

The Use of Artificial Intelligence Tools in English Academic Writing among University Students: A Scoping Review

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Abstract

As artificial intelligence (AI) use in English academic writing instruction has increased, this scoping review reviews empirical studies in higher education. However, the studies differ in theory use and teaching practice. Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) protocol and the Population-Concept-Context (PCC) framework, a systematic Web of Science (WoS) Core Collection search yielded 20 eligible peer-reviewed studies published post-2020. Most studies were carried out in English as a Foreign Language (EFL) contexts, aiming to improve writing performance and learner motivation via AI-assisted tools. Common platforms encompass automated writing assessment systems. Theoretical frameworks were frequently limited to self-efficacy and scaffolding, with scant consideration for cognitive load, sociocultural adaptation, or ethical governance. Methodologically, most studies relied on short-term experimental designs, lacking longitudinal or classroom-based rigor. Future research should employ mixed-methods and longitudinal designs, include diverse learner demographics, and prioritize teacher preparation and ethical AI literacy to guarantee sustainable and equitable implementation.

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Introduction

Artificial intelligence (AI) technologies are reshaping English academic writing instruction in today's increasingly digitalized higher education environment. Generative language models such as ChatGPT or Automated Writing Evaluation (AWE) systems such as Grammarly and Pigai have benefited university students by offering them real-time corrective feedback, language enhancement and structural suggestions, increasing their writing fluency, linguistic accuracy in compositions and self-editing (Chen et al., 2020). English academic writing is now commonly perceived as an indispensable scholarly skill in higher education, and generative AI systems have been shown to enhance the students' linguistic performance and engagement during writing tasks (Ng et al., 2025).

Although AI tools have been increasingly used, studies in this area remain fragmented and methodologically biased toward certain tools or local practices, lacking holistic theoretical or applied frameworks. As noted by Song and Song (2023) and Su (2023), the integration of AI in writing instruction has a motivational effect on students' motivation to compose arguments. However, current research in the field shows considerable diversity, with inconsistencies in tools, learner profiles, and instructional settings, and a lack of theoretical underpinning (Chen et al., 2020). In addition, learners' ambivalent attitudes toward AI-generated feedback, which has the potential to undermine their confidence in writing and language development, are indicative of the double-edged nature of AI in writing instruction (Guo, 2024).

Given the context, a rigorous scoping review is urgently required to describe the existing landscape of AI-assisted English academic writing in higher education. Despite the growing corpus of studies on AI-assisted writing (Nazari et al., 2021), most existing studies, which are frequently limited to short-term experimental designs within narrow English as a Foreign Language (EFL) contexts, remain fragmented and uneven (Hu et al., 2025). Theoretical integration remains limited, as few studies have attempted to bring together cognitive, motivational, sociocultural, and ethical perspectives within a unified framework (Farrokhnia et al., 2024). Moreover, in contrast to the extensive focus on learner outcomes, much less attention has been devoted to issues such as teacher preparedness, institutional policy, and ethical governance, as recent bibliometric work on AI-enhanced language education also reveals (Bo et al., 2025). As a result, despite the efforts of expanding research body, there is still not comprehensive synthesis between theoretical bifurcation and practical application.

In an effort to fill such gaps, this paper reviews 20 empirical articles adopting a scoping review to focus on AI-supported English academic writing in higher education. It makes

three main contributions. It fleshes out priorities and gaps in the literature. Second, it offers an integrative model, which combines cognitive, emotional, sociocultural and ethical-technical aspects. Last but not least, it translates these theoretical insights into pedagogical implications that support a more equitable and sustainable use of AI in university writing instruction.

This study adopts the Population-Concept-Context (PCC) framework (Arksey & O'Malley, 2005) to delineate its scope as follows: the population is composed of university students who are EFL learners; the concept revolves around AI-assisted writing tools including generative model like ChatGPT and automated feedback systems such as Pigai and Grammarly; and the context refers to English academic writing instruction and practice in higher education. By systematically synthesizing empirical studies, this review seeks to offer possible theoretical perspectives and concrete approaches for researchers, educators, and policymakers facilitating the successful and sustainable use of AI writing tools in university settings.

Method

The scoping review was the follow-up of an initial bibliometric study which investigated the trends in publication and hot topics in AI for EFL research. The bibliometric search was conducted in the Web of Science (WoS) Core Collection (2020–2024) with the following query: ((TS=("artificial intelligence" OR "AI")) AND TS=("English*") AND TS=("educa*" OR "pedagogy")). This query was intended to cover extensively the research at the intersection of AI, English, and education. There are other databases like Scopus, ERIC, or Google Scholar which also index research on AI in education; however, this study opted for the Web of Science (WoS) Core Collection because it covers top journals carefully and provides proven citation data. The WoS database is known to be a key source for bibliometric and scoping reviews and its open metadata as well as its advanced search capabilities ensured transparency and academic soundness in the review procedure (Zawacki-Richter et al., 2019).

Table 1

Search Strategy

Search Directory	Search String
WOS Database	((TS=("artificial intelligence" OR "AI")) AND TS=("English*") AND TS=("educa*" OR "pedagogy"))

Note: The first search term was broad in order to ensure inclusion. but the last inclusion was limited to those studies that were related to integration of AI tools in academic writing context in higher education.

The review was conducted in accordance with the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) protocol. The review followed Arksey and O'Malley's (2005) methodological framework, which consists of five key steps: (i) formulating research questions, (ii) retrieving relevant studies, (iii) screening eligible studies, (iv) mapping the data, and (v)

synthesizing and reporting the findings. While the incorporation of AI tools into academic writing instruction has become more prevalent in recent years, there is still a lack of a comprehensive synthesis of their application, impact, and pedagogical value in higher education contexts. As such, this scoping review was framed around the following research question: "What empirical insights can be drawn from the existing literature regarding the use of AI tools in English academic writing among university students?" Table 1 shows pivotal research questions aligned with the specific objectives developed using the PCC framework.

Table 2
Research Questions and Objectives

Research Questions	Specific Objectives
1. How are past studies on AI tools in English academic writing distributed?	1. To explore the temporal and geographical distribution of studies on AI tools.
What research designs were used in past studies on AI-assisted academic writing?	2. To determine the research designs and methodologies applied in previous studies.
3. What are the main purposes of studies on AI tools used in academic writing?	3. To analyze the research aims addressed in the literature on AI-assisted writing.
4. What key elements have been explored in such studies?	4. To explore the studied elements such as tools, writing skills, and strategies.
5. What findings have been reported on the use of AI in academic writing?	5. To summarize the effects and perceptions reported in previous studies.

Since scoping review protocols are not suitable for registration in (International Prospective Register of Systematic Reviews) PROSPERO, this review follows the PRISMA-ScR reporting standards. Based on predefined criteria, all titles and abstracts were independently screened by two reviewers to ensure objectivity and consistency. The inclusion and exclusion criteria employed are detailed in Table 3. These criteria were established to ensure that only recent, relevant, and empirically grounded studies focusing on the use of AI tools in English academic writing at the university level were included in the final synthesis.

Table 3
Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Published from 2020 onwards	Published before 2020
AI tools in English academic writing	No AI use in English academic writing
University-level Participants	Non-higher education participants
Written in English	Not in English
Empirical studies	Non-empirical publications
Full-text accessible	No full-text access

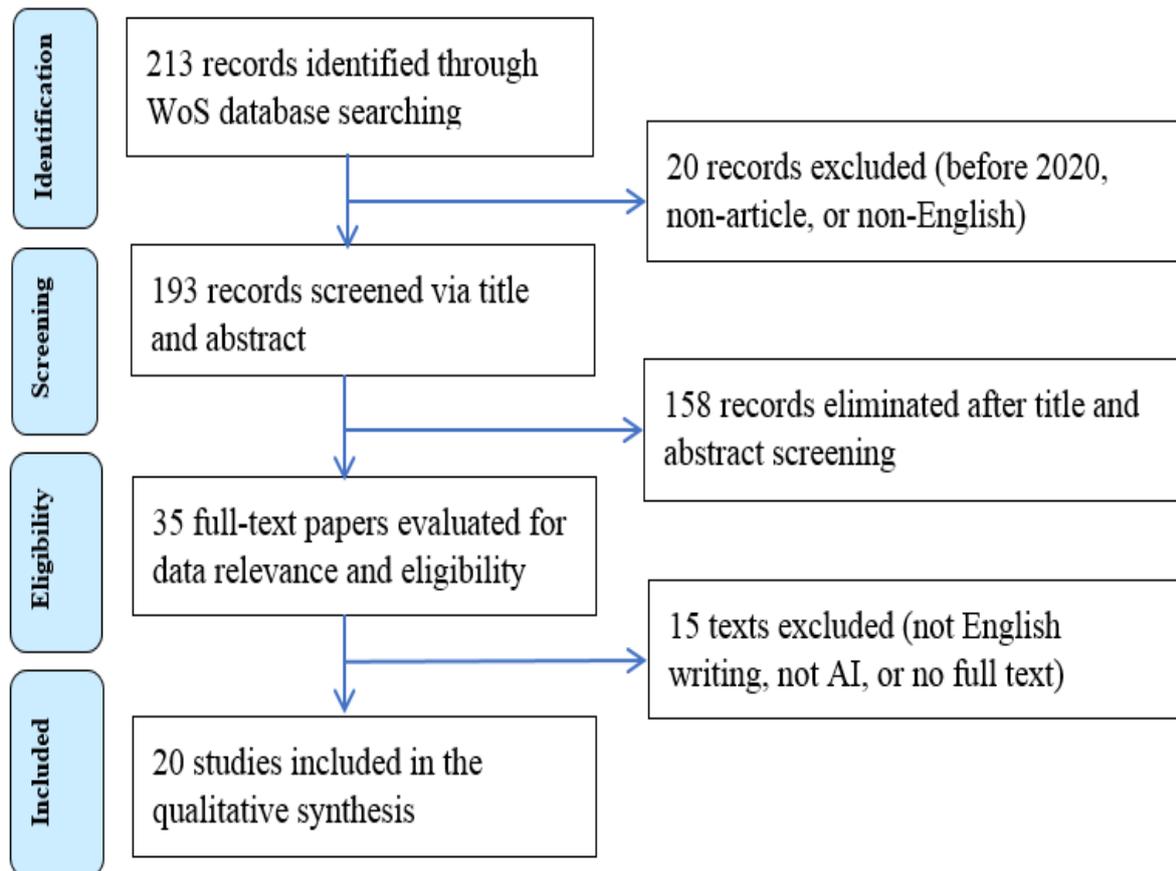
For data extraction, the research team used a Microsoft Excel-based charting form to synthesise key characteristics of the included studies. Data were extracted on authors, publication year, country of origin, data sources, study purpose, research design, types of AI tools applied, key academic writing variables, and primary findings. The archived data

were read and coded using inductively derived keyword tagging to identify recurring patterns during the charting process. Codes and categories were validated by assessing their thematic relevance and consistency with the research questions. The studies were then categorized according to pre-defined levels of analysis.

Results

In the first step, 213 records were retrieved from the WoS Core Collection. Twenty studies were excluded due to language, publication year, or document type, leaving 193 articles for title and abstract screening. Following this screening, 158 articles were excluded, and 35 full-text articles were assessed for eligibility. Of these, 15 did not meet the subject criteria or were unrelated to AI-based tools. A qualitative synthesis was conducted based on 20 studies. Figure 1 presents the study selection flowchart in accordance with the PRISMA-ScR guidelines.

Figure 1
PRISMA-ScR Flowchart



Distribution of Past Studies

Table 4 provides a detailed description of the included studies. It shows the authors, publication year, country of study, and study type. Figure 2 illustrates the relative proportion of research designs. The 20 studies in our review all discuss AI tools for EAW support in HEIs, as well as within the English academic writing context. These

papers have been published since 2020. A clear upward trend was recorded during this period. Three articles were published in 2023 ($n = 3$). The greatest increase in terms of the number of studies was in 2024 ($n = 11$), with a total of six published. This trend may indicate an increasing tendency of academia towards AI-supported English academic writing in higher education, especially in recent years, and is similar to that observed in other recent reviews indicating the rapid growth in generative applications of AI for educational research published in 2023 (Huang et al., 2023; Zhai et al., 2021).

In terms of country distribution, China made the greatest contribution, as 14 studies were identified, indicating that the country has been actively involved in the application of AI to language learning. Two studies were from Japan ($n = 2$), and one study each was from Malaysia, Iran, Australia, and South Korea. The geographic coverage was limited; yet the examined studies captured a variety of perspectives on how to improve learners' academic writing, encourage learner autonomy, engage learners more effectively, and examine the implications of generative AI technologies in EFL.

Table 4

Distribution and Methods

No.	Authors & Years	Country	Method
1	Nazari et al. (2021)	Iran	Quantitative (RCT – ANCOVA, $N = 120$)
2	Song & Song (2025)	China	Mixed-Methods (Interviews + Pre/Post-test)
3	Kim et al. (2025)	China	Qualitative (In-depth Interviews, $N = 20$)
4	Yang et al. (2024)	Australia	Case Study ($N = 5$)
5	Wei et al. (2023)	China	Randomized Controlled Trial ($N = 190$)
6	Shen & Teng (2024)	Malaysia	Quantitative (Cross-lagged Analysis, $N = 204$)
7	Li et al. (2024)	China	Quasi-Experimental + Interviews ($N = 61$)
8	Hu et al. (2025)	China	Quasi-Experimental ($N = 78$)
9	Shen et al. (2023)	China	Mixed-Methods (Text + Survey)
10	Guo & Li (2024)	China	Mixed-Methods (Workshop + Pre/Post Questionnaires)
11	Zhang (2024)	China	Lesson Study + Mixed Methods (Questionnaires + Interviews)
12	Tang et al. (2024)	China	Lab Experiment ($N = 59$)
13	Ding & Zou (2024)	China	Systematic Review ($N = 39$ studies)
14	Yao et al. (2025)	China	Qualitative (Interviews + Logs, $N = 13$)
15	Huang et al. (2024)	China	Meta-analysis (PRISMA-based)
16	Li & Kim (2024)	China	Qualitative + Survey
17	Putra et al. (2023)	Japan	AI System Development + Corpus + Evaluation
18	Zhang et al. (2025)	China	Mixed-Methods (multiple tools)
19	Wang (2024)	Japan	Mixed-Methods (Surveys + Self-Reports)
20	Hwang et al. (2024)	South Korea	One-group Pre/Post + Thematic Analysis

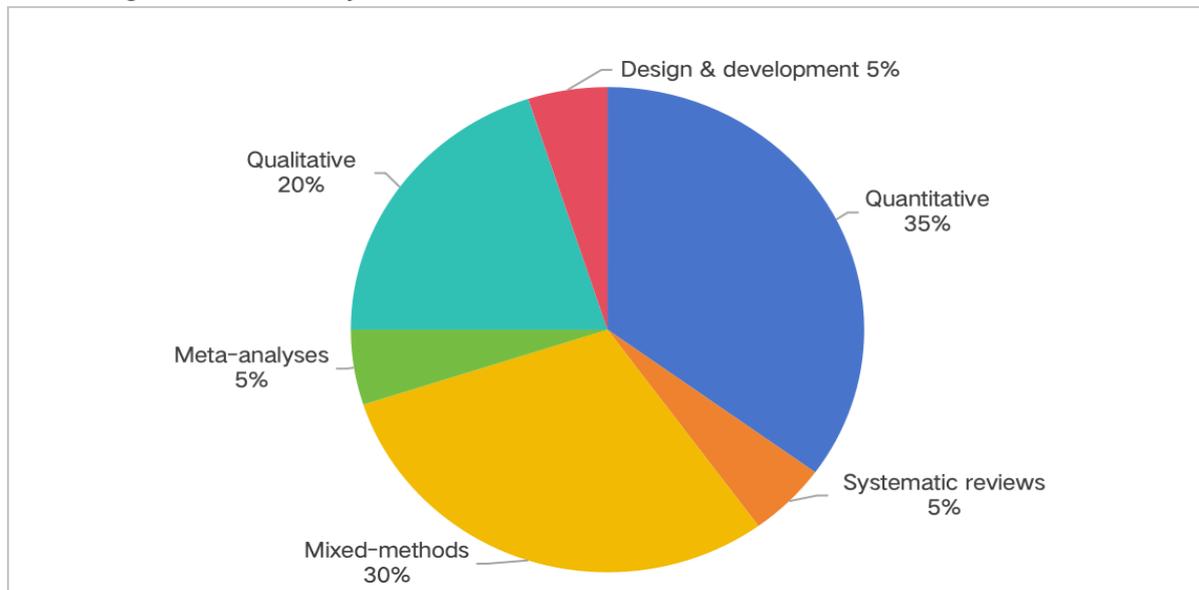
Research Method Used in Past Studies

A review of the 20 included studies, as detailed in Table 4 and illustrated in Figure 2, reveals a wide range of research methodologies used to investigate AI-assisted English academic writing in higher education settings. The research methods used in these studies can be divided into five categories: quantitative, mixed-methods, qualitative, systematic reviews, meta-analyses, and design- and development-based approaches. Quantitative methods were the most commonly used (35%), including Randomized Controlled Trials (RCT), quasi-experimental designs, cross-lagged analyses, and labbased

experiments. 30% of the studies used mixed-methods approaches, which typically included pre/post-tests as well as interviews, surveys, or textual analysis. 20% of the designs were qualitative, involving thematic analysis, case studies, and in-depth interviews. Three studies (15%) used alternative methodological approaches, in addition to these empirical designs: one systematic review, one PRISMA-based meta-analysis, and one design and development study that centered on AI system integration and evaluation. This distribution highlights a considerable emphasis on empirical and applied approaches in the current literature and points to interest in evaluating the effectiveness of AI as well as its pedagogical integration in academic writing instruction.

Figure 2

Percentage Distribution of Research Methods



Research Aim of Past Studies

To obtain a deeper insight into the research priorities in AI-supported writing studies, six major research goals were proposed. These aims are presented in Table 5. Six studies ($n = 6$) targeted the enhancement of writing performance, such as linguistic accuracy, text cohesion, organizational skills, and argumentative writing (Song & Song, 2025; Wei et al., 2023; Shen et al., 2023; Ding & Zou, 2024; Putra et al., 2023; Zhang et al., 2025). Affective and motivational variables (e.g., writing engagement, writing self-efficacy, regulation of writing-related anxiety, and learner emotions) were the focus of four studies ($n = 4$; Nazari et al., 2021; Huang et al., 2024; Hu et al., 2025; Li & Kim, 2024).

Cognitive and metacognitive development ($n = 3$) was examined by exploring how AI-based tools, such as ChatGPT, support critical thinking processes during self-regulated learning (Kim et al., 2025; Shen & Teng, 2024; Yao et al., 2025). Four studies ($n = 4$) focused on learner–AI interaction, particularly in relation to chatbot use, nudging behaviours, and feedback strategies as writing-related affordances (Guo & Li, 2024; Wang, 2024; Hwang et al., 2024; Yang et al., 2024). One study ($n = 1$) aimed to improve

teaching and learning through a focus on AI-assisted flipped instruction and its effect on teacher TPACK (Technological Pedagogical Content Knowledge) and student writing outcomes (Zhang, 2024). In addition, two studies (n = 2) targeted AI-supported tools for writing assessment and feedback analytics (Tang et al., 2024; Li et al., 2024).

Table 5
Research Aims and Focus Areas

Authors & Years	Aim	Key Factors
Nazari et al. (2021)	Examine how AI tools improve writing engagement, self-efficacy, and emotion	Engagement types, self-efficacy, emotions, AI vs. non-AI
Song & Song (2025)	Evaluate AI-assisted impact on EFL students' writing skills and motivation	Writing skills, motivation, ChatGPT use
Kim et al. (2025)	Investigate ChatGPT's effect on argumentative writing and reasoning	Argumentation, AI feedback, self-reflection, peer input
Yang et al. (2024)	Explore how students respond to AWE feedback in writing tasks	Feedback patterns, error correction, submission behavior
Wei et al. (2023)	Assess Grammarly-based AWE training on writing skills	Cohesion, grammar, lexical richness, writing performance
Shen & Teng (2024)	Examine link between critical thinking and AI-assisted writing over time	Critical thinking, SDL, reciprocal influence
Li et al. (2024)	Study chatbot-supported argumentative writing improvements	Argument quality, feedback, motivation
Hu et al. (2025)	Explore AI conversational agent's influence on collaborative writing	Cognitive, behavioral, emotional writing engagement
Shen et al. (2023)	Analyze Pigai AWE effects on writing across proficiency levels	CAF, engagement by level, feedback uptake
Guo & Li (2024)	Explore how self-made AI chatbots assist personalized writing	Chatbot functions, writing support, student interaction
Zhang (2024)	Evaluate AI-powered flipped instruction on writing and teacher TPACK	Flipped writing, TPACK growth, AI integration
Tang et al. (2024)	Test AI analytics tool for improving writing self-assessment	Analytics design, feedback, writing self-assessment
Ding & Zou (2024)	Review AWE systems and their effects on writing proficiency	AWE tools, feedback efficacy, learner views
Yao et al. (2025)	Explore metacognitive strategies in ChatGPT-based academic writing	Planning, evaluating, debugging in writing with ChatGPT
Huang et al. (2024)	Synthesize AWE effects on writing anxiety and motivation	Anxiety, motivation, L2 writing scores
Li & Kim (2024)	Investigate autonomous learners' use of AI feedback tools in writing	Autonomy, emotional regulation, hybrid feedback use
Putra et al. (2023)	Develop AI sentence reorder system to enhance argumentative flow	Sentence logic, writing order, argument coherence
Zhang et al. (2025)	Examine how flow states affect logical writing and self-efficacy	Flow triggers, logical writing, self-efficacy
Wang (2024)	Analyze sociocultural factors in AI-supported writing regulation	Cognitive/social factors, AI tool engagement
Hwang et al. (2024)	Study prompting behaviors in ChatGPT-assisted writing revision	Prompt use, revision depth, writing structure

Factors of Study

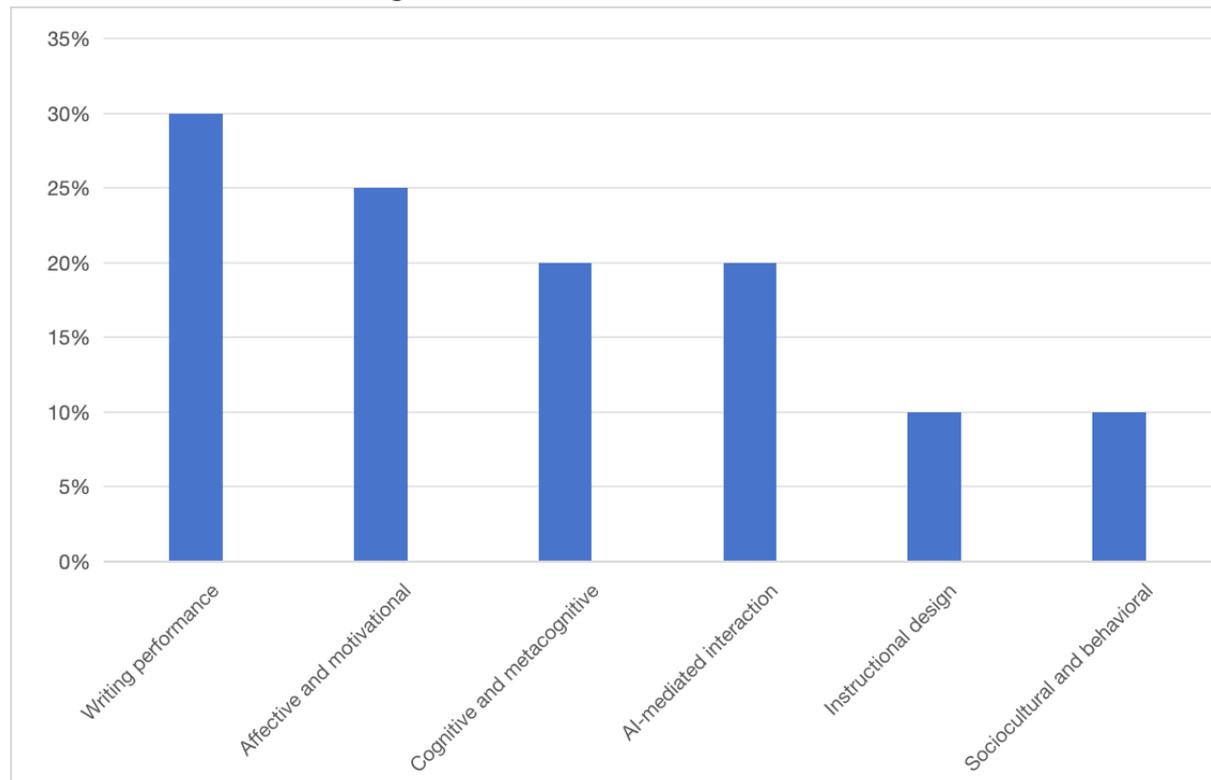
Aside from their stated objectives, the 20 included studies investigated an array of pedagogical, linguistic, and psychological factors in the context of AI-assisted English

academic writing. These factors can be broadly classified into six key dimensions, which are not mutually exclusive, as several studies concentrated on more than one. Figure 3 presents the distribution of these dimensions based on the number of studies that examined each. Writing performance—including grammatical accuracy, lexical richness, coherence, and argumentative structure—was the most frequently addressed dimension, appearing in 30% of the studies ($n = 6$; Ding & Zou, 2024; Putra et al., 2023; Shen et al., 2023; Song & Song, 2025; Wei et al., 2023; Zhang et al., 2025). Affective and motivational factor—such as writing engagement, self-efficacy, emotional regulation, and anxiety—were explored in 25% of the studies ($n = 5$; Hu et al., 2025; Huang et al., 2024; Li & Kim, 2024; Nazari et al., 2021; Zhang et al., 2025).

In comparison, cognitive and metacognitive strategies were examined in four studies (20%; Kim et al., 2025; Shen & Teng, 2024; Yao et al., 2025; Wang, 2024). These studies addressed specific skills, including critical thinking, planning, evaluation, and debugging, within AI-supported writing tasks. They also reported how students regulated and reflected on their writing processes when using AI tools. In a further four studies (20%), attention was given to AI-mediated feedback and learner–AI interaction (Yang et al., 2024; Hwang et al., 2024; Guo & Li, 2024; Li et al., 2024). The aspects examined included prompting practices, learner responses to feedback, revision frequency, and patterns of chatbot use.

In contrast, instructional design and teacher development were examined in two studies (10%; Tang et al., 2024; Zhang, 2024), with a focus on flipped learning models and the integration of TPACK. Another two studies (10%) addressed sociocultural and behavioural factors, including learner autonomy, peer collaboration, and engagement with AI tools (Li & Kim, 2024; Wang, 2024). On the whole, the distribution of research topics indicates that existing studies cover a range of emphases, spanning writing outcomes, learner processes such as motivation and metacognition, and pedagogical approaches. However, none of the included studies explicitly examined ethical or governance-related issues, including data privacy, algorithmic bias, or transparency, highlighting a notable gap in the current literature.

Figure 3
Factors in AI-Assisted Writing Studies



Findings of Past Studies

Many studies reported improvements in grammatical accuracy, vocabulary use, text cohesion, and argument structure when AI-assisted tools were used. Students using automated writing evaluation tools such as Grammarly and Pigai, as well as generative AI tools like ChatGPT, produced better writing outcomes than those who did not. The gains were mainly related to error correction and text organization. Some studies found stronger effects among lower-proficiency learners (Wei et al., 2023; Shen et al., 2023), while others reported improvements across proficiency levels (Ding & Zou, 2024; Song & Song, 2025; Putra et al., 2023; Zhang et al., 2025).

Affective and motivational gains

Several studies reported positive effects of AI tools on learners' affective and motivational outcomes in writing. These effects included higher writing engagement, stronger self-efficacy, reduced writing anxiety, and greater learner confidence. In these studies, the reported improvements were often associated with the immediacy and personalization of AI systems, as well as the low-stakes learning environment they provided, which supported learners during the writing process (Hu et al., 2025; Huang et al., 2024; Li & Kim, 2024; Nazari et al., 2021; Zhang et al., 2025).

Development of cognitive and metacognitive strategies

Beyond affective gains, several studies also examined how AI tools supported higher-order thinking skills in writing. In AI-supported writing tasks, learners were reported to use planning, evaluation, and critical thinking strategies. Some studies further identified “debugging” as a metacognitive strategy that emerged in AI-mediated academic writing, referring to learners’ efforts to detect, question, and revise AI-generated output. These findings suggest that learners developed new ways of regulating their thinking while interacting with generative AI tools (Kim et al., 2025; Shen & Teng, 2024; Yao et al., 2025; Wang, 2024).

Learner-AI interaction and feedback use

Studies on learner-AI interaction reported that repeated use of AI tools supported students in developing more effective revision strategies. These strategies included adjusting prompts, using feedback, and monitoring revisions during the writing process. However, several studies also noted that many learners experienced difficulties in applying AI-generated feedback to improve deeper aspects of writing, such as idea development and logical organisation. This suggests that, while AI tools are effective in supporting surface-level revisions, higher-order writing skills still require additional instructional guidance (Yang et al., 2024; Hwang et al., 2024; Guo & Li, 2024; Li et al., 2024).

Instructional and sociocultural implications

Several studies examined the broader pedagogical implications of AI integration, with particular attention to instructional innovation. For example, AI-supported flipped classroom approaches were associated with improvements in student writing performance and teacher Technological Pedagogical Content Knowledge (TPACK). Other studies adopted sociocultural perspectives, highlighting learner autonomy, peer collaboration, and contextual engagement with AI tools across different educational settings (Zhang, 2024; Tang et al., 2024; Wang, 2024; Li & Kim, 2024). However, none of the 20 included studies reached clear conclusions regarding ethical or governance-related issues. As a result, areas such as data privacy, algorithmic bias, and transparency remain underexplored, despite their increasing relevance in AI-assisted educational contexts.

Table 6
Summary of Main Findings

Authors & Years	Key Findings
Nazari et al. (2021)	Students using the AI-powered writing assistant showed significant improvements in behavioral, emotional, and cognitive engagement, self-efficacy, and academic emotions.
Song & Song (2025)	Students improved writing skills and motivation with AI-assisted instruction, but expressed concerns about over-reliance and contextual accuracy.
Kim et al. (2025)	Students using ChatGPT showed better argument structure and more nuanced reasoning; positive perceptions toward AI support were reported
Yang et al. (2024)	Students improved their writing and developed strategic autonomy through sustained engagement with Pigai feedback, despite limited clarity in non-error feedback.
Wei et al. (2023)	Students using AWE outperformed peers in all writing dimensions; self-efficacy and pre-test proficiency predicted success; AWE especially effective for lower-level learners.
Shen & Teng (2024)	Critical thinking and self-directed learning influenced each other, and autonomy moderated AI writing performance, highlighting the need for critical, independent AI use.
Li et al. (2024)	Students improved writing quality and motivation through LCAW, supporting the integration of GenAI into writing instruction.
Hu et al. (2025)	Students showed enhanced cognitive engagement with the AI-based agent, though other engagement types and writing performance remained unchanged.
Shen et al. (2023)	Students used AWE mainly for error correction; skilled learners enhanced lexical complexity while unskilled learners improved accuracy, with engagement shaped by proficiency.
Guo & Li (2024)	Students used self-made AI chatbots to support writing tasks, which improved their motivation, confidence, and writing attitudes.
Zhang (2024)	Students improved their writing and reported positive experiences through AI-powered flipped instruction, while teachers enhanced their TPACK.
Tang et al. (2024)	Students improved their self-assessment accuracy using the AI-powered toolkit, though poor design features limited deeper reflection.
Ding & Zou (2024)	Students improved their writing and held positive views of AWE tools, though more research is needed on diverse learners and feedback comparisons.
Yao et al. (2025)	Students employed various metacognitive strategies when using ChatGPT, with “debugging” emerging as a GenAI-specific adaptation in academic writing.
Huang et al. (2024)	Students experienced reduced anxiety and enhanced motivation and L2 writing performance through automated writing evaluation.
Li & Kim (2024)	Students used AFSs to identify weaknesses, track progress, and build confidence, benefiting most when guided to critically and independently engage.
Putra et al. (2023)	Students' argumentative writing benefited from AI-assisted sentence reordering, which enhanced logical flow without disrupting effective original structures.
Zhang et al. (2025)	Students improved their logical writing through ChatGPT-induced flow, though deeper flow was linked to reduced self-efficacy.
Wang (2024)	Students improved writing with AI tools, but still relied on teacher guidance and peer collaboration for deeper learning.
Hwang et al. (2024)	Students improved surface-level writing using ChatGPT, but lacked effective prompting skills to enhance deeper aspects like content and organization.

Discussion

This scoping review analysed 20 empirical studies focusing on the use of AI tools in English academic writing within higher education. While most studies reported positive effects on students' writing quality and motivation, these improvements were primarily associated with lower-level writing skills. In particular, AI support was frequently used

for tasks such as grammatical correction and structural organisation. Some studies noted that students engaged in metacognitive practices, including activities resembling “debugging,” when interacting with generative AI. However, comparatively little attention was paid to higher-order aspects of academic writing, such as critical reasoning, ethical reflection, or sensitivity to cultural contexts. Moreover, the predominance of studies conducted in Chinese EFL settings raises questions about the broader applicability of these findings. Although AI technologies are increasingly present in academic writing instruction, their pedagogical and sociocultural implications remain underexamined and warrant further investigation. Future research would benefit from clearer theoretical grounding, closer alignment with classroom practice, systematic attention to identified gaps, and more focused directions for subsequent investigation.

Theoretical Implications

Across the 20 reviewed studies, improvements in writing performance and learner motivation were reported more frequently than other outcomes. In contrast, only a limited number of studies examined deeper forms of learning, such as critical reasoning, cultural awareness, or ethical reflection. This pattern is in line with the PCC-based scope and the PRISMA-ScR approach used in this review, and may explain why some effects were reported more often than others. Future research could draw on different theoretical perspectives to explain why certain learning outcomes are easier to observe, while others have received less attention.

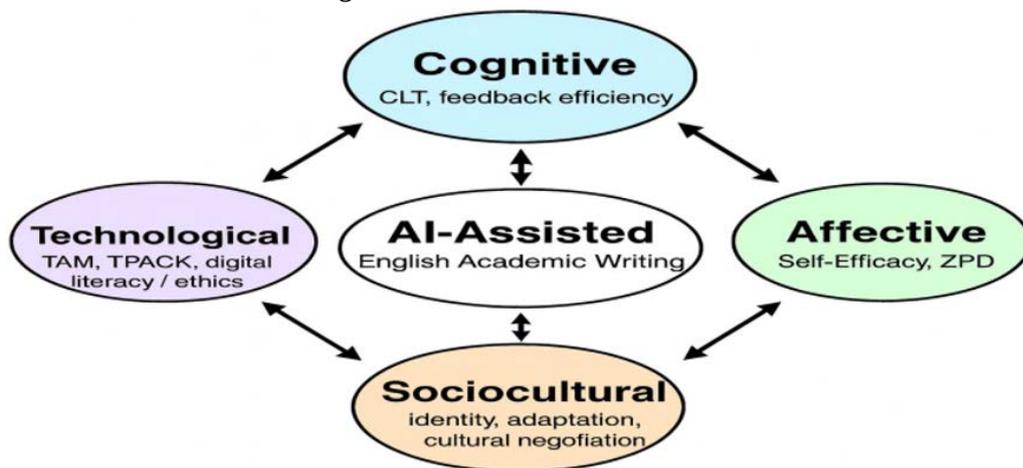
However, the use of theory in this area remains limited and uneven. Only a few studies have explored whether AI-generated feedback reduces or increases learners’ cognitive load. As a result, it is still unclear whether AI support helps learners focus more on higher-order thinking, or whether detailed and complex feedback instead uses up their mental resources (Martin et al., 2025). Sociocultural and identity-based perspectives are also rarely used. This gap is important, as multilingual learners may interpret, resist, or adapt AI feedback in different ways depending on their language backgrounds and cultural experiences (Baidoo-Anu & Ansah, 2023). In addition, although UNESCO (2021) highlights the need for human-centred approaches to AI, few empirical studies address ethical and governance issues. As a result, there is limited evidence on how factors such as bias, transparency, and trust affect how learners and institutions adopt and use AI technologies (Chen et al., 2020; Farrokhnia et al., 2024).

Future research should pay greater attention to developing a more integrated view of how AI supports writing. This work can draw on several key dimensions. These include a cognitive dimension, such as how learners process feedback in relation to Cognitive Load Theory; an affective and motivational dimension, informed by Self-Efficacy and the ZPD; a sociocultural dimension, focusing on identity, adaptation, and cultural negotiation; and a technological and ethical dimension, including perspectives such as TAM, TPACK, and digital literacy. Taking this approach shifts the focus beyond whether AI improves

writing to how and why such effects occur, for whom they are most visible, and under what conditions they emerge. It also offers a stronger foundation for empirical research and instructional design. In practice, such a framework can help teachers and institutions develop writing pedagogies that are equitable, culturally responsive, and ethically informed. To integrate these perspectives, future studies may adopt a multidimensional framework, as shown in Figure 4, which links cognitive, affective, sociocultural, and technological dimensions in AI-assisted academic writing.

Figure 4

A Multi-Dimensional Integrative Framework



Practical Implications

The findings of this scoping review have clear practical implications for higher education stakeholders, including students, teachers, and institutions interested in the use of AI for English academic writing instruction. Rather than remaining at a purely conceptual level, the review identifies concrete ways in which AI can be integrated into teaching practice in a manner that is pedagogically sound, ethically responsible, and sustainable over time. In doing so, this study contributes to the existing body of research by offering practice-oriented insights into the educational use of AI.

Learner level: Fostering autonomy and critical engagement

Recent studies suggest that structured reflection is closely related to how AI supports the development of higher-order writing skills (Pan & Wang, 2025). Rather than serving only as tools for surface-level correction, AI-assisted writing systems can be used to support learners' independent decision-making during revision. Research has identified several reflective practices that appear to be particularly useful in this process. For example, learners may keep revision logs to explain why they accept or reject AI feedback, compare suggestions generated by AI with those provided by peers, or complete short revision tasks accompanied by brief explanations of their changes. These activities require learners to make their reasoning explicit and to monitor their own writing decisions, which can reduce uncritical reliance on automated feedback. Evidence also suggests that

guided journaling and AI-supported revision tracking can promote reflective awareness and learner autonomy (Teng, 2025). Similarly, structured comparison tasks have been shown to encourage more careful engagement with feedback (Song & Song, 2023). When AI is used within reflective writing activities, learners are more likely to participate actively in cycles of reflection and revision, rather than accepting AI-generated suggestions without evaluation (Guo & Wang, 2024).

Teacher level: AI literacy, pedagogical scaffolding, and professional development

Teachers play a key role in shaping how AI is used in writing instruction, yet current training opportunities remain limited. Where training exists, it often focuses on technical operation rather than broader competencies, including AI literacy, TPACK-informed curriculum design, and ethical awareness (Gao et al., 2024). As a result, AI feedback may be treated as a tool for surface-level error correction rather than as support for learning. When positioned as a learning resource, AI feedback can guide students toward more independent revision practices (Yang et al., 2024). This requires teachers to design tasks with clear pedagogical goals that use AI to support higher-order skills, such as argument development, synthesis, and disciplinary voice (Zhang et al., 2025). AI tools should also be carefully selected in line with curriculum aims, rather than adopted for convenience or novelty (Amaro & João Pires, 2024). In practice, professional development may involve workshops where teachers revise tasks using AI feedback, alongside guided discussions of ethical issues in line with UNESCO's (2021) call for human-centred AI. Through these processes, teachers can move beyond knowledge transmission to become learning designers and ethical guides, enabling deeper and more sustained development in students' writing.

Institutional and policy level: Ethical governance and sustainable implementation

At the institutional level, universities play a central role in shaping how AI is used in academic writing education. Clear policies and coordinated support are necessary to ensure responsible and fair use. Institutional guidelines on academic integrity, appropriate AI use, and data protection can help align teaching practice with educational goals and ethical principles (UNESCO, 2021).

Beyond policy, universities can create opportunities for students and teachers to engage critically with AI tools. Workshops on AI-assisted academic writing can address issues such as authorship, intellectual property, and system limitations through hands-on practice and reflection. Ensuring equal access to these technologies is essential to reduce digital inequality, particularly for students with limited resources. Research suggests that inclusive design and attention to local educational contexts support fair AI use in multilingual and multicultural settings (Belda-Medina & Calvo-Ferrer, 2022; Gao et al., 2024).

Ongoing investment in teacher development is also needed to connect technical skills with effective instructional design. Universities may support this through AI resource centres that provide licensed tools, peer-led training, and adaptable teaching models. Such measures enable teachers to use AI with clear pedagogical goals rather than in fragmented or ad hoc ways. Over time, fair access to AI tools and sensitivity to local learning contexts can foster a more inclusive academic writing environment and promote equitable learning opportunities (Baidoo-Anu & Ansah, 2023). These institutional actions support ethical and context-responsive AI use, in line with UNESCO's (2020) commitment to quality and inclusive education. These practice-oriented implications translate earlier concerns related to self-efficacy, scaffolding, and equity into concrete actions at the institutional level.

Conclusion

This scoping review synthesises recent empirical research on the use of AI tools in English academic writing in higher education. Overall, existing studies suggest positive effects on writing performance, learner motivation, and engagement with metacognitive strategies. However, theoretical engagement remains uneven, with self-efficacy and scaffolding frameworks more frequently applied than perspectives related to cognitive load, sociocultural influences, and ethical governance. The findings also point to the importance of inclusive and context-sensitive pedagogical approaches that support learner diversity and critical AI literacy. Methodologically, the predominance of short-term and cross-sectional designs limits the strength and generalisability of current evidence.

Several limitations should be considered when interpreting these findings. This review is based on studies indexed in the Web of Science Core Collection and is therefore likely to underrepresent practice-oriented or non-English research. In addition, the strong focus on Chinese EFL university contexts and the frequent reliance on short-term designs and self-report measures restrict insight into long-term learning processes and everyday classroom practice.

Future research would benefit from broader database coverage, greater linguistic and regional diversity, and more cross-cultural investigations into AI-supported writing. Deeper engagement with underexplored theoretical perspectives, alongside more diverse and longitudinal research designs, is also needed to develop a more comprehensive and responsible understanding of AI use in academic writing instruction.

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Generative AI Use Disclosure Statement

ChatGPT and Grammarly were used only for language editing and grammatical refinement. All ideas, data collection, analysis, interpretation, and conclusions were developed and verified by the authors.

Ethics Declarations

World Medical Association (WMA) Declaration of Helsinki-Ethical Principles for Medical Research Involving Human Participants

This study adhered to the ethical principles of the World Medical Association (WMA) Declaration of Helsinki. As a scoping review based on previously published studies and publicly available data, it did not involve human participants. Ethical approval and informed consent were therefore not required.

Competing Interests

The authors declare that they have no competing interests.

Data Availability

All data analyzed in this study were sourced from the Web of Science database.

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