

A SYSTEMATIC REVIEW OF EMPIRICAL STUDIES ON THE IMPACT OF ARTIFICIAL INTELLIGENCE ON UNIVERSITY STUDENTS' WRITING SKILLS*

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Abstract

The massive proliferation of GAI has evoked a surge of interest in education and a heated debate among educators, researchers and stakeholders about promising benefits and potential threats that may radically transform the landscape of the pedagogical relationship between teachers and students. Emergent AI technologies are perceived to be alarming since they could contribute to passive learning that may hinder critical thinking and deskill the students in the writing classroom. Hence, it is important to seek understanding of how evolving technologies influence students' learning of writing via current research studies. This systematic review of literature aims at synthesizing empirical studies to highlight the patterns of the impact of AI on the students' writing, and underscoring any challenges and limitations. A total of seven empirical studies were identified based on a literature review search across a research database. Qualitative and mixed-methods designs were selected, showcasing the employment of several data collection methods. The findings highlight three dominant themes: advancing the students' writing skills across multiple components; generating content, timely feedback and feedforward, and ethical considerations and fear of loss of authentic writing style. The results suggest that though GAI can enhance the students' writing skills in academic settings, it can also result in undesired limitations, challenges and ethical issues that should be addressed by academic institutions to ensure the ethical, responsible use of GAI.

Key words: *Generative Artificial intelligence, Systematic review, Writing skills, Feedback, Higher education.*

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1. Introduction

Artificial Intelligence (AI) has become an omnipresent component in almost all the domains, and higher education is no exception. AI tools provide students with personalized learning opportunities, for they can create well-tailored contents, which respond to their needs; moreover, the students can have their own learning management systems that assist them with extra explanations, activities and updated knowledge; however, this steadfast change in the entire learning process across modules and skills calls for attention to the shortcomings of virtual personal assistants and AI-powered chatbots. In this context, the chief issue has risen from whether the students' use of AI has resulted in active deep learning, or the students are merely passive reliant on automated tools, and are submitting ready-made knowledge that is primarily based on assigned prompts. The entire process has marked a remarkable change in the landscape of higher education, namely quality teaching and active learning simultaneously. This inevitable reality compels higher education institutions to totally ban the use of Generative AI, enact AI-educational policy and ethical regulations and review their plagiarism policies while some institutions opt for altering their assessment and exams' procedures. As a matter of fact, a critical scrutiny and meticulous examination of the currently emerging empirical studies about the use of AI in the writing class is of a paramount significance to understand its impact on the involved parties at miscellaneous levels (García-Martínez *et al.*, 2023; Kamalov *et al.*, 2023). Therefore, this systematic review aims at unveiling the ways GAI is implemented in the writing classroom concerning the process and product, and the impact of AI on writing at university. Fundamentally, this systematic review seeks rigorous answers to the following research questions:

Research question 1: What are the prominent aspects of empirical studies on the use of Generative Artificial Intelligence in the writing classroom at university?

Research question 2: What is the impact of GAI on the students' academic writing skills?

2. Method

A systematic review was undertaken to identify the empirical studies that investigated the teachers' implementation of AI-powered writing devices in the writing classroom at the tertiary level of education. This review relied on systematic, explicit methods in order to identify and extract relevant studies to be included in the review (Wright *et al.*, 2007) along with the establishment of inclusion and exclusion criteria to reach valid and reliable conclusions (Strech and Sofaer, 2012), which basically adopted the Preferred Reporting Items for Systematic Reviews and Meta Analyses' (PRISMA) reporting guidelines (Page *et al.*, 2021). The PRISMA framework was designed in order to provide transparent accounts of systematic reviews and to evaluate a myriad of interventions across domains such as education. To ensure a standardized rigorous systematic review, this review relied on these four essential steps, which are highly recommended by Okoli (2015): (a) the planning phase, (b) the selection phase (practical screening and literature search), (c) the extraction phase (qualitatively,

quantitatively and appraising the quality of studies, and (d) the execution phase (the synthesis of studies into themes and writing the review).

2.1. The planning phase

The main purpose this review is already tackled in the introduction; nevertheless, it also considers the dissemination of the findings of the systematic review to practitioners, researchers and scholars who are primarily interested in the intersection between GAI and the writing skill at university concerning its current evolutionary state of empirical research. Similarly, this review will offer updated perspectives and trends about the integration of GAI in the process of writing in several educational settings and fields; hence, the dissemination strategy will be basically executed via the researchers' Google Scholar and ResearchGate accounts.

2.2. The selection phase

In line with the research questions, the following search formula was developed "writing at university"* AND "AI"* AND "Writing in Higher Education"* OR "University*" in order to generate a comprehensive list of related peer-reviewed articles. The screening was undertaken with regard to the title, the abstract and the keywords of the published articles in June 2024 in ERIC (Education Resources Information Center) since this database covers a wide range of indexed journals and recent studies in many disciplines and contexts. Furthermore, other parameters were included to identify the inclusion/ exclusion criteria.

Before embarking on the searching process, the inclusion and exclusion items were developed (Table 1); thus, the published articles, which tackled broad themes such as the evaluation of AI in Higher education and AI misuse in particular, or other dimensions including AI implementation in other skills rather than writing were rejected.

Table 1. Inclusion versus exclusion criteria

| Paradigm | Inclusion | Exclusion |
|------------------|--|--|
| Language | English | Other languages |
| Publication year | 2023-2024 | ////////// |
| Theme | AI and Writing | No focus on the other skills (Eg., speaking) |
| Target group | Higher Education | Not Higher Education (Eg., secondary) |
| Study type | Empirical Studies | Theoretical reviews |
| Publication type | Open access and peer-reviewed articles | Conference papers, dissertations, books, meta-analysis and reviews of literature |

The screening stage was undertaken via EPPI-Reviewer Web by uploading all the search results using RIS files. The researchers opted for this application because it is specialized in all types of literature reviews, and it provides transparent screening and coding results (Thomas *et al.*, 2020). The researchers verified the lists of the relevant titles and omitted all the duplicates. First, the relevant titles and abstracts were screened, and then the full articles were also read and screened.

2.3. The extraction phase

Once the list of the selected papers was refined, the first and second author classified important information about the empirical studies such as the research questions, the purpose of the study, the design and methods of data collection, the participants and samples, the field of research and the country. The obtained results were also extracted to highlight common themes across the studies. The third researcher reviewed the extracted data and undertook meticulous examination and updating. Furthermore, the researchers evaluated the quality of the included studies using the Mixed Methods Appraisal Tool (Hong *et al.*, 2018). This critical appraisal tool is designed to appraise the methodological quality of empirical studies only: qualitative, quantitative and mixed-methods. Two screening questions are meant for all the types of the studies; also, five questions should be answered taking into account the adopted study design. Every researcher rated the studies independently and met several times to discuss minor disagreements about the inclusion or the exclusion of the studies.

2.4. The execution phase

The researchers synthesized the obtained data and constructed the themes as proposed by Thomas and Harden (2008). After initial data extraction, the researchers read the entire articles in order to code the texts and develop descriptive themes about the impact of AI on university students' writing skills. So as to ensure rigour, the researchers met several times to discuss the extracted themes, refine and expand them.

3. Findings

3.1. Identifying relevant empirical studies

The total number of identified empirical studies from Eric database was 215 articles. Once the duplicates were removed, the researchers screened the titles and the abstracts of the studies. The initial outcome of this stage resulted in the elimination of 160 because of theme (n=121), target group (n=05), study type (n=30), publication type (n=4), and non-open access articles (n= 7). Similarly, the entire texts of forty-six articles were thoroughly read and examined; accordingly, 07 empirical studies were selected for inclusion in this systematic review of literature, and 39 articles were eliminated due to: theme (n=23), target group (n=2), study type (n=11), publication type (n=1), and language (n=2).

3.2. Characteristics of the empirical studies

The studies included a distribution of 80% of qualitative and 20% of mixed-methods design studies. The major research methods were case studies (03 studies) and intervention design (3 studies) whereas 1 study employed a survey design. The obtained data relied on interviews (20%), textual analysis (20%), pre- and post-tests (20%), while questionnaires (13%), focus groups (13%), and the least used were observations and field notes (7%) and reflective writing (7%). The populations of the studies were majorly undergraduate and graduate students (86%) and teachers (14%). There was a range of disciplines including engineering, English, psychology, law and economics, and several countries were represented: USA, China, Taiwan, Indonesia, Turkey, and India.

3.3. The impact of Generative Artificial Intelligence on the students' academic writing

After the analysis of the included studies, Table 2 highlights the obtained themes:

Table no. 2 Themes extracted from the empirical studies

| | |
|--|--|
| 1. Advancing the students' writing skills across multiple components | Kim <i>et al.</i> (2024); Tseng & Lin (2024); Özçelik & Ekşi (2024); Marzuki <i>et al.</i> (2023); Mahapatra (2024); Muslimin <i>et al.</i> (2024) |
| 2. Timely feedback and immediate feedforward | Tseng & Lin (2024); Özçelik & Ekşi (2024); Marzuki <i>et al.</i> (2023); Mahapatra (2024); Muslimin <i>et al.</i> (2024) |
| 3. Ethical considerations and loss of authentic writing style | Barrett and Pack (2024); Tseng and Lin (2024); Marzuki <i>et al.</i> (2023); Mahapatra (2024) |

3.3.1. Advancing the students' writing skills across multiple components

The studies pinpoint a significant theme with regard to the impact of GAI tools in advancing the students' writing skills. For instance, Kim *et al.* (2024) seemingly indicate that relying on ChatGPT when revising engineering lab reports results in improved awareness of the genre conventions and context of writing through “the addition of technical background information from outside sources” (p. 277) taking into account the expectations of audience when writing the introduction and the conclusion that align with the requirements of the genre characteristics and organization. Despite the improvement at the macrostructure level, the researchers assert that ChatGPT assistance in revision that requires an advanced command over critical thinking, connection between claims and evidence, interpretation and a firm understanding of technical concepts remains limited. Although the students might readily accept generated output without questioning its accuracy, it is also an essential part of the learning process in a specialized field such as engineering since the students are in the formative stages of honing their knowledge and optimizing their understanding of complex technical concepts.

Tseng & Lin (2024) advocate a balanced approach between the value of human output and AI assistance via ChatGPT-3.5 when the students received solid instruction concerning the essay structure prior to AI implementation in writing. Hence, the students “apply their pedagogical and technological knowledge to understand and implement the instructor's guidance, which includes crafting personalized prompts, refining instructions, and seeking clarifications.” This scaffolding approach empowers the students to critically engage in crafting their final essays regarding coherence, maintaining authorship and task authenticity. This endeavour raises the students' awareness of the requirements of the written task and equips them with the appropriate skills to accomplish the learning goals.

Marzuki *et al.* (2023) point out that many AI tools can be harnessed in order “to stimulate creativity and idea expansion... since they could offer various angles

when students were struggling with writer's block, thereby helping them overcome creative obstacles." (p. 17) Initially, AI can boost the students' brainstorming about the topic; therefore, they can articulate their ideas and enrich their content. However, some teachers expressed their concerns due to overreliance on AI tools that would inhibit the students from developing critical thinking skills. Though the teachers' concern about diminishing the students' authorship and originality in writing is valid, AI allows the students to generate ideas autonomously while writing on future assignments. Still, the students are engaged in constant conversation and collaboration with the chatbots to negotiate recommendations as long as they are mindful users of AI. Additionally, Özçelik & Ekşi (2024) maintain that ChatGPT promotes personalized approach of learning since it assists them in self-editing using different registers and suggestions to refine their writing.

Mahapatra (2024) upholds the perspective of transformative AI potential in promoting collaboration among the students in a supportive productive environment. A participant reports that ChatGPT is "a handy support tool for writing without being dependent on anyone." Additionally, "You ask for information, and you get it. You can go as specific or detailed as you wish." So AI engages the students in self-directed learning that allows them to make learning decisions in a formal learning situation that recognizes the value of social context and collaboration to construct worthwhile, meaningful learning. Accordingly, ChatGPT nurtures the above mentioned perspectives, for "so much talk is going on simultaneously! The conversations are so meaningful, we are working together and writing...I absolutely love how that fun is productive."

According to Muslimin *et al.* (2024), AI implementation has redefined descriptive writing since Cami-AI provides suggestive evidence about its positive impact on the students' writing. The students were easing into working on their descriptive paragraphs via Cami-AI, an active writing mentor with multiple integrated AI tools. The students' agency has been embodied in the students' ability to follow the instructions of Cami and construct texts based on generated images and specific guidelines, and then sharing these texts with classmates on WhatsApp group to further discussion about them. It is evident that the students' engagement and motivation are heightened, and their agency is promoted via self-regulation cycle when they reflect on how their writing is taking shape via generated images, tailored suggestions and immediate feedback that advance optimal learning experience and personalized instruction.

3.3.2. Timely feedback and immediate feedforward

Artificial Intelligence has transformed the educational landscape. Ground-breaking AI tools have revolutionized feedback provision; accordingly, they have proved effective in producing instantaneous timely feedback and feedforward across the writing skills. Tseng & Lin (2024) refer to ChatGPT as formative assessment tool that incarnates the essence of feedback practice. ChatGPT offers promising solutions to the challenges of feedback provision embodied in "time constraints and a lack of personalized attention." Due to its ability to provide "immediate feedback and constructive suggestions, enabling students to refine their work continuously

without time restrictions.” Thus, the students accomplish their writing tasks successfully via a self-regulation process that comprises knowing the characteristics of the final product, the ability of ChatGPT to offer feedback that identifies writing issues, and prescribes guidelines to refine the drafts. Once the students understand and use the feedback to correct their mistakes immediately, they ultimately acquire the concept of quality performance and internalize feedback to be transferable to new learning situations. For instance, a participant declares that AI “highlighted areas where I can improve clarity, coherence, and conciseness. It can detect my problems in the essay. It can also review my paragraph and tell me the problem I had and the ways to revise it.”

Mahapatra (2024) and Özçelik *et al.* (2024) uphold a positive view towards the students’ experience of interaction with ChatGPT to keep their ideas and content relevant to the topic; furthermore, the students exhibit positive attitudes towards ChatGPT assistance regarding coherence and cohesion. Moreover, AI-based interaction increases shy students’ willingness to voice their learning difficulties, and engages them in trial and error that shape active learning and boost self-esteem.

Marzuki *et al.* (2023) reiterate that ChatGPT also establishes itself as an immediate source of feedback that inevitably create explicit learning opportunities that contribute to the exercise of self-regulation in comparison with writing in traditional writing classes. To illustrate, a teacher adds: “AI writing tools have definitely made a difference. Prior to their use, students would often skip transition words and misuse them. However, with the AI tools’ guidance, the students have started to see how these transitions provide smooth pathway from one idea to the next, and have begun using them more effectively.” Therefore, AI tools contribute to the students’ understanding of high-quality information about their learning and reflect on it to close the gap between current performance and the desired learning goal.

Eventually, Muslimin *et al.* (2024) accurately emphasize how Cami-AI’s feedback promotes students’ dialogic feedback so as to design other projects like social media blogs. In particular, the feedback was sound and constructive when the students shared feedback with one another about the feedback provided by the AI tool. Hence, the students demonstrated their heightened interest and transferable creative skills to generate context-based images and texts that respond to the norms of social media posts.

3.3.3. Ethical considerations and loss of authentic writing style

Though GAI has brought radical changes to the educational realm, it raises serious concerns and challenges with regard to the value of the complex nature of the learning process and the students’ ethical responsibility and integrity in academia. In Barrett’s & Pack’s (2023) study, the teachers and the students highlight their perceptions of ethical practices concerning the integration of AI in writing. For them, AI should be solely considered as a supportive system at the initial stages of writing namely brainstorming, outlining or modelling as long as the students are competent in English and the writing skills; besides; using AI to generate entire essays without disclosure is unethical. Additionally, the authors claim that the use of AI in light of the

absence of clear policies will only aggravate the situation, predominantly for the students who have a history of intentional cheating and plagiarism.

Tseng & Lin (2024) note that the students question the concept of authorship, and if they can preserve their authenticity in an AI-dominated world. Also, the students express their trepidation about the loss of personal connection and depth that are omnipresent in traditional writing, and how they can ensure a balanced approach between maintaining personal style and AI assistance. Likewise, Marzuki *et al.* (2024) and Mahapatra (2024) pinpoint some challenges concerning the quality of learning to write using AI tools. Although AI tools can enhance the students' writing performance, they can negatively contribute to the students' demotivation to think and to enhance their critical thinking skills and creativity; thus, the students will never appreciate what it takes to master English writing conventions and the registers of their specialities. The students also voice their concerns with regard to the intensive use of AI. A participant's remarks "It might be a concern that my dependence might discourage me to do things on my own when writing. What if I won't want to write on my own?" Besides, the teachers convey their apprehension concerning the students' overdependence on AI that would result in the unconscious use of complex terms without being well-aware of their connotations. Overreliance on AI would jeopardize the students' authenticity, for AI-generated content is, in many cases, generic and impersonal.

4. Discussion

This systematic review of literature aims at synthesizing current empirical evidence on the impact of Generative Artificial Intelligence on university students' writing by stressing its promising aspects and underlining challenges. A total of seven empirical studies were the result of a comprehensive review of literature of open-access peer-reviewed articles, published between 2023 and 2024 in a scientific database. Ultimately, the synthesis of the obtained data yielded three themes.

As highlighted by Hattie (2012), one of the aims of effective teaching is to make the students' learning visible, particularly when the students show willingness to engage in active learning and seek external valid assistance (teachers or resources) to construct new knowledge and internalize it. To fulfil this objective, the focus should shift from teaching to learning, via a combination of the concept of 'how to learn' and explicit use of skills in a supportive context. We argue that the findings of this review align with the concept of advancing visible learning and equipping the students with the appropriate assets to confidently approach their learning. Fundamental to making learning happen is to consider the profiles of the students, who are digital natives, and harness AI technology in favour of unravelling the processes of learning. Hence, the implementation of GAI in writing increases the students' motivation and active engagement to take control over the learning process and enhances their metacognition. In this respect, the integration of AI in writing assist the students to move from surface to deep understanding of the requirements of writing in the long run. The reviewed studies indicate that when teachers provide the students with a clear idea about the characteristics of the final product, set clear

guidelines to achieve the final outcome and help the students formulate pertinent prompts, the learners willingly engage in interactions with chatbots to independently accomplish their tasks. Basically, AI tools are recognized as valuable scaffolding tools that foster reflection and independent learning enabling the transition from passive to active knowledge construction and skill development. For Hattie (2012, p. 144), “the purpose of scaffolding is to provide support, knowledge, strategies, modelling, questioning and other forms of feedback, with the intention that the student comes to ‘own’ the knowledge, understanding and concepts.”

The reviewed studies consistently highlight several benefits in terms of creating an environment of technological inclusivity and experimentation with GAI. This involves the acceleration of the students’ knowledge about the writing genres, context and audience along with developing their questioning and critical skills to evaluate the relevance and accuracy of the AI-generated content and revisions. Tseng & Lin (2024) emphasize the dynamic partnership between the learners and AI to refine their essays, and Kim *et al.* (2024) suggest that ChatGPT improves the students’ lab report quality in engineering classes. Özçelik & Ekşi (2024) also add that ChatGPT promotes the students’ acquisition of formal register knowledge across different disciplines. Marzuki *et al.* (2023) and Mahapatra (2024) underscore the enhancement of the students’ writing content and organization. Muslimin *et al.* (2024) argue that Cami-AI positively transformed the students’ descriptive writing via image generation, continuous support, personalized, seamless teacher and peer feedback. Moreover, the role of AI tools as mentors and proofreaders yields emergent dimension in the pedagogical relationship between the teachers and the students. This reality will inevitably trigger a debate about defining new roles of teachers in light of AI domination. Walter (2024) argues that new roles of teachers involve a command over prompt-engineering, AI-literacy and critical thinking to facilitate their students’ AI use to better cater for their needs and styles, and to optimize interactive learning experiences.

As discussed in several studies, AI has proved its efficiency in providing the students with prompt answers and feedback (Wiboolyasarini, 2024; Wang, 2024). Wang (2024) pinpoints that the students who receive AI corrective feedback via Poe application significantly enhanced their writing accuracy and reduced their anxiety in comparison with their teacher’s feedback group. In this systematic review, the synthesized studies report that AI timely feedback aids the students refine coherence and cohesion; besides, cognitive engagement processes are furthered thanks to reflection-in-action, immediate decision-making and responsive action to accomplish the task. Even in traditional writing classrooms, timely feedback improved the students’ writing of final drafts and boost self-correction (Ferris, 2004). On one hand AI feedback addresses pitfalls of assessing writing in traditional classrooms such as time constraints, crowded classes and unavailability of human and technological resources to offer personalized feedback. On the other hand, AI feedback incarnates the ideals of formative assessment when the chatbots identify the students’ mistakes and weaknesses where evidence about writing achievement is clearly elicited, and immediately used by the students to adjust their performance, or

by the teachers in order to inform their teaching to effectively respond to their students' needs. Through their continuous AI-interaction, the students realize that the ultimate goal of writing is never the attainment of a corrected version of writing, but they are self-absorbed in a process-oriented endeavour to self-instruct and reconstruct their writing experience.

Although the students experience significant transformation in their writing thanks to the infusion of AI in their writing, several challenges and pitfalls are undeniable. Potential threats involve plagiarism and submitting written assignment without disclosure of AI assistance, and without devoting the appropriate time and efforts for task completion. Additionally, AI tools can be a shortcut for students with a history of cheating and essay mills (Barrett & Pack, 2023); therefore, overdependence on AI may hinder effective learning and jeopardize the development of writing skills and critical thinking; as a result, these behaviours may contribute to laziness, decelerating active learning (Marzuki *et al.*, 2023; Mahapatra, 2024), and deterioration of writing authenticity (Tseng & Lin, 2024). Therefore, the teachers should advocate a balanced view towards AI as a supplement supportive element, and writing should be nurtured via personal efforts and AI-editing (Maphoto *et al.*, 2024). Some students also voice their concerns when ChatGPT fails to provide accurate correct information, or in-depth analysis concerning the interpretation and discussion results in fields like engineering (Kim *et al.*, 2024). The integration of AI in writing is no longer an option but a reality; hence, writing pedagogy should involve a proactive approach towards educating the students about ethical uses of AI, information literacy and fact-checking procedures (Graham, 2023) along with enacting policies about ethical, responsible uses of Artificial Intelligence.

5. Limitations

Some limitations are associated with this systematic literature review about the impact of GAI on university students' writing. First, this study only covers current literature about some GAI tools in assisting university students' writing in English. Secondly, the study includes seven studies across some contexts, which may not capture the evolving nature of AI; also, the scope of the study focuses primarily on writing at university, and on open-access, peer-reviewed empirical studies in one database, so further research may consider existing literature in other databases and contexts. Finally, these limitations should be considered when interpreting the findings of this systematic review.

6. Implications

The reviewed studies indicate that GAI can enhance the students' writing by providing a supportive environment, tailored context and personalized feedback; nevertheless, higher education institutions should provide stakeholders, teachers and students with clear guidelines, frameworks and policies about embracing and using AI ethically. Moreover, teachers should foster their AI literacy and undertake urgent trainings about AI, prompt-engineering, fact-content checking, and how to model acceptable uses of AI in class. For example, the teachers can use GAI to train the

students in judging the quality of generated texts. Practitioners should also insist on the fact that writing, re-writing and multiple revisions are still valid as the foundations of writing. In light of the emerging trends in AI, universities should urgently think about current assessment procedures. This involves designing new curricula and frameworks to address these issues in teacher training and education.

7. Conclusion

This systematic review shed light on the impact of GAI tools on the students' process and products in academic writing across higher education institutions. The findings offered several perspectives into the current context of the students' use of AI in their writing and the impact of such tools on their performance, motivation to foster their engagement in writing, and the quality of learning; nonetheless, the review accentuated the urgent need for higher education and institutions to consider the rapid evolution and use of AI tools to instil integrity norms, keep teachers updated and well-informed about the latest developments and skills in this field to better harness these tools in favour of advancing active quality learning and teaching in the writing classroom.

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-The reviewed studies are highlighted with an asterisk.