was statistically significant ($p < 0.01$), with an effect size of 0.76, indicating a medium to large effect. In contrast, the control group's change was not significant ($p > 0.05$).

This increase in learner autonomy among the experimental group can be attributed to the use of AI-based writing tools, which facilitated self-assessment, independent revision, and goal-setting. The data suggest that students in the experimental group felt more empowered to take charge of their learning process, reflecting higher levels of self-regulation and independence in writing tasks (Benson, 2016; Little, 2006).

c. Correlation Between AI Tool Usage and Autonomy

A multiple regression analysis was conducted to explore the relationship between the use of AI-based writing tools and changes in learner autonomy. The analysis revealed that AI tool usage significantly predicted improvements in learner autonomy ($\beta = 0.45$, $p < 0.01$), accounting for 42% of the variance in autonomy scores. This finding suggests that the more frequently students engaged with AI writing tools, the greater their autonomy in writing tasks (Zhang et al., 2020).

The regression analysis also controlled for potential confounding variables, such as gender, proficiency level, and academic discipline. None of these variables showed a significant interaction effect, indicating that the impact of AI tool usage on autonomy was consistent across different subgroups (Heidari et al., 2023).

2. Qualitative Findings

a. Perceptions of AI-Based Writing Assistants

The qualitative data from semi-structured interviews and reflective journals provide further insights into students' experiences with AI-based writing assistants. A majority of students that the tools significantly enhanced their confidence in writing. They appreciated the immediate feedback provided by the AI tools, which helped them identify mistakes in real-time and understand the reasoning behind corrections. One student mentioned, "The AI tool is like having a tutor available 24/7. I feel more confident to write and revise on my own without waiting for feedback from my teacher."

Several participants highlighted that the AI tools helped them become more aware of their frequent errors, particularly in grammar and vocabulary usage. This increased awareness led them to actively revise their drafts and pay closer attention to language accuracy, thereby promoting self-directed learning (Lee & Kim, 2020). However, some students expressed concerns about the over-reliance on AI feedback, indicating a need for balance between AI and human input to ensure comprehensive learning (Smith & Greaves, 2019).

b. Enhanced Engagement and Motivation

Thematic analysis of reflective journals revealed that students using AI-based writing assistants showed higher levels of engagement and motivation throughout the study. Many participants noted that the immediate feedback encouraged them to experiment with different writing styles and structures, as they felt less inhibited by the fear of making mistakes. This sense of experimentation and exploration was particularly evident in students with lower initial proficiency levels, who felt more comfortable taking risks in their writing (Zhou & Xu, 2019).

Moreover, the data suggested that the personalized feedback provided by AI tools was particularly motivating for students, as it was perceived as more relevant and specific to their individual needs compared to generic teacher feedback. This personalized approach was frequently cited as a key factor in fostering a sense of ownership and responsibility for their learning outcomes (Chiu & Ko, 2020; Nguyen & Pham, 2021).

c. Challenges and Limitations

While the findings indicated many benefits, several challenges were also identified. Some students expressed concerns about the AI tools' limitations in understanding complex context and providing nuanced feedback. For instance, one participant noted, "Sometimes, the AI doesn't get the context right, especially with creative or argumentative writing. It suggests changes that don't fit the overall tone or argument."

Another challenge reported by participants was the potential for over-reliance on AI suggestions, which could lead to a superficial understanding of writing rules rather than deep learning. To mitigate this risk, some students suggested combining AI-based feedback with regular teacher-led discussions to clarify misunderstandings and deepen understanding (Smith & Greaves, 2019).

Furthermore, issues related to data privacy were raised by a few participants who were concerned about sharing their writing with AI tools. These students were wary of how their data might be used and stored, indicating a need for clear policies on data security and ethical considerations (Nguyen & Pham, 2021).

Overall, the findings indicate that AI-based writing assistants positively impact both writing proficiency and learner autonomy in academic writing among ESL/EFL students. The quantitative data suggest that these tools significantly enhance writing skills and foster autonomy by providing continuous, individualized feedback. The qualitative data further reveal that students generally perceive AI tools as beneficial, enhancing their confidence, engagement, and motivation. However, some challenges, such as over-reliance on AI and concerns about

data privacy, highlight the need for balanced integration with traditional pedagogical approaches.

The study concludes that while AI-based writing tools offer promising potential for enhancing writing instruction, their effectiveness depends on thoughtful implementation that addresses both the technological limitations and the ethical considerations associated with their use (Heidari et al., 2023; Johnson et al., 2018).

DISCUSSION

1. Impact of AI-Based Writing Assistants on Writing Proficiency

The findings indicate that the use of AI-based writing assistants significantly improved the writing proficiency of ESL/EFL students in the experimental group compared to the control group. The substantial increase in the mean post-test scores for the experimental group (from 67.5 to 82.3) demonstrates that the AI tools provided effective, individualized feedback that helped students enhance their writing skills, particularly in grammar, coherence, organization, and vocabulary. This aligns with previous research suggesting that AI-based tools can offer targeted, context-aware feedback that promotes faster and more accurate error correction than traditional teacher-led approaches (Ahmad & Sultana, 2022; Heidari et al., 2023).

The significant effect size (Cohen's d = 0.85) observed in the experimental group further supports the idea that AI-based tools are a powerful supplement to conventional writing instruction. These tools' ability to provide immediate feedback likely contributed to more efficient learning cycles, allowing students to recognize and correct their mistakes in real-time. This immediate reinforcement is essential in language learning, as it helps students internalize correct language use more quickly (Chiu & Ko, 2020). Moreover, the lack of a significant improvement in the control group suggests that traditional feedback methods alone may not be as effective in supporting rapid or substantial gains in writing proficiency. This finding underscores the potential of AI-based tools to complement or even enhance current pedagogical practices.

2. Enhancement of Learner Autonomy

The study also demonstrates a notable increase in learner autonomy among students using AI-based writing assistants. The significant rise in autonomy scores for the experimental group (from 3.2 to 4.1 on a 5-point scale) suggests that these tools fostered a greater sense of independence and self-regulation in academic writing. This outcome is consistent with Benson's (2016) framework on learner autonomy, which emphasizes the importance of self-assessment,

goal-setting, and independent use of learning strategies—all of which were supported by the AI tools.

The positive correlation between the frequency of AI tool usage and increases in autonomy ($\beta = 0.45$, $p < 0.01$) further highlights how AI-based writing assistants can empower students to take greater control over their learning processes. By providing continuous, personalized feedback, these tools enable students to self-monitor their progress and make informed decisions about their writing strategies. This supports earlier findings by Zhang et al. (2020), who argued that AI tools could encourage more autonomous learning behaviours by reducing dependency on teacher feedback. However, while AI tools seem effective in fostering autonomy, the findings also suggest the importance of guiding students to use these tools constructively, as excessive reliance could potentially limit deeper cognitive engagement with the material (Smith & Greaves, 2019).

3. Students' Perceptions and Experiences

The qualitative data provide valuable insights into students' perceptions of AI-based writing assistants, revealing generally positive experiences. Most students reported increased confidence and motivation in writing, attributing these improvements to the immediate and specific feedback provided by the AI tools. The perceived accessibility and availability of these tools, described as "like having a tutor available 24/7," contributed to a more supportive learning environment, which helped reduce anxiety and enhance self-efficacy (Lee & Kim, 2020). These findings echo those of earlier studies that highlight the motivational benefits of AI tools in language learning, particularly for lower-proficiency students who may feel apprehensive about writing (Zhou & Xu, 2019).

However, some students expressed concerns regarding the limitations of AI feedback, particularly its occasional inability to grasp complex contexts or nuances in creative or argumentative writing. This finding aligns with McCarthy et al. (2020), who noted that while AI tools are highly effective for surface-level corrections (e.g., grammar and spelling), they may not be as reliable for more complex writing tasks that require a deeper understanding of context or rhetorical strategies. Additionally, concerns about data privacy indicate that while AI tools can significantly benefit learning, their adoption must be balanced with considerations of data security and ethical implications (Nguyen & Pham, 2021).

4. Balancing AI and Traditional Pedagogy

While the findings highlight the potential of AI-based tools to enhance writing proficiency and learner autonomy, they also suggest that these tools should not completely

replace traditional pedagogical methods. Some students noted the risk of over-reliance on AI-generated suggestions, which might lead to superficial learning rather than a deep understanding of writing rules and conventions. This is consistent with previous research that cautions against viewing AI tools as a substitute for human feedback (Smith & Greaves, 2019). Instead, the integration of AI-based writing assistants should be seen as complementary, providing immediate, formative feedback while allowing instructors to focus on more nuanced aspects of writing that require human judgment, such as developing critical thinking and argumentation skills (Johnson et al., 2018).

The findings suggest that combining AI tools with traditional methods—such as regular teacher-led discussions, workshops, and peer reviews—can help address some limitations of AI tools while maximizing their benefits. For instance, using AI tools to handle routine feedback on grammar and style can free up class time for more interactive, higher-order learning activities that promote critical thinking and creativity. This balanced approach can help mitigate the potential risks associated with over-reliance on AI and ensure a more comprehensive and effective learning experience (Flowerdew & Costley, 2017).

5. Implications for Practice and Future Research

The study's findings have several implications for practice. First, educators should consider integrating AI-based writing assistants into their curriculum to enhance both writing proficiency and learner autonomy. Given the significant improvements observed in the experimental group, AI tools can be a valuable addition to writing instruction, particularly in EFL contexts where students may require extensive, individualized feedback that is not always feasible for instructors to provide manually.

Second, educators should provide students with training on effectively using these tools, emphasizing the importance of balancing AI-generated feedback with independent critical thinking and human guidance. Addressing concerns related to over-reliance and data privacy is essential to ensure that students use these tools responsibly and ethically.

For future research, more studies are needed to explore the long-term effects of using AI-based writing assistants on learner autonomy and writing proficiency. Investigating different types of AI tools, their specific features, and their impact on various student populations could provide a more nuanced understanding of their effectiveness. Additionally, further research should examine the potential for AI tools to support other aspects of language learning, such as speaking or listening, and how these tools can be effectively integrated across different educational contexts and disciplines.

CONCLUSION

Overall, the study confirms that AI-based writing assistants can significantly enhance writing proficiency and foster learner autonomy among ESL/EFL students. While these tools offer considerable benefits, their optimal use depends on thoughtful integration with traditional pedagogical methods and careful attention to ethical considerations. By combining the strengths of AI technology with human judgment, educators can create a more balanced and effective learning environment that supports student growth and autonomy in writing.

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