

A Review of Pedagogical Application: Pedagogical Integration of Mainstream AI Writing Tools in English Academic Writing Instruction and Its Impact on EFL Students' Thinking, Structure, and Language

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Abstract. As humans step into the era of artificial intelligence (AI), these advanced technologies have been integrated into a variety of fields, and education is included as well. This paper focuses on reasonable methods for English as a foreign language (EFL) teachers to combine mainstream AI-generated writing tools with academic writing guidance, and aims to improve EFL students' competence in three aspects: language, structure and thinking. This paper builds a complete and reasonable structure with sufficient content, which helps readers get a deeper understanding of the influence of AI writing tools and their importance in the pedagogical system. This paper analyzes the advantages and disadvantages of AI writing tools in the above three dimensions, collects the viewpoints of EFL teachers and students, and draws on the key findings of current research. It clarifies the key problems and provides targeted solutions for these problems. Different from traditional teaching methods, these writing tools have changed the current role of teachers with the help of advanced technology, so this paper also puts forward four specific transformation. In summary, this study emphasizes the great importance of integrating AI writing tools with pedagogical training in reliable ways. It also tries to find out the gaps in current research and helps future research avoid getting into such difficulties.

Keywords: Pedagogy, Linguistics, AI writing tools, English as a second language

1. Introduction

1.1. Background & trends

Since the dawn of the artificial intelligence (AI) era, large language models (LLMs) and AI writing tools like ChatGPT, ProWritingAid, and QuillBot have expanded quickly and extensively in educational settings. This has caused a significant shift, cheating, in the field of English as a Foreign Language (EFL) teaching [1]. Contrary to traditional language learning technologies, which simply correct basic grammar, modern LLMs use advanced natural language processing (NLP) to provide multifaceted support for academic writing, including contextualized linguistic refinement, inspiring

critical thinking, and designing structural frameworks [2]. The tremendous potential of AI writing tools is implicated in the development of AI in Language Learning (ALL), which is made possible by the technological revolution.

The expanding availability of AI-supported writing assistance highlights the significance of academic writing proficiency in light of English's role as an international language franca. Proficiency in academic writing is crucial to the academic and professional development of EFL learners [3]. Three essential components of the proficiency—accurate language expression, logical textual structure, and logical thinking—help students effectively communicate ideas, strengthen academic arguments, and engage in global scholarly debate [4]. Consequently, institutions around the world focus more on developing EFL students' academic writing skills and incorporate AI writing tools into their educational systems.

1.2. Core challenges

There are still many pedagogical, logistical, and cognitive challenges to be addressed before LLMs and AI writing tools can be effectively included into EFL academic writing training, despite their bright future. These difficulties are further discussed in the section that follows, drawing on recent empirical research.

1.3. Research purpose & core question

After summarizing previous research on the pedagogical use of popular AI writing tools in EFL academic writing teaching, this paper examines the benefits and drawbacks from three perspectives (language, structure, and thinking). In the meantime, it highlights a number of pedagogical issues, comes up with solutions, and talks about how the role of the teacher has changed. Lastly, it makes every effort to answer the main questions: What are the advantages or disadvantages of popular AI writing tools for academic writing by EFL students in terms of language, structure, and critical thinking? What obstacles need to be overcome in order to successfully include AI writing tools in teaching?

2. Literature review

2.1. Classification of mainstream AI writing tools

Nowadays, advances in AI writing tools have a high impact on language learning and teaching. In 2023, Alharbi classifies those mainstream AI writing tools into four categories—automated writing evaluation tools(AWE), tools providing automated writing corrective feedback(AWCF), AI-powered machine translators(MT), and automatic text generators(GPT-3) [5]. With the regulations in Alharbi's classification, this paper forms Table 1 to classify those AI writing tools, which recent prevailing AI tools(Doubao, Deepseek, Quillbot, Claude...) are also included, as shown in the following Table 1.

Table 1. The form based on the classification of Alharbi [5]

Category	Core Function	Representative
AWE	Firstly were used to help teachers in assessing their students' assignments, then with the development of AI, they upgraded from checking grammar and spelling to also offering support in identifying writing problems with targeted advice (e.g., organization and coherence).	Criterion, MY Access!, WriteToLearn
AWCF	These tools can continuously and simultaneously offer corrections and suggestions, mainly focusing on lower-level errors(e.g., grammar, vocabulary, punctuation) to help students improve writing accuracy.	Grammarly, ProWritingAid, Ginger, Quillbot
MT	They provide learners with near-human translations, rephrased sentences, and lexical references, helping learners deal with lexical and syntactic bottlenecks. But they failed to capture pragmatic and context-dependent meanings of language, which may limit their effectiveness in producing discipline-specific academic discourse.	Google Translate, DeepL
GPT-3	Without additional training for operation, they could generate human-like content only with basal prompts(a topic or a brief description) but incorporate it in a wide range of genres(essays, poems, academic writing). This low threshold of content production also raises concerns regarding overreliance and authorship ambiguity.	ChatGPT, Google Compose, Microsoft Editor, DeepSeek, Doubao, Claude

2.2. Current research focuses

The advances of AI writing tools significantly influence pedagogical systems both at home and abroad, attracting numerous scholars to get involved in relevant research. This review outlines five major research focuses identified in recent studies.

Firstly, scholars focus on a structured integration model. A study conducted by CUNY with 39 undergraduate students shows that the structured integration of LLMs is embedded at specific stages of drafting and revision [6]. In writing, assignments make students engage actively and deeply with draft revisions, while they foster their argumentative logic, and their knowledge of the difference between "AI for feedback" and "AI for content generation" is strengthened. Also, with the feedback of AI writing tools, EFL students' writing effectiveness(including task achievement, coherence, and language precision) highly improves, thereby, students demonstrate their willingness to integrate and mention the reduction of writing anxiety via the structured process. It is well acknowledged that writing anxiety as a key affective variable is widely recognized in second language writing research. Secondly, scholars like Consalves pay more attention to academic integrity. His study indicates that fear of academic consequences, unclear guidelines, uneven enforcement, and peer pressure are major obstacles to students' non-compliance with AI use declarations [7]. Therefore, Consalves encourages universities to establish a trust-oriented AI disclosure policy and distinguish disclosure requirements [7]. Thirdly, customized or personalized instruction is also worth considering. Through empirical study, Pu gains dynamic feedback via the personalized teaching model of English writing—AI offers basic-level learners grammatical correction and simple sentence templates, while provides higher-level learners with structure optimization and literature support advice [8]. In the AI era, teachers' traditional roles have changed, so the fourth focus is the transformation of teachers' instructional roles rather than a loss of pedagogical authority. Based on research with 26 EFL teachers from 6 universities, the study illustrates three essential roles of teachers—planner of cultural exploration, facilitator of critical thinking, and encourager of technological literacy—and points out the importance of transformation, the enhancement of both "cross-cultural writing adaptability" and "technological application ability" [9]. Last but not least, critical thinking is indispensable. With AI tools' assistance, EFL students could expand their arguments or even complete their writing easily, but would over-depend upon them; hence, teachers' guidance is crucial. The design of the "critical verification" encourages students to compare their outputs with

AI-generated content to check logical faults or semantic redundancy—prevents students from blind application, meanwhile it maintains their innovation [10].

3. Pros & cons of AI writing tools across academic writing dimensions

3.1. Impact on language competence

With regard to Language competence, a number of teachers underline that AI writing tools may enhance lexical exposure without guaranteeing active vocabulary acquisition, then, strengthen students' vocabulary because those tools furnish students with abundant synonyms or even more advanced words [11]. Marzuki suggests that lexical acquisition enables students to demonstrate their minds more accurately and effectively. Moreover, with new words, students might express their ideas alternatively, reducing repetition by replacing frequently used words or phrases. Another researcher Zhao designs a pretest-posttest random assignment experiment, involving 295 English as a foreign language students, and underscores that AI writing tools are most effective in language precision(focusing on grammar correction, vocabulary enhancement, and sentence structure refinement) [2]. Through this trial, the AI intervention group obtains a post-test mean score of 83.33, noticeably higher than the traditional teaching control group ($M=37.44$). Moreover, the between-group difference was statistically verified to be highly significant ($F=906.385$, $p<.001$). In contrast, with much more intricate words that students could not comprehend completely, AI writing tools might result in stylistically inappropriate or semantically imprecise writing. Due to the rapid speed, AI writing tools provide advanced vocabulary, students might fall into laziness—not make efforts to recall or memorize new words [11].

3.2. Impact on text structure

In terms of text structure, teachers illustrate how AI writing tools are beneficial in cultivating a perspicuous and rational coherence of thinking by removing redundant expressions; at the same time, tools exhibit essential effectiveness in the use of lexical and phrasal transitions [11]. Researchers regard AI writing tools as differential writing tutors because with their help students could correct and learn from their mistakes via real-time feedback, making the study much more constructive and practical. On the flip side, overdependency would also lead to negativity, which means students might overlook their own development of coherent writing and strangle their personal writing styles.

3.3. Impact on critical thinking

Some teachers emphasize that AI writing tools play a significant role in cultivating students' creativity and capability to generate ideas [11]. According to Marzuki's experiment, he highlights the potential benefits of those writing tools to achieve idea expansion, provide various perspectives, and help students overcome creative hurdles [11]. On the contrary, with too much help of AI writing tools, students may be limited in promoting deeper or more innovative thinking, causing a so-called "over-dependence". This makes students have diminished independent analytical ability and causes their work to be rigid.

4. Key challenges, solutions, and teacher role transformation

4.1. Key challenges

Challenges will be divided into three aspects, which are mentioned in the introduction. And perspectives from both EFL teachers and students have been taken into consideration.

Firstly, pedagogical challenges: A large number of EFL teachers with insufficient capacity, like technological literacy or pedagogical training, fail to generate ideas effectively via AI writing tools [11]. Moreover, Alm and Watanabe illustrate that AI tools possibly reduce chances for critical dialogue between teachers and students because those tools might repeat one-way knowledge transfer [4]. Mismatch also exists, which means AI-assisted writing processes and conventional assessment systems are incompatible. It is easy for AI writing tools to handle obvious errors (e.g., grammar, spelling, or illogical structure); however, they confuse teachers about students' true ability in academic writing.

Secondly, practical problems: the digital divides persist in both access and effective use of AI tools. For EFL students with poor family socioeconomic status (SES), containing mother education, father education, estimated family income, perceived family social class, and socioeconomic ladder, lack access to high-tech tools or stable devices, losing the chance to leverage AI writing tools [12]. Moreover, scholars also emphasize that EFL students who use the output of AI directly without any contribution might make the distinction between assistance and plagiarism unclear, leading to the vulnerability of academic integrity [13].

Finally, cognitive complexities: over-reliance on AI causes a diminishing of critical thinking. Students favor AI's "quick fixes" over comprehending errors, which hinders the growth of writing self-control. And another disadvantage is that AI-generated content frequently fails to encourage students' in-depth engagement with subjects since it is impersonal and typical [11]. With long-term cooperation with AI, students might lose the ability to write tasks independently, failing to duplicate AI's scaffolding.

4.2. Practical solutions

To achieve great success in integrating AI writing tools with pedagogical system, practical solutions need to be cautiously taken into account.

It is an advisable practice to build an "AI + Teacher" collaborative feedback system, which means to arrange AI tools handle superficial errors (e.g., grammar, spelling, structure) while teachers pay more attention to higher-level skills (e.g., content depth, argument logic, cultural propriety) [3]. Alm and Watanabe also suggest that teachers train their students to use AI with questions—identifying bias or inaccuracy in AI tools' outputs [4]. The establishment of a process-oriented pattern is a wise choice for teachers to focus on students' interactions with AI, like how to generate effective prompts or to apply feedback, instead of just their final writing works [1].

To narrow digital gaps, targeted and specific digital literacy is significantly needed, while such training will be vital for students to equip themselves with the irreplaceable expertise and technical skills to successfully leverage the beneficial potential of AI [12]. Meanwhile, schools should define clear ethical guidelines for effective use, for example, no direct creation of essay content [14].

Critical thinking, as the most valuable part of academic writing, builds the bridge that enables students to learn from passive information declaration to active writing creation. Zimmerman introduces a self-regulated learning (SRL) model, pointing out that students might actively learn with the awareness of their own strengths and limitations [15]. Based on this model, the 6-P(plan,

prompt, preview, produce, peer-review, and portfolio-tracking) approach could effectively help EFL students' academic writing by the use of generative AI tools [16]. It is also vital to bolster students' willingness to compare their original works with AI outputs and explore differences, trying to comprehend how AI polishes their writing, and then reconsider their final draft [14]. Furthermore, Talayhan suggests students should rewrite outputs of AI writing tools with their examples to foster their critical thinking and creativity [10].

4.3. Teacher role transformation

Different from traditional teaching methods, teachers change their typical roles with the help of AI writing tools. After organizing several studies, roles can be divided into the following four aspects—technology integrator and teaching collaborator, personalized growth and differentiated instructor, multidimensional assessor and guardian of academic integrity, lifelong learner and research-oriented practitioner.

For "technology integrator and teaching collaborator", AI functions as a collaborative instructional resource rather than a substitute for pedagogy with innovative and contextual strategies, while AI provides students with real-time feedback, so teachers can spend more time on combining AI with curriculum goals. For "personalized growth and differentiated instructor", EFL teachers take advantage of AI to solve individual student weaknesses in writing precision. For "multidimensional assessor and guardian of academic integrity", teachers should shoulder the responsibility to guide ethical AI use, training students to be cautious about accuracy and avoid plagiarism. For "lifelong learner and research-oriented practitioner", Nazim and Alzubi suggest that EFL teachers can become lifelong learners using generative AI-mediated self-professionalism, which uses AI to evaluate pedagogical methods and improve instructional methodologies [17].

5. Conclusion

In conclusion, the combination of mainstream AI tools and academic writing instruction deeply influences the writing competence (thinking, structure, and language) of EFL students; however, every research subject is characterized by dual dimensions, where its positive values and potential limitations are inherently intertwined. Therefore, paying attention to both virtues and drawbacks is essential for EFL teachers to make their teaching effective. Positive values of AI writing tools include: enhancing lexical acquisition, reducing repetition, and improving language precision on language competence; cultivating logical structure, removing redundant expressions, and designing better word or phrase transitions on text structure; generating ideas and providing innovative perspectives on critical thinking. In contrast, limitations like bringing laziness to memory words, ignorance of personal development, and diminution of analytical ability still exist.

Obviously, core pedagogical challenges and empirical solutions are needed. To deal with technological literacy for both EFL teachers and students, specific guidance is effective, such as training for EFL students to equip themselves with beneficial skills of AI use; while for EFL teachers to leverage the potential of AI to form a more reasonable pedagogical instruction. Moreover, it is judicious to establish an AI+Teacher collaborative feedback system, which could arrange AI tools handle shallow errors and provide teachers with sufficient time to focus on higher-level problems. To cope with cognitive complexities, which means over-reliance on AI and causes students' critical thinking diminishing, it is advisable to apply the 6-P approach based on the SRL model and bolster students' willingness to conduct comparisons between original works with AI to identify improvements and foster self-creativity. Additionally, AI writing tools make contributions to

the transformation of teacher's roles and help the modern pedagogical system become much more innovative, interpersonal, honest, and perennial.

Finally, the study highlights a key research gap by identifying two major divides. It seems to be a "black box" gap in thinking process studies because of a lack of transparency—people could only know the input prompts and see the output results, but the intermediate process remains unknown, making a puzzle, and currently, no one fully understands the underlying principles behind their behaviors. Another universal gap is that numerous studies prefer to focus on AI enhancing short-term writing proficiency rather than long-term retention. Investigation of AI-assisted writing is still in its infancy today, and there is a dearth of useful evidence regarding the long-term impacts of AI on students' writing proficiency. Deriving insights from those experimental gaps, could scholars undertake more prospective studies.

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