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Commentary

Rethinking Authorship in the Age of AI: Reflections on the AI-Integrated Writing Framework (AWAI)

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Abstract: The rapid development of artificial intelligence (AI) has brought significant changes to academic writing, raising important questions about authorship, originality, and how writing is taught and learned. While AI-based writing tools are now widely available, academic writing instruction has not kept pace and continues to rely on conventional pedagogical approaches. This paper introduces a conceptual framework called the Academic Writing and AI Integration (AWAI) Framework, which seeks to address this gap in a structured and pedagogically informed manner. Grounded in interdisciplinary scholarship, the AWAI Framework emphasizes the integration of three key elements: scholarly content knowledge, academic writing conventions, and AI literacy. Rather than reporting empirical findings, this study presents a theoretical model aimed at supporting educators and students as they navigate the opportunities and challenges posed by AI in academic contexts. The framework outlines a balanced approach to incorporating AI tools into writing instruction, while upholding the standards of academic rigor and ethical responsibility. Through this work, academic writing is reconsidered in light of emerging technological influences. The framework contributes to broader discussions about educational innovation and provides a foundation for future inquiry into the evolving relationship between human authors and intelligent systems in scholarly communication.

Keywords: artificial intelligence; academic writing; AI-assisted academic writing; authorship

1. Introduction

In recent years, the rapid advancement of artificial intelligence (AI) technologies, including tools such as ChatGPT (Brown et al., 2020), has begun to influence how academic writing is produced and understood (Zhu, 2025; Xiong et al., 2025). While these tools offer significant benefits in terms of efficiency and productivity (C. Xu, 2024), they also raise important questions about authorship, originality, and the role of human agency in the writing process (Samuelson, 2020, Ballardini et al., 2019). The provocative question, "Who is writing?" has become central to current debates (Broussard, 2018), prompting a redefinition of what it means to be an "author" in the digital age.

Despite the increasing integration of AI tools in various professional and educational settings, academic writing instruction remains predominantly anchored in traditional pedagogical approaches (Dong, 2023). Such instruction typically emphasizes language expression and adherence to formatting requirements, thereby neglecting the integration of AI tools into the writing process (Tseng & Warschauer, 2023). This focus has resulted in a pronounced theory-practice gap, where students often lack effective guidance from teachers on using AI in academic writing (J. Kim, 2024). Moreover, both students and instructors may not possess sufficient mastery of

these emerging technologies, which can lead to overreliance or misuse and, consequently, undermine academic rigor and independent critical thinking (Van Niekerk et al., 2025).

These challenges underscore the need for a new theoretical framework that integrates traditional academic writing skills with the advanced capabilities of AI tools. Specifically, it is crucial to address two pressing questions:

- What kind of framework can effectively connect core writing competencies with the affordances of AI technologies, while preserving disciplinary knowledge, writing conventions, and ethical standards?
- How can students be guided to make informed and responsible use of AI tools, in ways that promote originality and uphold academic integrity?

This paper proposes a novel conceptual framework for learning academic writing in the AI era. We begin by outlining the current tensions between writing pedagogy and technological change, followed by a discussion of how AI is reshaping notions of authorship and academic practice. This framework aims to bridge the gap between traditional academic writing practices and the innovative potential of AI tools, offering both theoretical insights and practical guidance for educators and learners navigating this rapidly evolving digital landscape.

2. Proposal of the Academic Writing and AI Integration (AWAI) Framework

2.1. Core Concepts

Academic writing is traditionally defined as a formal, structured process for communicating research findings through clear, evidence-based arguments (Hartley, 2008). It demands both mastery of traditional writing skills (clarity, precision, and rigorous citation) and the integration of multidisciplinary knowledge in academic writing practice, drawing on insights from various fields to construct comprehensive, innovative arguments (Lillis & Scott, 2015).

Historically, academic writing has been a monological process (Mouser, 2024), characterized by independent planning, drafting, and revising. Gradually, in the process of writing practice and instruction, academic writing has incorporated a collaborative model, involving cooperative discussion and co-writing among individuals. Collaborative writing is a process in which multiple individuals work together to plan, draft, revise, and edit a text, leveraging collective expertise to enhance writing quality and efficiency (Rbuiaee et al., 2015). However, the rise of AI tools like ChatGPT is transforming this paradigm into a more interactive and dialogical practice, enabling engagement with non-human collaborators (Mouser, 2024). AI-assisted writing offers real-time feedback, alternative phrasings, and structural guidance (Sok & Heng, 2024), thereby supporting writers in managing complex interdisciplinary synthesis while enhancing overall efficiency (Parker et al., 2024).

This transformation underscores the need to strike a balance between traditional writing expertise and AI assistance. While conventional methods ensure that the writer's unique voice and critical judgment remain central Van Niekerk et al., 2025), AI tools can alleviate routine tasks and facilitate the integration of diverse disciplinary perspectives (Dergaa et al., 2023). Achieving this balance is essential for maintaining scholarly rigor and authenticity.

Moreover, academic writing contrasts with non-academic styles, which often prioritize creative expression and emotional appeal (Bhatia, 2014) over methodical, evidence-based argumentation (Paltridge, 2004; Fang, 2021). For students and even less experienced scholars, expressing their ideas and academic findings in academic language can be quite challenging. By harmonizing established writing practices with emerging AI capabilities and multidisciplinary integration, academic writers can produce work that is both methodologically sound and innovative (Dergaa et al., 2023; Tiandem-Adamou, 2025).

These core concepts, including scholarly multidisciplinary knowledge integration and the balance between traditional and AI-assisted writing, form the foundation for the academic writing and AI integration (AWAI) framework.

2.2. Main Components of the AWAI Framework

2.2.1. Scholarly Content Knowledge (SCK)

Scholarly content knowledge (SCK) is a critical component of academic writing, encompassing the foundational theories, data, and cutting-edge research specific to a particular academic discipline (Shannon, 2011). It is essential for students to possess a robust understanding of the subject matter they are writing about, as it directly influences the depth, accuracy, and originality of their academic work Tedick, 1990). Traditionally, university education has focused on cultivating this knowledge through lectures, readings, group works research projects, and experiments (Prince, 2004). These methods have played a central role in academic development, with

academic writing serving both as an assessment tool and a means of communicating and disseminating knowledge (Boud & Falchikov, 2006).

The advent of AI technologies, particularly chatbot models like ChatGPT, has revolutionized how students engage with scholarly content (Parker et al., 2024). AI systems provide students with real-time, context-specific information through prompt-based interactions, enabling them to quickly access a wealth of academic resources Nguyen et al., 2024). This integration of AI into the learning process facilitates more efficient academic writing Sok & Heng, 2024), allowing students to supplement their own knowledge with AI-generated insights (Afzaal et al., 2024).

However, the application of AI in academic writing is not without limitations. One key concern is the potential contamination of AI's knowledge base with unreliable sources, leading to the spread of misinformation Bender et al., 2021). Additionally, AI systems can produce "hallucinations," generating inaccurate or fabricated information that may mislead students (Dergaa et al., 2023; Brown et al., 2020). Furthermore, AI's database often lags behind the most current research, meaning that students may not always receive the latest insights in their field (Bommasani et al., 2022). AI-generated content also tends to be generalized, often lacking the specificity and depth required for specialized academic inquiry (Kim et al., 2024). These limitations are especially apparent in interdisciplinary fields, where AI may struggle to integrate complex and nuanced knowledge from multiple domains (Abbonato et al., 2023).

While AI offers valuable support in facilitating the writing process, the human author remains indispensable in ensuring the accuracy, quality, and critical engagement of the final product (Mouser, 2024). A solid foundation in core disciplinary knowledge is necessary for students to assess and contextualize the information provided by AI, applying it rigorously and creatively in their writing Habib et al., 2024). In this collaborative framework, the student's expertise serves as a safeguard for maintaining the integrity of the academic process, ensuring that the final work is both accurate and intellectually sound.

2.2.2. Academic Writing Conventions (AWC)

Academic writing conventions are essential for producing scholarly work that adheres to discipline-specific standards of clarity, credibility, and rigor Swales & Feak, 2010). These conventions include knowledge of paper structures, citation formats, argumentation methods, and the appropriate use of academic language (Awagu, 2021). Traditionally, students acquire these conventions through direct instruction, independent practice, and feedback, with the aim of ensuring their work aligns with the expectations of their academic discipline and ethical standards (Hyland, 2008).

With the introduction of AI tools such as ChatGPT, students now have access to instant assistance in applying academic writing conventions more effectively (Kim et al., 2024). AI can support students in structuring their papers, formatting citations, refining arguments, and selecting appropriate academic vocabulary, thereby enhancing both the efficiency and quality of their writing (Kim et al., 2024). Through prompt-based interactions, AI can also provide personalized suggestions to help students organize their content, improve the coherence of their arguments, and meet academic standards (Bazerman, 1990).

However, current AI technologies still exhibit various shortcomings due to inherent technical limitations (Brown et al., 2020). For example, although AI-generated texts are often coherent at the sentence level, they frequently lack clear transitions and cohesion across paragraphs (Li et al., 2024). Additionally, AI-generated references frequently contain inaccuracies, necessitating thorough human verification to avoid errors (Zhu, 2025). Furthermore, AI may lack a deep understanding of the stylistic expectations of specific academic disciplines, leading to recommendations that may not fully align with certain academic genres Safrai & Orwig, 2024). Therefore, at this stage of AI-assisted academic writing, students should have a basic understanding of academic writing conventions and be able to guide AI in standardizing academic writing formats through well-structured prompts (Lin, 2023). Additionally, they should critically evaluate AI-generated suggestions and maintain the integrity of their scholarly work (Mouser, 2024).

Moreover, it is crucial to recognize that the primary objective of integrating AI into academic writing is not to enable AI to independently generate complete academic papers (Holmes & Luckin, 2016). Rather, the goal is to assist students in better understanding and applying academic writing conventions (Fathi & Rahimi, 2024). The challenge does not lie in using AI to produce papers that adhere to formal requirements but in fostering students' critical engagement with these conventions (Darwin et al., 2024), allowing them to internalize and apply them effectively throughout the writing process (Arinushkina et al., 2024). While AI can provide valuable support, the ultimate responsibility for ensuring that academic work meets scholarly standards remains with the students themselves (Hyland, 2008).

In summary, AI can assist students in adhering to academic writing conventions by offering timely suggestions and improving writing efficiency. However, the fundamental issue remains: how can students internalize and effectively apply these conventions in an AI-assisted writing process? Only through active and critical engagement with both AI tools and academic writing conventions can students transform academic writing into an intellectual growth process, ensuring that they are not merely passive recipients of AI-generated content but active participants in shaping and refining their scholarly work (Malik et al., 2023).

2.2.3. AI Literacy (AIL)

AI Literacy (AIL) refers to the ability to understand, interact with, critically evaluate, and effectively use AI technologies, particularly within academic contexts (Lintner, 2024). As AI tools become increasingly prevalent in academic settings, AI literacy has become an essential competency for engaging with these technologies (Long & Magerko, 2020). This literacy not only encompasses an understanding of the basic concepts and principles of AI (know and understand AI), but also includes the ability to flexibly apply AI technologies in practical contexts (use and apply AI), as well as the capacity to analyze and evaluate AI systems and participate in the development of AI applications (evaluate and create AI), while also requiring sensitivity to the societal impacts of AI, with a focus on fairness, transparency, and ethical issues (AI ethics) (Ng et al., 2021).

In the context of academic writing, AI literacy encompasses four core dimensions that are interrelated and mutually reinforcing. First, knowing and understanding AI requires that scholars grasp the basic concepts and principles of AI, including an understanding of its inherent capabilities and limitations Druga et al., 2019). This foundational knowledge enables users to appreciate that while AI can serve as a powerful tool for identifying research topics, generating text, summarizing studies, offering stylistic suggestions, and assisting at various stages of the writing process, it also has inherent drawbacks (Van Niekerk et al., 2025).

Second, using and applying AI involves the practical application of AI technologies in real-world academic scenarios (How & Hung, 2019). By leveraging AI tools effectively, scholars can streamline tasks such as drafting and editing, thereby enhancing productivity (J. Kim et al., 2024). However, successful application demands awareness of the potential risks associated with AI outputs, such as the introduction of biases or erroneous information Ng et al., 2021).

Third, evaluating and creating AI is centered on the ability to critically assess AI-generated content (Bearman et al., 2024). Scholars must rigorously analyze and evaluate AI outputs to ensure their credibility, relevance, and accuracy, as well as recognize when AI systems may produce content that lacks critical reasoning or even generates plausible yet incorrect information (Alshater, 2022). This critical evaluation is essential for maintaining academic rigor and is a key aspect of fostering a scientifically sound approach to AI usage.

Fourth, AI Ethics underscores the importance of addressing the societal and moral implications of AI in academic writing (Chai et al., 2020). Ethical considerations become particularly salient when questions arise about authorship and responsibility (Samuelson, 2020). Although debates continue over whether AI can be deemed the author of a work, the responsibility for issues like plagiarism, authorship integrity, and the originality and accuracy of content unequivocally rests with the human author (Ballardini et al., 2019). Therefore, even as AI assists in idea generation and content refinement, students and scholars must remain vigilant and accountable for the quality and ethical standards of their work.

By integrating these four dimensions—knowing and understanding AI, using and applying it, evaluating and creating with it, and adhering to ethical principles—academic institutions can equip university students with the comprehensive AI literacy necessary to navigate the complexities of modern AI tools while upholding academic rigor and integrity (Lintner, 2024).

2.3. Interdisciplinary Integration

The integration of artificial intelligence (AI) tools into academic writing represents a paradigm shift in how scholars approach the creation of scholarly texts (Mouser, 2024). To achieve optimal outcomes, it is essential to adopt a strategic approach that thoughtfully combines disciplinary knowledge, AI tools, and established writing conventions (Dergaa et al., 2023). This multifaceted strategy not only enhances efficiency in the writing process but also preserves the methodological rigor and integrity that academic work demands. This section outlines the key intersections between academic writing domains and AI, illustrated in Figure 1 as overlapping components.

2.3.1. Disciplinary Writing Knowledge (SCK + AWC)

The first and most foundational integration process is the mastery of disciplinary writing knowledge (see Figure 1). For any academic to produce work that meets the high standards of scholarly communities, an in-depth

understanding of both scholarly content knowledge (SCK) and academic writing conventions (AWC) is paramount (Bailey, 2014). SCK encompasses the core theories, methodologies, and empirical data that underpin a discipline, while AWC refers to the structured ways in which academic arguments are constructed, organized, and presented (Swales & Feak, 2010).

At its core, disciplinary writing knowledge ensures that the scholar is well-versed in the established norms and expectations of their field (Swales & Feak, 2010). This includes familiarity with citation practices, argumentation styles, and the overall structure of academic papers. AI tools, when integrated into this process, can serve as invaluable aids. For instance, they can suggest clearer expressions, propose alternative phrasing, and offer various organizational strategies that enhance the clarity and coherence of the text (Song & Song, 2023). However, it is crucial to note that AI functions best as a supplementary tool. The deep, intrinsic understanding of the discipline's content is indispensable; the scholar's expertise must guide the interpretation and contextualization of AI-generated suggestions (Z. Liu, 2024).

This integration underscores a key point: while AI can streamline the writing process, it cannot replace the nuanced insights that come from years of specialized study. Instead, AI is best seen as a facilitator that helps scholars structure their arguments more effectively, ensuring that the intellectual rigor and depth required for high-quality academic writing are maintained (Hanafi et al., 2025).

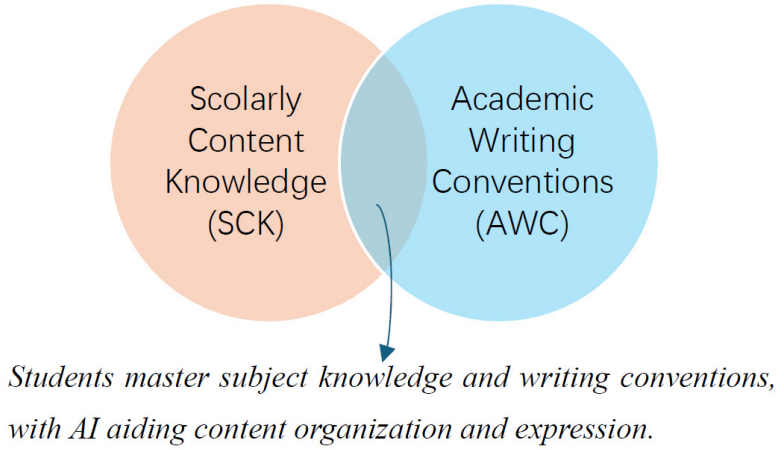

Figure 1. Disciplinary writing knowledge (SCK + AWC).

2.3.2. AI-Content Integration (SCK + AIL)

Building on the foundation of disciplinary knowledge, the next process focuses on AI-content integration (see Figure 2). This aspect of the process leverages AI tools to enhance and expand the scholarly content. Through the use of advanced algorithms and data analysis capabilities, AI can provide rapid access to vast arrays of academic literature, assist in synthesizing complex data sets (Wagner et al., 2022), and help researchers identify relevant studies that might otherwise be overlooked (Saeidnia et al., 2024).

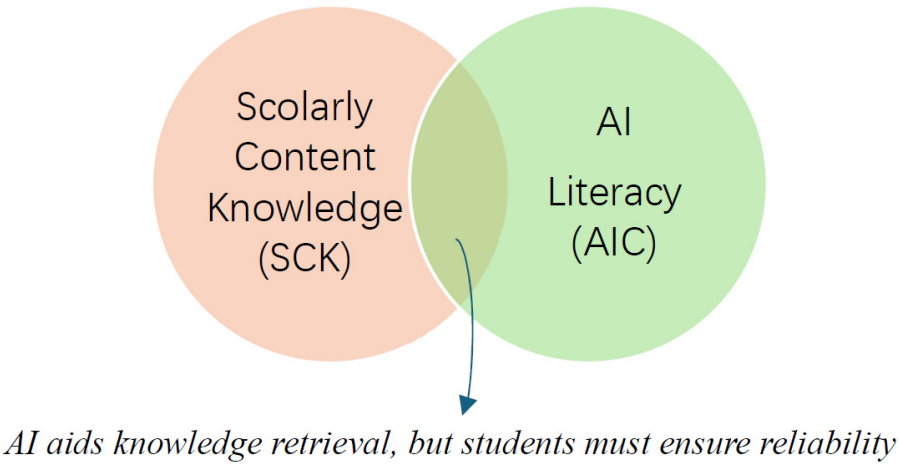

Figure 2. AI-content integration (SCK + AIL).

The enhancement of scholarly content knowledge (SCK) via AI is transformative. For example, AI-driven literature reviews can help scholars navigate extensive databases, pinpointing key sources that are most relevant to their research questions (Niskanen et al., 2023). Additionally, AI tools can cross-reference ideas from multiple disciplines (Glickman & Zhang, 2024), enabling researchers to integrate perspectives and methodologies from fields that might traditionally seem disparate (Tlili et al., 2023).

However, the benefits of these tools can only be fully realized when paired with effective AI Literacy (AIL). AI Literacy involves the critical ability to assess the quality, relevance, and potential biases of AI-generated content (Long & Magerko, 2020). Scholars must be adept at distinguishing between high-quality, reliable information and outputs that may contain errors, biases, or "hallucinations" that do not align with established research standards (Dergaa et al., 2023). This critical engagement ensures that the AI-enhanced content complements rather than compromises the researcher's own expertise (Alkaissi & McFarlane, 2023). In this layer, the scholar's active role in evaluating and integrating AI outputs is vital, ensuring that the enhancements brought by technology are judiciously applied within the bounds of academic integrity (Zawacki-Richter et al., 2019).

2.3.3. AI-writing Conventions Integration (AWC + AIL)

The third integration addresses the specific intersection between AI tools and academic writing conventions (see Figure 3). Academic writing is characterized by a clear, structured, and formal style that often requires meticulous attention to detail (Bazerman, 2009). AI tools have made significant strides in helping scholars adhere to these conventions by suggesting improvements in paper structure, refining citation formats, and enhancing language quality overall (Lund & Wang, 2023).

In practice, AI can provide real-time feedback on sentence construction, coherence, and the logical flow of ideas (Nguyen et al., 2024). It can recommend the proper ordering of sections within a paper, ensure that citations follow the required style guides, and even highlight areas where language may be too informal or imprecise (Gayed et al., 2022). Despite these advantages, the mere presence of AI-generated suggestions is not enough (Ma et al., 2024). Scholars must develop and maintain a high level of AI literacy (AIL) to critically assess these recommendations. Understanding the context in which a suggestion is made is crucial; writers must discern when to accept AI feedback and when to modify it to ensure that the final document aligns with both disciplinary standards and ethical considerations (Ng et al., 2021).

In this regard, the goal is not to delegate the entire writing process to AI but rather to use AI as a means of enhancing the scholar's inherent capabilities. Through careful engagement with AI tools, writers can internalize academic conventions and gradually build a more intuitive understanding of effective academic communication (Chichekian & Benteux, 2022). This layer emphasizes that the successful integration of AI into academic writing is not about automating the process but about enriching the writer's toolkit, thereby enabling the production of work that is both methodologically sound and stylistically impeccable (Cardon et al., 2023).

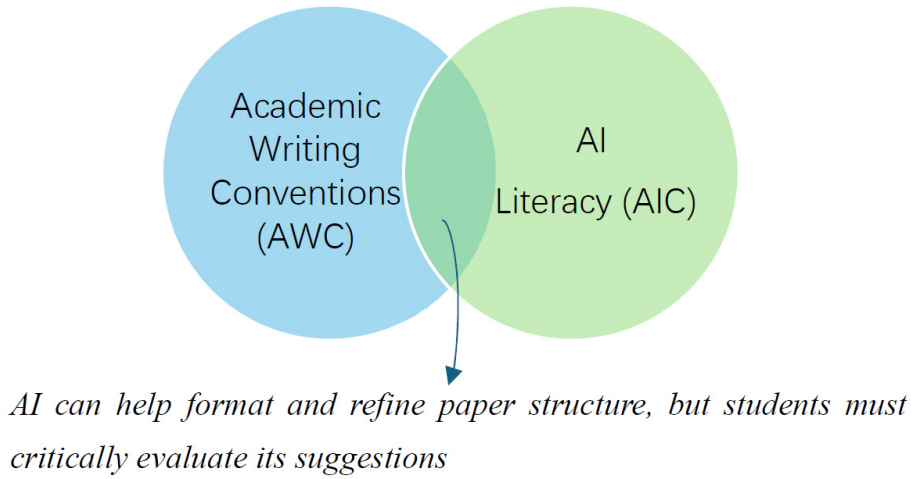

Figure 3. AI-Writing Conventions Integration (AWC + AIL).

2.3.4. Comprehensive Integration: AI-Integrated Academic Writing Ability (SCK + AWC + AIL)

The final process represents the comprehensive integration of all the components discussed, including Scholarly Content Knowledge (SCK), Academic Writing Conventions (AWC), and AI Literacy (AIL), into a holistic academic

writing ability (see Figure 4). This comprehensive approach empowers scholars to strategically utilize AI tools without compromising the originality, rigor, and intellectual autonomy that underpin scholarly research (Ng et al., 2021).

By mastering this integrated approach, writers can harness AI to streamline the research and writing process while ensuring that their work remains innovative and methodologically robust. This not only increases efficiency (Khalifa & Albadawy, 2024) but also opens up new avenues for interdisciplinary exploration (Garrido-Merchan, 2023). For instance, students and researchers can use AI to delve into cross-disciplinary perspectives, enriching their arguments and contributing to a more nuanced understanding of complex topics (Lin, 2023).

Moreover, the integration of AI into academic writing processes requires a continuous and active engagement with the technology (Lin, 2023).. Scholars must remain vigilant, regularly updating their skills in AI Literacy and staying informed about the latest developments in AI-assisted research tools. This ongoing education ensures that the integration remains beneficial and that AI is used to supplement rather than supplant human expertise (Bitzenbauer, 2023).

In practice, the comprehensive integration process involves a dynamic interplay between human insight and technological assistance (W. Xu & Gao, 2024). The scholar's ability to synthesize and apply SCK, AWC, and AIL ensures that the final output is not only efficient in its production but also exemplary in its adherence to academic norms. In doing so, AI becomes an indispensable tool in the academic toolkit, aiding scholars in producing work that is both high in quality and reflective of the latest advancements in technology (Hanafi et al., 2025).

In conclusion, the thoughtful integration of AI tools into academic writing necessitates a multi-layered approach that combines disciplinary writing knowledge, effective AI-content integration, and adherence to writing conventions through robust AI Literacy. By developing a comprehensive strategy that encompasses these elements, scholars can significantly enhance their academic writing capabilities. This integration not only leads to more efficient production of scholarly work but also fosters an environment in which innovation and methodological rigor coexist harmoniously. Ultimately, the successful fusion of human expertise and AI-driven insights heralds a new era in academic writing—one that promises to elevate the quality and impact of scholarly communication in the digital age.

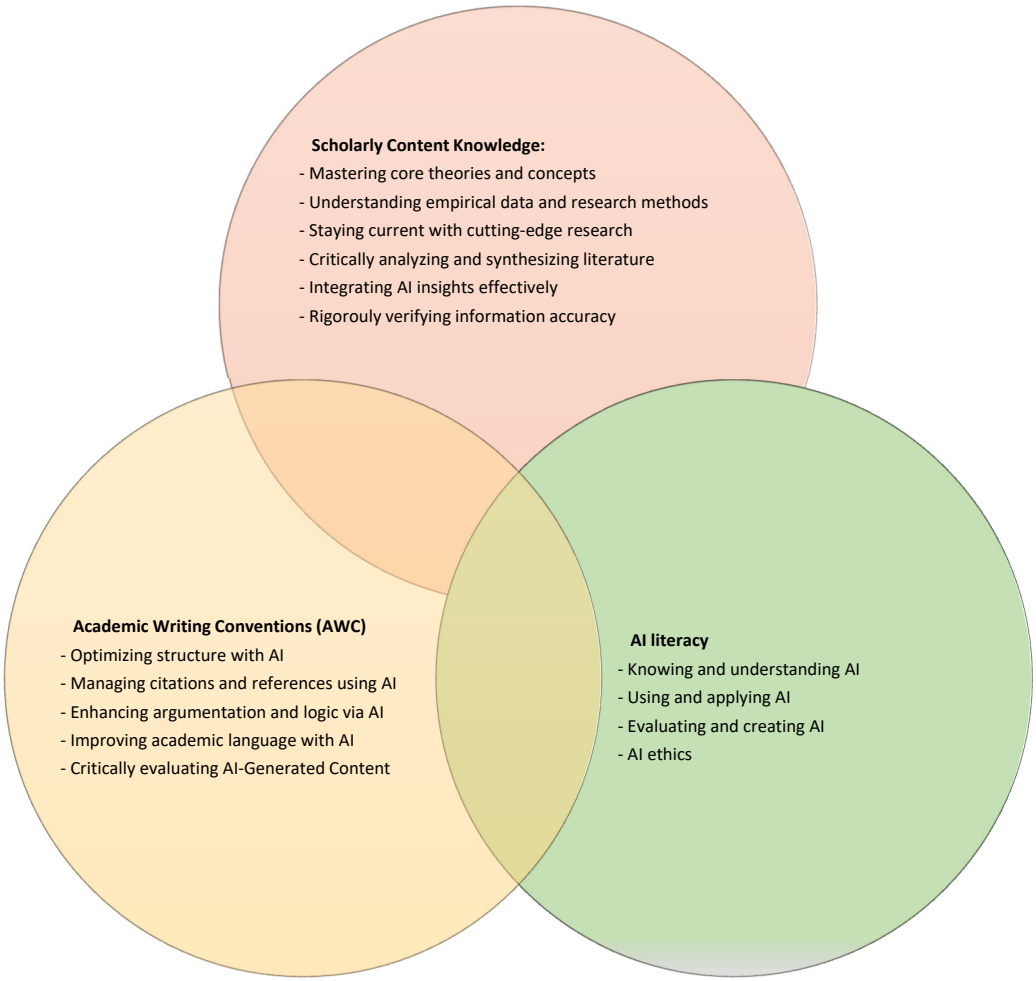

Figure 4. The Convergence of SCK, AWC, and AIL.

3. Application of the AWAI Framework

The integration of AI tools into academic writing presents both opportunities and challenges for enhancing scholarly practices (Dergaa et al., 2023; Stojanov et al., 2024). The AWAI framework provides a structured approach to incorporating AI technologies while maintaining the rigor and integrity of academic writing (Ng et al., 2021; Kim et al., 2024). To effectively implement this framework, four key areas must be addressed: instructional design, faculty training, student skill development, and research evaluation.

The instructional design of AI-assisted academic writing courses can refer to the core components of the AWAI framework: scholarly content knowledge (SCK), academic writing conventions (AWC), and AI literacy (AIL) (Bitzenbauer, 2023). At each stage of the writing process—topic selection, literature review, drafting, and revision—students should be guided in balancing traditional academic practices with the use of AI tools (Ray, 2023). In the topic selection phase, students should draw upon their disciplinary knowledge to identify research areas that allow them to apply existing theories and methodologies (Garrido-Merchan, 2023). AI tools can serve as an aid in exploring potential topics and generating initial ideas, but the selection process should be firmly grounded in the student's expertise (Salvagno et al., 2023).

During the literature review phase, AI's ability to quickly compile relevant sources can expedite the process, but students must be trained to critically evaluate the sources AI provides (Chichekian & Benteux, 2022). This ensures that the literature review maintains scholarly rigor and addresses key debates within the discipline (Zawacki-Richter et al., 2019). The drafting phase offers an opportunity for AI to assist in generating initial drafts or improving clarity, yet it is essential that students retain ownership of their writing, using AI-generated content as a guide rather than a substitute (Gayed et al., 2022). In the revision phase, AI tools can help refine grammar, sentence structure, and overall readability, but the student's role in making final revisions based on academic standards and personal judgment remains paramount (Woo et al., 2023).

For faculty training, instructors need specialized preparation to teach both traditional academic writing conventions and the integration of AI tools (Tan et al., 2023). Effective faculty training should equip instructors with the skills to guide students in using AI tools responsibly and efficiently, ensuring that AI enhances rather than compromises the writing process (Lin, 2023). This training can be structured around case studies and hands-on workshops where instructors practice using AI tools in a controlled setting, familiarizing themselves with the ways these technologies can support academic writing tasks (Tan et al., 2023).

Student skill development is at the heart of the AWAI framework, as it is essential for students to develop both the technical skills to use AI tools and the critical thinking skills to evaluate and apply AI-generated content Shibani et al., 2024). Practical, project-based activities should be designed to encourage students to engage with AI at various stages of the academic writing process (Dale & Viethen, 2021). Reflective practices are essential for helping students understand the role of AI in their writing process and ensuring that they retain control over their work (C. Liu et al., 2023). These activities encourage students to become more adept at navigating AI-assisted writing while maintaining academic independence and originality (Cardon et al., 2023).

Finally, research and evaluation are critical components in assessing the effectiveness of the AWAI framework in academic writing instruction (Lund & Wang, 2023). Observations, assessments, and interviews can provide valuable insights into how students apply their disciplinary knowledge, follow academic writing conventions, and engage with AI tools (Chan & Hu, 2023).

4. Impact of the AWAI Framework on Academic Writing Education

4.1. Theoretical Contributions

The AWAI framework, by integrating disciplinary content, academic conventions, and AI literacy, provides a fresh theoretical perspective for academic writing education. Traditional academic writing has often focused on language expression and logical structure; however, the AWAI framework emphasizes the simultaneous integration of domain knowledge, regulatory requirements, and advanced technological applications, thereby constructing a multidimensional and interdisciplinary theoretical system (M. Kim & Adlof, 2024). This framework not only broadens the scope of academic writing but also prompts a re-examination of the concept of "authorship". In the context of human-AI collaborative writing, the traditional notion of a single author is gradually being replaced by a multi-participant, cooperative model (Mouser, 2024). This perspective lays the groundwork for further discussions on academic authorship, creative attribution, and ethical issues, urging the academic community to rethink the fundamental paradigms of writing.

4.2. Pedagogical Practice

On the pedagogical front, the AWAI framework offers new guidance for teachers and students in approaching the academic writing process. Specifically, the framework advocates for using AI tools as aids rather than substitutes, thereby enhancing both writing efficiency and quality (Dergaa et al., 2023). In the classroom, instructors are encouraged not only to impart traditional writing skills but also to guide students in the effective use of AI tools for tasks such as data collection, content organization, and structural optimization. This approach helps students overcome the limitations of single-skill training by cultivating comprehensive writing capabilities and critical thinking skills (C. Liu et al., 2023). Moreover, it paves the way for interdisciplinary teaching and collaboration, as educators can integrate knowledge from different fields through co-teaching and project-based learning, thus providing students with a richer and more diverse learning environment.

4.3. Policy and Educational Reform

From the perspective of policy and educational reform, the AWAI framework offers a theoretical basis for higher education institutions to develop targeted faculty training programs and curriculum reforms. With the rapid advancement of AI technologies, existing models of academic writing education urgently need systematic adjustment and modernization (Shibani & Shum, 2024). Universities can leverage the principles of the AWAI framework to design well-structured teacher training programs that enhance faculty proficiency in AI tool usage; concurrently, curricula should be revised to combine traditional writing instruction with AI applications, thereby equipping students with contemporary, comprehensive writing skills. Additionally, policies related to academic publishing and copyright must be updated accordingly to foster a fair and legally sound academic ecosystem while promoting innovative scholarly practices (Barbone et al., 2023).

5. Research Conclusions and Future Prospects

5.1. Key Conclusions

This study demonstrates that, in the age of AI, academic writing has transformed from a mere extension of traditional writing skills into a multifaceted capability. It now integrates disciplinary knowledge, academic conventions, and proficiency in using AI tools. The AWAI framework not only offers theoretical guidance for this evolution but also outlines practical pathways for both teachers and students to redefine their roles within the writing process. The main conclusions drawn from this research emphasize several critical aspects.

First, academic writing today relies on a combination of comprehensive capabilities. It is no longer sufficient to merely possess language proficiency and logical reasoning skills; a deep understanding of domain-specific knowledge and the ability to effectively use technological tools have become equally important.

Second, the shift towards human-AI collaborative writing models is essential. As AI-assisted technologies continue to develop, traditional writing methods are being replaced by collaborative models, where human authors work alongside AI tools. This transition is reshaping the roles of authors and altering the overall writing process, making the integration of AI an increasingly crucial element in academic writing.

Finally, the need for dynamic adaptation and continuous feedback mechanisms is more pressing than ever. In an era characterized by rapid technological change, both educators and students must continually update their skills and develop flexible feedback systems to keep pace with evolving teaching methodologies and writing practices. This adaptability is key to maintaining relevance and effectiveness in academic writing education.

5.2. Continuous Adaptation and Skill Enhancement

In today's rapidly changing technological landscape, continuous adaptation and skill enhancement are paramount for academic writing education. Instructors must remain abreast of new developments in AI technology and adjust their teaching strategies promptly, while students should actively explore and learn to leverage AI tools for efficient writing. Establishing dynamic feedback mechanisms is essential—not only for identifying and addressing issues in the educational process but also for providing practical data to support ongoing improvements to the AWAI framework. Through continuous practice and reflection, educational content and teaching methods can remain aligned with technological progress, thereby propelling academic writing education to new heights.

6. Future Research Directions

While this study provides initial theoretical and practical insights into the application of the AWAI framework in academic writing education, several areas require further exploration. Future research can build upon these findings by focusing on a few key directions.

One of the primary areas for future investigation is evaluating the framework's applicability and effectiveness across various disciplines and educational levels. It is essential to assess how the AWAI framework performs in different academic contexts and at different stages of education. Through extensive empirical analysis and case studies, researchers can validate its relevance and effectiveness, offering insights into how it can be adapted and optimized for specific teaching environments.

Another important avenue for research is addressing the ethical, legal, and cognitive challenges that arise with the increasing use of human-AI collaborative writing models. As these models become more common, they present new concerns related to fairness, transparency, and cognitive processes in academic writing. Future studies should systematically explore these issues, developing a robust theoretical framework and practical guidelines to support ethical AI use in academic writing. Such research will be crucial in ensuring that these collaborative processes are conducted fairly and with full awareness of their broader implications.

Lastly, future research should focus on understanding the specific roles of various AI tools in academic writing, particularly in relation to different writing tasks and teaching needs. Investigating how AI tools can be tailored to meet the requirements of distinct disciplines and writing styles will be essential in developing customized teaching resources. This will not only enhance the quality of academic writing but also allow educators and students to leverage AI technologies more effectively. Moreover, research should explore the synergy between different AI tools, identifying best practices for integrating them into the writing process to maximize their benefits, while also considering the long-term effects of AI use on students, including whether AI usage might impact their critical thinking abilities, cognitive and metacognitive skills, and self-regulated learning (SRL) strategies.

Institutional Review Board Statement

Not applicable. This literature-based study did not involve human or animal participants. Ethical review was waived as it exclusively analyzes existing published data.

Informed Consent Statement

Not applicable. No human subjects were involved in this study.

Data Availability Statement

All data supporting this study are included in the article or available through publicly accessible sources cited in the references. As a literature synthesis, no novel datasets were generated.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in study design, data collection/analysis, or publication decisions.

AI Usage Statement

ChatGPT was used for writing refinement and translation in the preparation of this manuscript. However, all viewpoints and figures were independently created by the human authors.

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