Arab World English Journal
INTERNATIONAL PEER REVIEWED JOURNAL ISSN: 2229-9327

Arab World English Journal (AWEJ) Special Issue on ChatGPT, April 2024 Pp. 138-155
DOI: https://dx.doi.org/10.24093/awej/ChatGPT.9

Beyond Syntax: Exploring Moroccan Undergraduate EFL Learners' Engagement with AI-Assisted Writing

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Received:01/29/2024 Accepted: 04/04/2023 Published:04/24/2024

Abstract
Amidst the rapid integration of artificial intelligence into education, this research aims to uncover patterns and themes within student-written assignments, shedding light on the diverse impacts of AI tools on the writing process. This study explores the intricate dynamics of undergraduate EFL learners' interaction with AI-supported writing tools, focusing specifically on writing. The investigation, guided by questions about student use of AI-supported writing tools and the influence of different tools on writing quality, addresses notable gaps in the existing literature. A quasi-experimental study was conducted with purposive sampling of 62 Business Law undergraduates enrolled in a general English course at the International University of Rabat, Morocco, dividing them into two groups: one received structured AI training, while the other acted as a control group. Results revealed positive outcomes in language proficiency, creativity, organizational skills, and vocabulary use with AI assistance, emphasizing the transformative impact of AI on writing. The study also observed shifting preferences in AI writing tools, urging educators and developers to adapt to evolving user choices and promote continuous innovation in AI writing tools.
Keywords: AI-assisted writing tools, Moroccan EFL students' engagement, higher education, quasi-experimental study, syntax, writing

Cite as: Moussa, A., & Belhiah, H. (2024). Beyond Syntax: Exploring Moroccan Undergraduate EFL Learners' Engagement with AI-Assisted Writing. *Arab World English Journal (AWEJ)* Special Issue on ChatGPT, April 2024: 138-155.
DOI: https://dx.doi.org/10.24093/awej/ChatGPT.9

Introduction

In a time marked by the swift advancement of technology, the widespread incorporation of Artificial Intelligence (AI) into education has become a significant development. Within this technological framework, the field of writing has experienced a notable transformation, as tools assisted by AI reshape academic composition. Effectively navigating this transformative phase requires a deep comprehension of the differing viewpoints of those involved (Bin-Hady et al., 2023; Steiss et al., 2023; Tseng & Warschauer, 2023; Warschauer et al., 2023). This study initiates an investigation focused on the complex dynamics of student interaction with AI-supported writing tools, with a specific emphasis on the evaluation of written assignments.

The extensive utilization of AI tools in education raises crucial inquiries regarding how individuals navigate and make use of these technological aids in their writing pursuits. As the educational sector confronts the challenges associated with incorporating AI (Curtis, 2023; Rahaman et al., 2023), it becomes essential to investigate the tangible outcomes of participants' academic work to identify the complexities of their engagement with AI-supported writing. The principal aim of this study is to uncover patterns, themes, and variations within student-written assignments, thereby shedding light on the diverse ways in which AI tools impact the writing process.

The study explores the significant role of AI in enhancing academic writing through AI-assisted tools. Despite the transformative effect of AI on education (Jacob & Warschauer, 2023), the literature lacks insights into how undergraduate students use these tools in academic contexts. This research aims to address this gap by examining the interactions between students and AI writing aids, aiming to improve our understanding of AI's impact on writing. We seek to identify how these tools are used and their effects on education and student performance. The study fills a critical gap by detailing undergraduate EFL learners' use of AI aids, potentially guiding the development of more effective AI tools. The study also evaluates the impact of AI-assisted writing on language proficiency in accordance with the guidelines of the Common European Framework of Reference for Languages (CEFR), creativity, coherence, organization and structure, vocabulary and expression, and argument development, posing two main questions: How do students utilize AI writing tools, and what patterns emerge in their writing? Furthermore, how does the use of different AI tools influence the quality of their written work?

Literature Review

Integration of AI in Language Learning

Over the past two years, there has been a notable surge in research on the integration of AI into language learning, with studies exploring various aspects of AI's role in language education (Bin-Hady et al., 2023; Fitria, 2023; Forero-Corba & Bennasar, 2024; Kohnke et al., 2023; Liang et al., 2023; Steiss et al., 2023; Tseng et al., 2023; Warschauer et al., 2023). Research in artificial intelligence and education predominantly focused on AI technologies supporting learners (Afzaal et al., 2022). Pereira (2023) discussed the development of Natural Language Generation models and the creation of powerful AI-assisted writing tools and reported that users appreciated the seamless assistance of AI in writing, rapidly diversifying ideas, maintaining clarity, and enjoying collaboration with AI-assisted writing tools. A testament to this is the success of ChatGPT, with over 100 million active users just two months after its launch (Williams, 2023).

AI in Writing Assistance and Academic Settings

Lund and Wang (2023) highlighted the diverse tasks AI writing assistants could accomplish, accentuating their potential in guiding discussions about productivity. Taecharungroj (2023) identified five functional domains of large language models: creative writing, essay writing, prompt writing, code writing, and answering questions. Fok and Weld (2023) acknowledged the transformative potential of large language models but raised questions about designing tools that effectively leverage these models for complex writing processes. Booth Olson et al. (2023) advocated for the advantageous use of generative AI tools, particularly for complex writing tasks like argumentative writing, benefiting language learners. Su et al. (2023) underlined ChatGPT's role in supporting students with argumentative writing, aiding content generation, and streamlining the writing process. Nazari et al. (2021) found AI-powered writing tools to be efficient in promoting learning behavior and technology acceptance among non-native postgraduate students in English academic writing. Marzuki (2023) listed several benefits of integrating AI writing tools in enhancing the quality of EFL student writing.

Challenges, Opportunities, and Ethical Considerations

Warschauer et al. (2023) explored the affordances and challenges associated with using AI-based tools for second language learners, addressing dilemmas faced by these learners. Liang et al. (2023) highlighted the pressure on language learners to emulate the target language and the challenges encountered when using AI-based tools like ChatGPT, including allegations of plagiarism. In a study scrutinizing the precision of seven widely utilized GPT detectors on US student TOEFL essays, Liang et al. (2023) revealed a high false-positive rate in labeling essays as "AI generated" among these detectors. In a similar study, Casal and Kessler (2023) reported the difficulty experts face in distinguishing between ChatGPT/AI-generated abstracts and those produced by humans. Yuan et al. (2022) deliberated on the capabilities and limitations of large neural language models like GPT-3, highlighting their potential for co-writing experiences and noting trade-offs between flexibility and performance. Similarly, Dhamala et al. (2021) and Carlini et al. (2021) articulated concerns about biases inherited by large language models from their training data. Imran and Almusharraf (2023) studied the ethical considerations of using ChatGPT/AI in research and academic publishing, finding that journal editors accept AI-assisted abstract writing as an appropriate practice.

The most recent body of research highlights the various effects of AI in writing assistance. While these studies have diligently examined the challenges, opportunities, and ethical considerations associated with the incorporation of AI, a notable gap persists in research specifically addressing the precise impact these tools exert on EFL writers. This gap signals the need for ongoing commitment to understanding the broader implications of AI integration in educational and linguistic contexts.

Method

This study employed a quasi-experimental research design to investigate the impact of a structured AI training intervention on undergraduate participants' engagement with AI-assisted writing tools. The research design drew upon relevant literature, including the work of Gopalan et al. (2020), which emphasized the necessity of a comprehensive approach to enhance research design in educational studies, highlighting the importance of methodological rigor, laying the foundation for the chosen research design. The participants, totaling n=62 undergraduate

participants enrolled in a general English course within a Business Law program at the International University of Rabat, Morocco were purposively sampled to ensure representation across diverse proficiency levels, ranging from A2 to C1 according to the CEFR. The intervention and control groups comprised 31 participants each, with varying proficiency levels as highlighted in Tables One and Two (see appendix).

The focus group was provided access to a structured AI training program developed by Walden University that included modules covering an introduction to generative AI, its responsible use, limitations, and AI and Academic integrity. This course was particularly well-suited for the study as it provided a comprehensive introduction to AI and covered essential aspects such as responsible use, limitations, and the intersection of AI with academic integrity. The aim was to equip participants with foundational knowledge and concepts related to generative AI, addressing any complexity associated with this technology. Upon completion of the training, participants were expected to be more informed and confident in navigating AI, enabling effective application of AI technologies in their learning processes. The inclusion of modules on responsible use and academic integrity aligned well with the ethical considerations emphasized in the research, providing an ideal foundation for the intervention group.

While the focus Group benefited from the structured AI training program, the control group did not receive any specific training related to AI tools. The participants in the control group approached the written assignment without structured guidance on generative AI, its responsible use, limitations, and the intersection with academic integrity provided to the focus group. This intentional lack of training served as the control condition, facilitating the assessment and comparison of the impact of AI training on writing processes and outcomes between the two groups.

Both groups received an identical argumentative writing prompt: "*To what extent do you agree with the statement that the government alone should bear the responsibility of aiding the victims of the recent earthquake in Morocco, as opposed to the idea that it is a collective duty requiring contributions from all individuals and organizations?"* The participants were explicitly informed about the permissibility of using AI assistance during their writing process and were required to transparently mention the specific AI tool utilized during submission. The participants had one hour to compose a short essay ranging from 200 to 500 words.

Primary measures included assessing writing outcomes in terms of language proficiency based on the CEFR Grid for Writing Tasks developed by the Association of Language Testers in Europe (ALTE) in both the pre and post tests, creativity, coherence, organization and structure, vocabulary and expression, and argument development. Additionally, data on the specific AI tools used by participants were collected for analysis. Data analysis involved a comparative examination between the Intervention and Control Groups to ascertain if the structured AI training had a significant impact on writing outcomes.

Ethical considerations are paramount in this study. Researchers communicated transparent and comprehensive guidelines on the ethical use of AI tools to participants, emphasizing the importance of maintaining academic integrity. Confidentiality was prioritized, and participants were assured that their work would be anonymized during the analysis process. Informed consent was diligently obtained from both instructors and participants, reaffirming the ethical standards upheld throughout the study.

Findings

Control group

Proficiency Levels

The statistical examination of the control group's language proficiency, before and after the intervention, provides valuable insights into its efficacy. Initially, the group displayed a broad spectrum of language skills, with the majority being classified under the B1 proficiency level. However, post-intervention data, as detailed in Table Three, reveals a significant redistribution of proficiency levels, notably marked by an increase in B2-level proficiency. This change underscores the effectiveness of AI assistance in fostering more advanced language competencies. A closer analysis reveals differentiated impacts across proficiency levels. While B1 participants saw a reduction, indicating some advancement to higher proficiency levels, the proportion of A2 participants halved, suggesting a varied response to the AI tool. The consistency in C1-level participants before and after the intervention indicates that those with already advanced skills maintained their proficiency, unaffected by the AI assistance. The emergence of responses classified as "Not Clear" post-intervention points to challenges in clarity for some users, hinting at areas for further refinement in AI assistance.

Table 3. *Distribution of participants' writing proficiency levels and corresponding answers pre and post-intervention*

Participants' Pre-Intervention Proficiency	Participants' Post-Intervention Proficiency
A2 Level: (12.90%)	A2 Level: (6.45%)
B1 Level: (45.16%)	B1 Level: (29.03%)
B2 Level: (22.58%)	B2 Level: (38.71%)
C1 Level: (9.68%)	C1 Level: (9.68%)
	Not Clear (in French): (3.23%)

Creativity

The creativity displayed in the participants' responses to the argumentative writing prompt was multilayered, including not only content but also stylistic elements and refined expressions. Participant One, for instance, was creative in the use of terminology such as *"force majeure"* introducing a legal dimension to the discussion and elevating the linguistic sophistication. P3 described the earthquake as a *"revealer of management difficulties"* displaying creativity in framing the disaster as an opportunity for broader policy reflection. Participants five and eight expressed disagreement creatively, employing direct and assertive language, while Participant one employed succinct yet impactful statements like *"it's a shame"* conveying a potent emotional response. The diversity in language proficiency levels added another layer of creativity, with participants utilizing varied vocabulary and sentence structures to articulate their thoughts effectively. Moreover, participants 20 and 22 showed creativity by integrating personal experiences and observations into their arguments, offering a unique perspective. Participant Three employed the rhetorical question *"How can a country organize herself to prevent this type of crisis or to overcome them ?"* to stimulate critical thinking, fostering a dynamic and engaging writing style. In contrast, Participant two demonstrated creative thinking by considering the global impact and portraying the earthquake as a testament to solidarity. The intervention's impact on creativity is intriguing, as some participants show signs of increased complexity and depth. The introduction of AI assistance has clearly influenced participants to experiment with more intricate sentence

structures, explore nuanced viewpoints, and employ sophisticated vocabulary. While creativity is inherently subjective, the diverse approaches seen in these responses collectively reflect a rich Spectrum of linguistic inventiveness and thoughtful engagement with the given prompt.

Coherence

The coherence in the participants' responses was evident through the consistent organization and logical progression of ideas. Each writing effectively introduced and developed a specific point, contributing to a cohesive and structured argument. Participant three demonstrated a high degree of coherence by exploring the earthquake as a "*revealer of management difficulties"* and effortlessly transitioning to reflections on policy. The paragraph maintained a clear cause-and-effect relationship, demonstrating a logical connection between the earthquake's impact and the subsequent need for policy reevaluation. Participants five and eight consistently showed coherence by exploring the creative expression of disagreement. The transitions in their responses were seamless, highlighting the effective use of direct and assertive language in conveying dissent:

> "I believe that the responsibility of aiding the victims of the recent earthquake in Morocco should not fall solely on the government, but rather it is a collective duty that requires contributions from all individuals and organizations"; "While the government plays a crucial role in disaster relief and participant, expecting it to shoulder the entire burden may be impractical and insufficient".

Organization and Structure

Organization and structure varied greatly, reflecting different levels of proficiency and effectiveness in conveying ideas. Several participants demonstrated a clear and logical organization, with a well-defined introduction, body, and conclusion. Participants 11 and 12 exhibited a high level of organization, presenting a structured argument with distinct paragraphs. These participants effectively introduced the topic, provided detailed supporting points, and concluded with a concise summary or opinion. The effective use of cohesive devices, such as transition words and phrases, contributed to the overall coherence and flow of ideas. On the other hand, other participants, like 27, demonstrated challenges in organization. The lack of clear paragraph breaks and a discernible structure hindered the readability of the writing. Participants 20 and 22 incorporated personal experiences into their responses, adding a layer of depth and authenticity. While this enhances the content, it also introduces a more subjective and narrative structure, which may be considered less traditional but adds a unique flavor to the overall composition. The impact of AI assistance was also evident in Participant nine's writing, where the improvement in the organization did not align with the pre-intervention proficiency.

Complexity of Sentences

The complexity of sentences in the participants' responses presented a range of syntactic structures. Some participants demonstrated a high level of sentence complexity, employing varied sentence structures to convey complex ideas. This was exemplified by the use of complex sentences, incorporating subordinate clauses, relative clauses, and diverse punctuation "First and foremost, I strongly advocate for the crucial and indispensable role of the government in this challenging situation. Moroccan citizens rightfully anticipate that the government will promptly and effectively implement necessary initiatives. However, it is essential to recognize that local assistance can also play a valuable role alongside governmental efforts." This complex and

sophisticated writing style was also confirmed through the use of rhetorical questions, utilizing intricate sentence structures to stimulate critical thinking and reflection "A State is supposed to prevent problems (climate disasters, volcano, flood...) and not to solve them. In front of this situation, my question is: How can a country organize herself to prevent these types of crisis or to overcome them? What money is contributed for the crises?" Conversely, lower-proficiency participants employed simpler sentence structures, relying on shorter sentences to convey ideas, which is accounted for by low language proficiency levels.

Vocabulary and Expression

The use of vocabulary varied among higher proficiency participants. P1 employed advanced language, stating, *"The government is the representative of the people, and so it has a duty to assume this responsibility, and to anticipate as much as possible this kind of force majeure as far as possible."* This demonstrates a meticulous and intricate use of language in the articulation of concepts. Conversely, participants with moderate proficiency, as seen in Participant five, conveyed their opinions more straightforwardly, stating, *"it is always better to help everyone."* Meanwhile, those with basic proficiency, exemplified by Participant nine, expressed opinions in simpler terms, "*No, the Moroccan government shouldn't have to face this terrible happening Alone."* Moreover, some participants showcased creativity in vocabulary usage, as observed in Participant one, where the response states, *"It's good to show solidarity and to not owe anyone any favor."* The use of AI assistance is evident in Participant seven's response, where a French phrase is included: "*Je sais pas trop comment l'écrire en anglais" (Translation: "I don't really know how to write it in English*"). This indicates the participant attempting to incorporate a different language to solicit the aid of AI.

Argument Development

The development of arguments in participants' responses shifted in terms of clarity, coherence, and depth. Higher-proficiency participants, exemplified by Participant one, strategically built their argument by emphasizing the need for a collective duty in aiding earthquake victims. The participant introduced the idea that relying solely on the government may be impractical, highlighting the potential insufficiency of government resources during large-scale disasters. This demonstrates a well-structured argument with logical progression. On the other hand, Participant six presented a subtle perspective by discussing the role of public-private partnerships and community involvement. This added depth to the argument by acknowledging the importance of a collaborative approach. Participant two communicated improved argument development by exploring the concept of solidarity and the role of individuals and corporations in aiding earthquake victims. Participants with basic proficiency levels, as seen in the case of participant 14, struggled to develop arguments with clarity. The participant expressed the belief that the government alone should not bear the responsibility but failed to provide detailed reasoning, resulting in a less developed argument.

Focus group

Proficiency Levels

The evaluation of the focus group's language proficiency, before and after AI intervention, unveiled significant findings. Initially, participants demonstrated proficiency across various levels, predominantly at the B1 level. Post-intervention analysis, however, illustrated a remarkable shift

in language mastery, particularly evidenced by the transition of participants from B1 to B2. This shift not only reveals AI's effectiveness in elevating language skills but also reflects a broader improvement in proficiency levels across the board. A deeper look into the data, as depicted in Table Four, highlights a substantial decrease in A2-level participants and a doubling of B2-level proficiency post-intervention. This suggests that the AI tools were especially beneficial for those at the intermediate proficiency level, enabling a substantial number of learners to advance their language skills. Even among the most advanced learners at the C1 level, a modest increase in proficiency was observed, underscoring AI's potential to enhance language competencies even at higher-proficiency levels.

Table 4. *Distribution of participants' writing proficiency levels and corresponding answers pre and post intervention*

Participants' Pre-Intervention Proficiency	Participants' Post-Intervention Proficiency
A2 Level: (16.13%)	A2 Level: 4.17%
B1 Level: (48.39%)	B1 Level: 25.00%
B2 Level: (29.03%)	B2 Level: 50.00%
C1 Level: (9.68%)	C1 Level: 12.50%

Creativity

The participants demonstrated a range of writing creativity and effectiveness in conveying thoughts. Participant three adopted a formal and structured tone, presenting the argument in a clear and organized manner, starting by introducing the debate on the responsibility for aiding victims and delineating the two opposing views *"Natural disasters, such as earthquakes, often bring devastation and suffering to affected communities."* The participant argued for a collaborative approach, emphasizing the essential role of governments in coordinating relief efforts while stressing the active participation of individuals and organizations through donations, volunteering, and community support. Participant four employed storytelling elements to create a vivid narrative around the earthquake, setting the scene by describing the intensity of the earthquake and the immediate reaction of citizens and exploring the roles of the government and citizens dynamically, portraying the citizens as immediate responders and highlighting potential challenges in their uncoordinated efforts *"The earthquake that stroke Morocco a couple of weeks ago was so intense, most of the country felt it."* Participant one utilized metaphorical language to convey the roles of the government and citizens in aiding earthquake victims *"To solely rely on the government is to ignore the symphony of support that lies dormant within communities."* The metaphor of a symphony was employed to emphasize the idea that both entities play unique yet complementary roles. Participant six used a personal and conversational tone in expressing opinion on the roles of the government and community solidarity *"In my view, I firmly believe that the government bears a significant responsibility for addressing the needs of earthquake victims in Morocco. Simultaneously, the solidarity within the community holds paramount importance and exerts a crucial impact on the overall response to this situation."* The participant recognized the government's role but underlined the crucial impact of community solidarity. The response concluded by emphasizing the shared responsibility of overcoming disasters together.

Coherence

The coherence in the responses varied, with some demonstrating a high level of organization, logical progression, and cohesion, while others exhibited moderate to lower coherence. Participant

Three effectively established a clear flow by introducing the context of natural disasters, stating, *"Natural disasters, such as earthquakes, often bring devastation and suffering to affected communities"* before smoothly presenting opposing viewpoints and concluding with the importance of collaboration between the government, individuals, and organizations, stating, *"To effectively respond to earthquakes and other disasters, collaboration between the government, individuals, and organizations is essential."* This created a cohesive and well-structured argument. Similarly, Participant one presented good organization and logical progression by introducing the roles of the government, communities, NGOs, and businesses in a balanced manner, *"Helping earthquake victims in Morocco is a complex issue. Communities, non-governmental organizations, and all the businesses have something valuable to provide, like resources and knowledge."* On the other hand, Participant three lacked a clear and organized structure, presenting ideas in a disjointed manner with phrases like *"The government doesn't have to wait individuals or organizations to help victims."* resulting in a negative impact on overall coherence. While expressing a perspective that supports both government and collective efforts, Participant three encountered a challenge in maintaining a well-defined structure, which impeded the overall coherence of their response.

Organization and Structure

Among the responses analyzed, 70% presented a well-organized structure, introducing the topic, presenting viewpoints with clear transitions, and concluding effectively. The participants often followed a logical progression, discussing the role of the government, contributions from organizations and individuals, and the need for collaboration. Participant two, 22 and 24 presented well-structured writing, featuring a clear introduction with a strong thesis, logical development of ideas, supported with detailed examples, consideration of counterarguments, and a concluding reiteration of the thesis. The use of transitional phrases and clear language enhanced the overall coherence and readability of the paragraphs. On the other hand, the remaining 30%, were comprised of lower-level participants who presented paragraphs that lacked clear organization, presenting ideas without a structured progression. These less organized responses often expressed opinions without a clear introduction or conclusion; thus, impeding the flow of ideas and weakening the overall impact. This same category presented a series of ideas without establishing a cohesive link between them, resulting in a fragmented presentation of the arguments.

Complexity of Sentences

The responses exhibited significant variations in syntactic complexity. Moderate-proficiency participants, including participants one and six exhibited lower linguistic complexity, marked by grammatical errors and use of informal language, while others demonstrated higher levels of proficiency through the use of complex sentences. Higher-proficiency students, including Participants 14 and 15 presented a balance between complexity and clarity in their responses, with a combination of intricate and straightforward sentences articulating complex ideas. Participants 22 and 24 stood out for their elaborate construction, presenting well-structured arguments with rich vocabularies. Conversely, Low-proficiency participants lacked both complexity and coherence, featuring fragmented statements and repetitive language. Overall, the participants collectively depicted a spectrum of language proficiency, with variations in the ability to maintain linguistic complexity, suggesting differing levels of room for improvement in grammar and expression even with Ai assistance.

Vocabulary and expression

Word choice varied widely, reflecting differences in linguistic proficiency and formality. For instance, Participant one, representative of moderate-proficiency, presented simpler language with informal expressions such as "*kind of*" contributing to a less formal tone. In contrast, Participant five stood out for the use of sophisticated vocabulary considering the low proficiency, employing phrases like "*advocate for a collective duty*". Participant four had a balance between complexity and clarity, effectively exploring both government and individual responsibilities in disaster relief "*When a disaster hits, the number one responsible of taking action as fast as possible is the government, it is their duty to contribute with all their resources to: coordinate all emergency services to help and rescue, make sure all medical operations are in place..."* Conversely, Participant Three's writing lacked both complexity and coherence, with fragmented statements and repetitive language diminishing overall clarity. Participant two displayed elaborate construction and rich vocabulary, establishing a high level of linguistic proficiency. The participant successfully combined linguistic complexity with a sense of national pride, using rich vocabulary to convey the idea of collaborative efforts between the government and the people.

Argument development

A range of writing styles and argumentative approaches were observed. With lower-proficiency participants adopted a direct and personal tone, expressing individual opinions without extensive elaboration, as seen in responses like *"No, because I think that they both need to work together."* On the other hand, moderate-proficiency participants followed a structured format, introducing the topic, presenting contrasting viewpoints, and concluding with a clear stance, often utilizing transitional phrases for coherence. Examples were strategically employed, strengthening the arguments with concrete instances and lending authenticity to their claims. Higher-proficiency participants presented a balance in viewpoints, acknowledging the roles of both government and individuals. Advocacy for collective responsibility was evident in various responses, emphasizing the collaborative duty of individuals and organizations for more effective disaster relief. National pride and unity shined through in certain answers, portraying a collective identity and the spirit of citizens coming together during crises. Legal and practical considerations were woven into the arguments of some respondents, emphasizing the government's role in managing emergency services and the need for collaboration. Others explored the complexity of the issue, presenting intricate perspectives and acknowledging the complex nature of the topic. A global perspective is briefly touched upon by higher-proficiency participants, indicating an awareness of international involvement in disaster relief efforts.

AI writing Assistance tool Preferences

The dataset revealed thought-provoking patterns in participants' preferences for AI-assisted writing tools. Notably, the overwhelming majority of the participants, favored CHAT GPT. This tool transcended gender and proficiency level differences, as both male and female participants across various proficiency levels predominantly opted for CHAT GPT. In contrast, alternative tools like You.com and QUILLBOT had considerably lower representation as highlighted in table five below. In a post-intervention brainstorming session, participants provided insights into their overwhelming preference for CHAT GPT. The unanimous choice was primarily driven by two key factors: user-friendliness and the perceived power of the tool. Participants highlighted that CHAT

GPT's interface and functionality were intuitively designed, making it easy for users across different proficiency levels to navigate and utilize its features effectively.

Table 5. *Control group user preferences for AI-Assisted writing tools*

Preferred AI-assisted writing tools	Preference Percentages
CHAT GPT	93.4%
YOU.COM	3.3%
QUILLBOT	3.3%

In examining the preferences of the focus group, CHAT GPT continued to be the predominant choice. This reaffirms its broad appeal across genders and proficiency levels, showcasing its versatility and effectiveness. Notably, this group demonstrated a more diversified set of preferences compared to the control group. While CHAT GPT remained the popular choice, several participants explored alternative tools, including Jenni.ai, Google Translate, Grammarly, Wordtune, and QUILLBOT as seen in Table Six below. Female participants, in particular, displayed a greater range of tool selection, incorporating options beyond CHAT GPT. This suggests a more elaborate approach to AI writing tools among female participants. The inclusion of various tools highlights a willingness to experiment and tailor choices based on specific writing needs. Further exploration into the motivations behind individual tool selections could provide deeper insights into the factors influencing these diverse preferences.

Table 6. *Focus group user preferences for AI-Assisted writing tools*

Preferred AI-assisted writing tools	Preference Percentages
CHAT GPT	77.6%
Jenni.ai	3.2%
QUILLBOT	6.4%
Google Translation	6.4%
Wordtune	3.2%
Grammarly	3.2%

Discussion

The Findings uncovered a trend where students go beyond mere grammatical corrections, using AI to enrich their writing through creative expressions and improved structural coherence. Furthermore, the choice of AI tools played a crucial role in the quality of their written assignments, with students showing a strong preference for certain tools, which was linked to notable improvements in writing outcomes. In the control group, a diverse range of proficiency levels was observed, with a notable shift towards B2 proficiency post-intervention. This suggests that AI assistance positively influences language proficiency, particularly at the intermediate level. In contrast, the focus group exhibited a more substantial transformation, with a significant decrease in A2-level participants and a substantial move from B1 to B2. The focus group results suggest that AI assistance plays a pivotal role in elevating writing skills across proficiency tiers, even influencing participants at the advanced C1 level. These results align with and confirm previous research on the ability of AI to enhance overall writing quality (Gayed et al., 2022; Gelvanovsky & Saduov, 2024; Hz et al., 2023; Marzuki et al., 2023).

Both groups showed evidence of increased creativity in writing styles influenced by AI assistance. The control group highlighted a range of creativity levels, emphasizing AI's role in fostering dynamic writing styles. The focus group supported this observation, showcasing a prominent outcome of AI intervention as increased creativity. Participants in both groups exhibited varied and effective writing styles, incorporating formal tones, storytelling elements, metaphorical language, and personal and conversational tones. This indicates that AI assistance stimulates creativity and contributes to a rich tapestry of expressive approaches. These results correlate with findings from previous research on the significant improvements AI-assisted writing has on learning ability and creativity in English writing (Meniado, 2023; Niloy et al., 2024; Wang, 2022).

The control group indicated variations in the organization, emphasizing participants' experimentation with writing techniques facilitated by AI. While improvements in coherence and organization were observed, individualized participants pointed to areas where AI assistance needs refinement. In the focus group, effective organization and structure were prevalent in the majority of participants, indicating that AI assistance contributes to enhancing organizational skills. However, a subset of participants lacked clear organization, underlining individualized responses to AI assistance. Overall, both groups demonstrate that AI support positively influences organizational skills, albeit with varying degrees of impact. These findings confirm results from previous research on the impact of AI-assisted writing on the writing process (Booth Olson et al., 2023; Su et al., 2023).

In the control group, variations in sentence complexity and vocabulary usage indicated participants' experimentation with writing techniques facilitated by AI. The focus group results revealed a spectrum of syntactic complexity and linguistic proficiency among participants with lower-level proficiency, indicating that AI assistance contributes to a diverse range of linguistic complexity. Both groups exhibited instances of higher linguistic proficiency with complex sentences and advanced structures, indicating the positive influence of AI assistance. However, even with AI aid, lower-level participants in both groups showed room for improvement in linguistic complexity. These results confirm previous findings on the impact of the use of AI-powered writing assistance on syntactic and lexical proficiency (Mahmud, 2023).

The control group highlighted variations in vocabulary use. In the focus group, vocabulary and expression reflected a wide range of linguistic proficiency and formality, suggesting that AI assistance positively impacts participants' vocabulary use. Instances of sophisticated vocabulary and out-of-level word choice indicate the positive impact of AI assistance on elevating language proficiency. Conversely, simpler language in certain responses suggests individual variations in linguistic expression, revealing the diversity of interactions with AI intervention.

The control and focus group findings collectively underscore the transformative role of AI-assisted writing tools across multiple dimensions. AI support not only positively influences proficiency levels but also fosters creativity, enhances organizational skills, and contributes to a varied spectrum of linguistic complexity and vocabulary use. The strong conclusions drawn from both groups emphasize the multifaceted impact of AI intervention, providing valuable insights for refining AI assistance in shaping writing abilities among undergraduate EFL learners. Numerous research findings support the conclusion that artificial intelligence could significantly enhance the writing abilities of EFL learners (Lee et al., 2024; Sumakul et al., 2022)

The analysis of AI writing assistance tool preferences reveals intriguing patterns and distinctions between the control and focus groups. In both groups, CHAT GPT emerges as the overwhelmingly favored tool, transcending gender and proficiency level differences. The high

usage of CHAT GPT is attributed to its perceived effectiveness, user-friendly interface, and widespread availability, as evidenced by the preference percentages of 93.4% in the control group. In the focus group, CHAT GPT continues to dominate, reaffirming its broad appeal across genders and proficiency levels. However, a notable difference arises as participants in this group display a more diversified set of preferences. The participants' preference of this specific AI tool aligns with results put forward by Bibi and Atta (2024) who assert that "Students have an overall favorable opinion of ChatGPT, and many of them are happy with the help it provides with different parts of creating content in English" (p. 10). While CHAT GPT remains popular, several participants explore alternative tools, including Jenni.ai, Google Translation, Grammarly, Wordtune, and QUILLBOT. Female participants, in particular, presented a greater range of tool selection, suggesting a more informed approach to AI writing tools. The inclusion of various tools in the focus group emphasizes a willingness to experiment and tailor choices based on specific writing needs. This diversity in preferences reflects a dynamic environment of AI writing tool usage, with participants balancing the reliability of CHAT GPT and the exploration of alternative tools to enhance their writing experiences. This stands in contrast to the control group, where alternatives like You.com and QUILLBOT had considerably lower representation.

Despite these differences, both groups consistently highlight the importance of user-friendliness and the perceived power of CHAT GPT as significant factors driving their preferences. These results confirm the findings of Phan (2023) who reported that students' perceptions of AI writing tools were positive, particularly regarding their ease of access, flexibility, and user-friendliness. The study concludes that, while CHAT GPT remains a reliable and popular choice, the focus group's inclination towards exploring alternative tools suggests a potential evolution in user preferences. Further investigation into the motivations behind individual tool selections in the focus group is recommended to gain deeper insights into the factors influencing these diverse preferences. Overall, the study underscores the need to consider user adaptability and the evolving nature of AI writing tool preferences in experimental research.

Conclusion

This study aimed to uncover patterns, themes, and variations within student-written assignments to elucidate the diverse ways in which AI tools impacted the writing process of undergraduate English as a Foreign Language (EFL) learners. Specifically, it investigated the complex dynamics of these students' interactions with AI-supported writing tools, focusing on the effects of such tools on the quality of their written assignments. This aim was comprehensively addressed through the examination of AI-assisted writing tools across various aspects, such as proficiency levels, creativity, organization, sentence complexity, and vocabulary use, which indicated a significant impact on the development of writing skills among undergraduate students. Both the control and focus groups showed positive outcomes in language proficiency, creativity, organizational abilities, linguistic complexity, and vocabulary usage with the assistance of AI. Notably, the study underlined the diverse and substantial influence of AI intervention on writing. Regarding tool preferences, CHAT GPT emerged as the overwhelmingly preferred tool in both groups. However, the focus group exhibited a more varied selection of preferences, exploring alternative tools like Jenni.ai, Google Translation, Grammarly, Wordtune, and QUILLBOT. This indicated a shift in AI writing tool preferences, highlighting the need for user adaptability. While CHAT GPT remained popular, the study recommended further exploration of the motivations behind individual tool choices to better understand evolving user preferences. Overall, the research

highlighted the dynamic nature of AI writing tool usage and emphasized the importance of adaptability in experimental research. The implications of this research extended beyond the academic realm, suggesting that AI-assisted writing tools significantly contributed to enhancing language proficiency and creativity among undergraduate writers. As the study revealed evolving preferences for alternative tools in the focus group, educators and developers were encouraged to consider the dynamic nature of user preferences, emphasizing the need for continual adaptation and innovation in AI writing tools to meet the diverse needs of users and facilitate continuous improvement in writing skills.

Limitations

While the study provides valuable insights into the effects of AI-assisted writing tools on undergraduate EFL students, it is not without limitations that suggest avenues for future research. The study's sample size, though adequate for a quasi-experimental design, may limit the generalizability of its findings across broader educational contexts and cultures. Additionally, the study's duration and the control over external variables might not fully capture the long-term effects of AI tool usage or account for all factors influencing student engagement and writing quality. The research also focuses primarily on quantitative outcomes, potentially overlooking the depth of students' qualitative experiences with AI writing tools. Despite these limitations, the study makes a significant contribution to understanding AI's role in education, underscoring the need for further exploration of these tools' pedagogical implications and their ethical use in academic settings.

Funding

This research is not funded.

Acknowledgments

Not applicable.

Conflicts of Interest

The authors declare no conflict of interest.

Authenticity

This manuscript is an original work

Artificial Intelligence Statement:

AI and AI-assisted technologies were not used.

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Appendix

Gender and Proficiency Distribution Across Control and Focus Groups

Table1. *Control group* Table 2. *Focus group*

Participant	Gender	Proficiency level	Participant	Gender	Proficiency level
P1	Male	B2	**P1**	Female	B1
P2	Male	B2	**P2**	Female	B2
P3	Female	B2	**P3**	Male	A2
P4	Male	A2	**P4**	Male	B1
P5	Male	B1	**P5**	Female	A2
P6	Male	B1	**P6**	Male	B1
P7	Male	A2	**P7**	Female	B2
P8	Male	B2	**P8**	Female	B1
P9	Female	A2	**P9**	Female	B1
P10	Male	B1	**P10**	Female	B1
P11	Male	C1	**P11**	Female	B1
P12	Male	C1	**P12**	Female	B1
P13	Male	B2	**P13**	Male	B1
P14	Female	A2	**P14**	Female	B2
P15	Female	B1	**P15**	Male	B2
P16	Male	B1	**P16**	Male	B2
P17	Male	A2	**P17**	Male	C1
P18	Female	B1	**P18**	Male	B2
P19	Female	B1	**P19**	Male	C1
P20	Female	B1	**P20**	Female	C1
P21	Male	B2	**P21**	Female	B2
P22	Male	C1	**P22**	Female	B1
P23	Male	B1	**P23**	Female	A2
P24	Male	B1	**P24**	Female	C1
P25	Female	B1	**P25**	Female	B2
P26	Male	B1	**P26**	Female	B2
P27	Female	B1	**P27**	Male	B1
P28	Female	B1	**P28**	Male	B2
P29	Female	B1	**P29**	Female	B2
P30	Female	B2	**P30**	Female	A2
P31	Female	B1	**P31**	Male	C1