



# Negotiating Meaning with Machines: AI's Role in Doctoral Writing Pedagogy

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## Abstract

This paper examines the integration of generative artificial intelligence (AI) in doctoral writing pedagogy. It explores how AI augments traditional teaching and composition processes, fosters a new paradigm of cognitive engagement and collaborative academic writing, and the broader ethical and social implications of human-AI writing in doctoral writing pedagogy. A community-engaged participatory research methodology was employed within a Doctor of Healthcare Administration program. Data were collected through discussion board messages, self-assessment papers, student reflections, and a focus group interview, and analyzed using thematic analysis. The research unearthed a hybrid human-AI writing process characterized by dynamic brainstorming, continuous negotiation of meaning, and comparative evaluation. These practices enhanced students' cognitive and metacognitive engagement, confidence, and learner agency, signifying a shift toward a collaborative approach to academic writing. The findings highlight the need for academic institutions to adapt policies and curricula to incorporate AI technologies ethically and responsibly. Emphasis on AI literacy and academic integrity is crucial for preparing graduates for an AI-integrated workforce. This study contributes to the understanding of AI's role in doctoral education, specifically doctoral writing development, presenting a novel perspective on the synergistic collaboration between students and AI in academic writing and its implications for institutional policies and writing pedagogy.

**Keywords** Generative AI · LLMs · Doctoral writing · Academic integrity · AI literacy · Ethical AI use · Postdigital education

## Introduction

The introduction of generative artificial intelligence<sup>1</sup> (AI) in academic settings has precipitated a shift toward collaboration between humans and AI in writing processes, leading to a cascading effect in doctoral education. This shift is

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<sup>1</sup> For simplicity, we use the acronym AI to refer to generative AI.

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occurring against the backdrop of well-documented challenges in doctoral writing development. Researchers have long recognized the complexities of doctoral writing, noting issues such as difficulties in developing scholarly identity through writing (Kamler & Thomson, 2006), challenges in adapting to discipline-specific writing conventions (Paré, 2019), and struggles with responding to and evaluating writing feedback (Inouye & McAlpine, 2019). Given that academic writing is the cornerstone of completing a doctoral degree, the advent of AI capable of generating human-like text presents both opportunities to foster and potential risks to hinder doctoral students' academic writing development.

This evolution not only underscores the socio-technical implications of digital technologies in educational contexts but also gives rise to the emergence of what Eaton (2023) describes as 'postplagiarism' in academic writing, where hybrid human-AI writing may become the norm. Hybrid-human AI writing calls for new approaches to the use of technology in writing classes and reshapes our understanding of academic integrity. While a substantial body of literature exists on doctoral writing pedagogy and development (e.g., Lee & Danby, 2012; Aitchison & Guerin, 2014), there is a notable lack of research on the specific impact of AI on writing processes and outcomes in doctoral education. This gap is particularly significant given the rapid adoption of AI tools in academic settings and the potential for these technologies to address—or exacerbate—existing challenges in doctoral writing.

Key challenges within this changing landscape include teaching and developing AI literacy for students and educators (Becker et al., 2024). AI literacy involves understanding the capabilities and limitations of AI tools and fostering critical thinking skills to discern when and how to use AI with integrity in composing research and academic writing. Moreover, the need to redesign methods of writing assessment in the age of AI is a predominant theme in formal and informal evaluations of how the landscape is changing. Traditional assessment methods, often focusing solely on content originality, must evolve to account for AI assistance in human compositions (Bearman & Luckin, 2020). This requires a prudent strategy that (a) recognizes the potential synergy of human-AI interactions, (b) values the potential innovative partnerships, and (c) maintains ethical academic standards. Ultimately, the goal is to equip doctoral students with competencies sufficient to navigate this new terrain confidently and responsibly as AI emerges as a tool for augmenting educational outcomes and processes rather than automating or undermining them.

In this article, we embrace the inevitability of human-AI hybrid composition, as highlighted by Eaton (2023) and advocate for AI-driven writing practices in an academic writing course. We hypothesize that this integration of AI in academic writing supports the development of process-oriented writing, nurtures engagement, reinforces feedback, and prepares doctoral students for a workforce imbued with and increasingly dependent on AI. This study explores AI tools' impact in the context of a doctoral writing class, emphasizing such tools' ability to augment the traditional writing process, and the potential ethical and social implications of human-AI writing. This includes the use of AI throughout the writing process, such as for brainstorming, drafting, and peer review, all of which reflect the new

norms of postplagiarism and the enhanced capabilities afforded by AI in the post-digital era.

This study is grounded in frameworks of Postdigital Education (Knox, 2019), and Academic Integrity in the Post-Plagiarism Era (Eaton, 2023). In the context of education, "postdigital" refers to a conceptual shift where digital technology is no longer considered a distinct, external force impacting education but rather an integrated and intrinsic part of the educational ecosystem (Knox, 2019). By adopting this framework, we situate our research within a broader understanding of how AI is not just a tool for education, but a transformative force reshaping the very nature of educational processes and practices. This aligns closely with what Eaton (2023) describes as "hybrid human-AI writing." In hybrid writing, AI is not just a tool but a collaborator in the writing process, reshaping how writing is approached, executed, and evaluated. Our view, which aligns with that of Eaton's (2023), is that hybrid human-AI writing will soon be the norm, and human creativity will be enhanced through collaboration with AI. This integration underscores the need for a deeper understanding of how AI influences writing practices, educational norms, and the development of critical skills, reflecting the broader postdigital perspective that technology and human practices are intertwined.

## Research Questions

1. In what ways does incorporating AI into doctoral writing pedagogy transform traditional composition processes?
2. How does human-AI writing shape doctoral students' academic writing development?
3. What are the broader ethical and social implications of human-AI writing in doctoral writing pedagogy?

## Context

This study was conducted within a first-year academic writing course for Doctor of Healthcare Administration (DHA) students. Spanning fourteen weeks, the course was designed to enhance students' academic writing skills for doctoral-level work, serving as a prerequisite for a series of applied research courses. The course, which includes weekly discussion posts and five written assignments, focuses on critical aspects of academic writing development, such as developing and structuring academic arguments, mastering critical reading, and effectively citing sources. Additionally, students learn to enhance clarity and precision in their writing alongside understanding the principles of revision and editing. In the fall 2023 semester, eight students were enrolled in the course, and four volunteered to participate as co-researchers on this project.

The course was modified to include AI, specifically LLMs like ChatGPT, and other custom AI tools developed by the professor using MindStudio (<https://mindsstudio.ai/>), a no-code application platform for creating AI-powered tools. Levels of

AI integration ranged from “no AI” to “advanced AI” integration, depending on the level of AI mastery required to complete an assigned task. These levels of integration align with Perkins et al.’s AI Assessment Scale (2023) and Bloom’s Taxonomy levels (1956), outlined in Table 1.

## Methods

We employed a community-engaged participatory research (PR) methodology. PR, used across various disciplines, is ideal when research aims to integrate stakeholders’ perspectives, ensuring the study’s outcomes are closely aligned with their needs and challenges while simultaneously promoting a sense of ownership and engagement among the participants (Vaughn & Jacquez, 2020). Community-engaged PR is rooted in the principles of collaborative inquiry and equitable partnership between researchers and community members (Minkler & Wallerstein, 2008). This approach aligns with trends in educational research that emphasize the importance of including student voices in curriculum development and pedagogical innovation (Cook-Sather et al., 2014). In the context of a writing class for doctoral students, we define “community” as the stakeholders actively contributing input, feedback, and insights into the research process. In this study, the community comprised doctoral students and their professor, offering a unique academic perspective, and enriching the research with their diverse lived experiences and knowledge.

Participants in PR contribute to various stages of the research process; their involvement is crucial for ensuring that the research is grounded in real-world experiences (Cargo & Mercer, 2008). This collaborative approach also improves research quality and rigor by integrating researchers’ theoretical and methodological expertise with participants’ real-world knowledge and experiences into a synergistic partnership. The distinguishing feature of PR is stakeholder power in decision-making and implementation; therefore, any research method or tool can be participatory if chosen and/or utilized collaboratively between stakeholders.

## Participants

Participants included the course professor (J. Parker) and four DHA students enrolled in the course (A. Acabá, S. Escoffier, S. Flaherty, and S. Jablonka), who volunteered to participate as co-researchers. The professor and students met at regular intervals beyond the regularly scheduled class meetings to reflect on and discuss the integration of AI tools into the course curriculum. These meetings were instrumental in gathering insights on learning, challenges, and potential enhancements for future discussion posts and assignments. The AI tools used throughout the course included ChatGPT (OpenAI, 2023) and custom AI tools developed by the professor.

**Table 1** Graduated Levels of AI Integration and AI Mastery in Academic Writing Tasks: Aligning with Bloom's Taxonomy for Enhanced Learning Outcomes

Level of AI Integration	Bloom's Level	AI Mastery Level	Description of Student Abilities
No AI	Remembering/ Knowing	None/Novice	<ul style="list-style-type: none"> <li>· Little to no understanding/experience</li> <li>· Lack of awareness about AI capabilities or limitations</li> <li>· No incorporation of AI into academic work</li> <li>· Tasks completed solely on student knowledge</li> </ul>
AI-Assisted Idea Development	Understanding/ Comprehending	Beginner	<ul style="list-style-type: none"> <li>· Basic understanding of AI tools</li> <li>· Perform simple tasks (brainstorming, generation of text)</li> <li>· Focus on learning/experimenting with basic functionalities</li> </ul>
AI Collaboration	Applying	Competent	<ul style="list-style-type: none"> <li>· Use AI for a variety of tasks</li> <li>· Have a grasp of tool utilization in academic settings</li> <li>· May still need guidance for more complex applications</li> <li>· Understanding of some ethical considerations/limitations</li> </ul>
Full AI Integration	Analyzing and Evaluating	Proficient	<ul style="list-style-type: none"> <li>· Advanced understanding of AI</li> <li>· Use AI as a collaborative partner</li> <li>· Integrate tools into complex academic tasks</li> <li>· Manipulate and customize output</li> <li>· Deep understanding of the ethics &amp; biases</li> <li>· Capable of critically evaluating outputs</li> </ul>
Advanced AI Integration	Creating	Expert	<ul style="list-style-type: none"> <li>· Extensive experience and deep knowledge</li> <li>· Leverage AI to generate original, creative work</li> <li>· Use tools to innovate</li> <li>· Comprehensive understanding of technology, limitations, ethics, future developments</li> </ul>

## Data Collection

Data sources included student discussion board messages, self-assessment papers, student reflections, and a focus group interview. Each discussion prompt was modified to include a three-step process, where step one remained the same as the original discussion post before AI was incorporated into the course. Students had the opportunity to change their original discussion board response after reviewing the AI's feedback but had to offer an explanation behind their decision. Although students were required to complete steps two and three, these components were not graded to encourage honesty and transparency. Table 2 displays a sample discussion board prompt instructions with the three-step process created by the professor.

The second primary data source consisted of one-page self-assessment and reflection papers, which accompanied four written assignments and were not graded to encourage honesty and transparency. These documents included students' responses to questions about how they used AI tools to complete the assignment, how they incorporated the AI's feedback into their assignment, what insights the AI if they had not considered, and how they plan to use AI in the next assignment.

The third data source consisted of a 75-min focus group interview, which was conducted at the end of the semester and after the final papers were graded, to explore in greater depth how the use of AI tools influenced students' writing development and to discuss their recommendations for course modifications and policies on AI. The focus group was conducted online via Zoom and led by a course outsider (V. Richard) so the professor could participate and share insights alongside the student co-researchers. The focus group interview protocol was developed after completing the first three steps of the analysis process.

**Table 2** Example of Discussion Prompt Instructions and Questions on AI Use in Discussions

Step 1. Review your academic argument paper and answer the following questions:

- Did you use a mixture of signal phrases and introductory phrases? If not, what would you change?
- What reporting verbs did you use?
- What might you change about the reporting verbs you used? Provide at least one specific example and explain your reasoning
- Challenge yourself not to repeat any reporting verbs throughout your paper. Use CTRL+F (COMM+F) to identify your repetitions, and don't forget to look at different tenses (e.g., explain, was explaining, vs. explained, etc.). HINT: You can also ask ChatGPT to identify your reporting verbs, identify any repeats, and share with you some synonyms
- What transition words or phrases did you use?
- Would you change any transition words or phrases in the paper? Provide at least one specific example of what you would change

Step 2. Interact with an LLM like ChatGPT to check your responses. Remember, the goal of this exercise is not to see if the AI is 'right' or 'wrong' but to use it as a tool to facilitate self-reflection and critical thinking. Always feel free to ask your peers or your professor for further clarification or discussion

Step 3. Compare your observations with the AI's insights and answer the following questions:

- How did your responses differ from the AI's insights? Identify areas where the AI provided unique perspectives or additional information
- Based on your interaction with the AI, decide if you would change any of your original responses. Explain the reasons behind your decision
- Copy and paste or share a screenshot of your interactions with the AI

## Data Analysis

Data were analyzed using Braun & Clarke's (2022) six steps of thematic analysis. In the first step, J. Parker and V. Richard familiarized themselves with the data by reading the discussion posts, reflections, and self-assessments three times. For the focus group data, V. Richard and J. Parker checked the transcripts for accuracy by listening to the audio and reading the transcripts. During this familiarization, V. Richard and J. Parker also noted initial ideas and analytical processes (Braun & Clarke, 2022). In alignment with Braun & Clarke's (2022) second and third steps, relevant data was coded (i.e., assigned a meaning-based name), and codes that were similar in meaning but that represented nuances of meaning were grouped (i.e., generating initial themes). The fourth step included developing and reviewing themes. In this process, the data in each group were reviewed and checked to ensure they aligned and were then combined to form more comprehensive themes. The fifth step consisted of refining, defining, and naming themes. Braun & Clarke's (2022) questions of how each theme fits into the larger "story" present in the data guided this process. Finally, the findings were written up, concluding the six-step process. The findings were then shared with each of the student co-researchers to confirm agreement. The student co-researchers organized the findings in order of most salient to least salient based on their individual experiences, which informed the final reporting of the findings.

## Findings

Themes captured a hybrid human-AI writing process characterized by a dynamic interplay of brainstorming and ideation, meaning negotiation, and critical analysis. These writing practices were perceived to enhance participant's cognitive and metacognitive engagement, confidence, and sense of agency. We explore the findings through the lens of each research question, noting dominant themes and providing support for our interpretations using quotes from the various data sources. We use the terms "participants" and "students" interchangeably. The professor's insights and interpretation of the findings are called out as asides alongside the findings.

*RQ1: In what ways does incorporating AI into doctoral writing pedagogy transform traditional composition processes?*

## Hybrid Human-AI Writing Process

Over the course of the semester, students gained mastery in using AI tools as their understanding of academic writing deepened, leading to an evolved writing process that we have named for its hybrid and collaborative nature. In this new writing process, participants gradually began to view the AI as a writing partner "who" they could negotiate with, akin to a human partner, challenging its suggestions and working toward a mutual understanding or refined writing product. As a result, the

overall writing process itself was transformed from a series of discrete stages (e.g., prewriting, planning, drafting, peer review, revision, etc.) to an integrated and adaptive flow of continuous brainstorming and ideation, feedback, meaning negotiation, and refinement. This collaborative writing process between the students and AI manifested as several distinct but related writing practices, which will be reported as three subthemes.

**Dynamic brainstorming and ideation** Throughout the course, participants leveraged AI to participate in dynamic brainstorming and ideation. Initially used to overcome writer's block, the AI interactions later facilitated advanced brainstorming for refining writing styles and achieving rhetorical objectives. Early in the course, when students had only a basic understanding of AI, participants primarily used AI tools when they were having "a difficult time starting an assignment" (P2) and when developing ideas for building arguments to "put thoughts together in a different perspective." (P2). For example, one participant described how they used AI to play the role of an HR professional: "I developed arguments and ideas off of perspectives that I just could not pull from my own life experience" (P4). Mid-semester, participants began using and applying AI tools to brainstorm ways to enhance their writing and achieve certain rhetorical goals. For instance, one participant shared how they used AI to "help refine my writing and provide diversity in the types of verbs I use" (P3).

The immediacy of AI-generated feedback also provided additional opportunities for participants to more frequently engage in brainstorming and refine their ideas. For some, the immediate feedback from AI was particularly valued for its efficiency in idea generation, marking a significant and creative shift in traditional writing and revision practices. One participant offered an analogy to describe their experience brainstorming and writing AI:

...having the immediate feedback of AI kind of allowed me to constantly be crafting this sculpture, I guess you could say. Whereas in the past, when I had somebody review my work or edit it, whatever, the sculpture was already made, and then I had to go back and chisel away at it and fix things. (P4)

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### **Professor Insights**

As the semester progressed and students became more proficient in their use of AI, I noticed that their prompts became more specific, and they began using AI for brainstorming in other creative ways to gain insights into their writing. For instance, rather than prompting the AI to suggest alternative counterarguments, students began asking the AI to help them consider specific perspectives based on their target audience. Some students asked the AI to play the role of their target audience and began to challenge the AI to explain its responses and provide examples. This not only demonstrates gains in AI mastery but their capacity to apply, analyze, and evaluate the AI's output based on their understanding of course concepts. As a professor of students from various healthcare disciplines, I also brainstormed with AI to help me support students in their development of thesis statements and guide them on how to structure their arguments, which helped me provide more targeted feedback

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**Continuous Negotiation of Meaning** At the core of the hybrid human-AI process is the participants' engagement in an ongoing, iterative cycle of feedback and meaning negotiation with the AI. A prime example of meaning negotiation is when a student receives feedback, interprets it, seeks understanding, and corrects misunderstandings. For instance, several participants experimented with prompting techniques to elicit more useful feedback from ChatGPT based on the focus of their revision:

The specific follow ups that narrow down the AI to a more focused topic are helpful. Those narrower searches either yield good results (like the list of repeated transition phrases or insight on parallel structure) or it is immediately clear that a more refines search may be need as ChatGPT did not understand the initial query (as seen in my ask to identify lists, as I wanted more feedback on enumeration in the paper). (P1)

When conducting a self-assessment, one participant described how they first completed an initial review of specific course objectives before collaborating with AI and adjusting their assessment:

I first re-read the paper to highlight signal phrases, reporting verbs, and transition words /phrases. After a read through I also used the 'find in text' function and searched the terms which fall under these categories to see if I missed anything. ChatGPT identified numerous signal phrases but missed all the introductory phrases and instead used each of the headings as examples of introductory phrases instead. ChatGPT also identified many of the *to be* verbs and other verbs as reporting verbs that do not necessarily match the list from the week 5 class resource or from my idea of what a reporting verb should be. (P4)

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### Professor Insights

One persistent challenge I encounter as a professor is providing timely, constructive feedback. Moreover, students often take feedback personally, leading to emotional defensiveness. This semester, however, marked a change as students could digest AI-generated feedback and revise their work prior to submission for grading. The AI's neutrality seemed to accelerate learning by allowing students to circumvent psychological barriers often triggered by feedback from their professor. Through their interactions with AI, students' affective filter<sup>a</sup> was lowered, and they displayed a proactive stance, allowing them to be more receptive to my feedback. As a bonus, I noticed that this experience has honed their skills in offering constructive peer feedback

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<sup>a</sup>"Affective filter" is a key concept in Krashen's (1981) second language acquisition theory, referring to emotional variables like motivation, anxiety, and self-confidence that can influence language acquisition. A lower affective filter facilitates better language acquisition because it allows learners to be more receptive to input, reducing psychological barriers to learning

**Comparative Evaluation** At the start of the semester, students were taught to critically evaluate the accuracy of the AI's output, which required them to reflect on how its output compared to their own observations and feedback from the professor or

peers. This practice of comparing, contrasting, and analyzing the AI's output reinforced the importance of reading critically, and showed participants how to interact with traditional academic texts in new ways.

Notably, through comparative evaluation of the AI's output, participants also learned that AI is not infallible. In discussion board messages, participants shared how they did not always agree with the AI's suggestions after comparing it to their own observations. Some participants found that the AI "incorrectly categorized certain verbs" (P3) or sometimes "words are taken out of context" (P1). Another participant described how they compared their assessment of paragraph unity to AI-generated feedback and rejected its suggestions: "Even though my responses weren't exactly the same as those from ChatGPT, I do not feel the need to change my responses because of it" (P4).

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### **Professor Insights**

Adult learners often grapple with the sheer amount of reading required in doctoral programs, especially in a first-year academic writing course. Beyond the sheer quantity of reading required, there is the added complexity of engaging with texts that goes beyond a superficial understanding – a critical reading that dissects arguments and questions assumptions. My observation has been that guiding students to develop a discerning eye when reviewing AI generated output hones their analytical skills and translates to a more thoughtful and in-depth engagement with scholarly literature. This process of critical evaluation becomes a transferable skill, improving their ability to dissect arguments, identify underlying assumptions, and synthesize information across various texts

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*RQ2: How does human-AI writing shape doctoral students' academic writing development?*

### **Cognitive and Metacognitive Engagement**

Academic writing requires writers to comprehend complex ideas and use sophisticated language, necessitating substantial cognitive engagement, as well as monitoring and directing one's own thought processes, calling for ample metacognitive engagement. Notably, the use of AI tools to provide immediate feedback can reinforce cognitive learning through practice and application. One participant used AI to provide feedback and suggest "stronger reporting verbs such as 'asserted,' 'mentioned,' and 'argued'" (P4) which seemed to enhance their language use and deepened understanding of contextual and emphatic nuances in the writing.

In turn, students must critically evaluate the feedback received from the AI, necessitating reflection and decision-making. A prime example of this was captured when one participant shared how they used AI to "evaluate the paragraph unity" in their paper and later, when responding to a peer in the discussion board, questioned whether the structure of their paragraphs was a deliberate choice or a subconscious emulation of other academic texts:

My question for you is around your paragraph structure and the use of the inverted pyramid model you mention. In my writing, this kind of happened without thinking about it... While I noticed in myself that there were a couple of paragraphs which could have benefitted from more structure, overall, the inverted pyramid was a natural way that my paragraphs were structured... I ask you this, as my theory about the use of that structure for paragraphs is that we see it so frequently in academic reading and reasoning that it is almost sub conscious for us and we emulate it without forethought! (P1)

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### **Professor Insights**

Integrating AI into the course discussion boards to replace the typical human peer-to-peer interaction seemed incredibly promising. The AI's involvement seemed to drive increased cognitive and metacognitive activity compared to what I have witnessed in other courses. I noticed that students not only engaged more deeply with the content, but also critically reflected on their approach to writing. By interacting with AI, they seemed to sharpen their ability to discern and evaluate the relevance and quality of feedback. This engagement was particularly evident in their ability to articulate the rationale behind their choices, demonstrating a more mature grasp of academic writing conventions that I would not expect from first-year, first-semester doctoral students

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### **Confidence**

Each of the identified creative practices seemed to contribute to participants' increased confidence in their academic writing skills over the course of the semester. Through continuous feedback and successful meaning negotiation with the AI, which was viewed as a neutral third party, participants were able to quickly validate their ideas, seek understanding, and correct misunderstandings. For some participants, the gain in confidence was directly linked to their ability to obtain feedback and revise before submitting an assignment. One participant stated: "I honestly reread it too, and agree it's not my best work, so now that I am brushing off the dust, I feel more confident in my resubmission" (P2). Another participant gained confidence when the AI validated their ideas or when its feedback aligned with their own self-assessment: "The feedback aligns perfectly with my self-assessment. The tool did not identify biased language, slang, or anthropomorphism. However, it showed instances in which precision and wordiness could be improved" (P3).

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### **Professor Insights**

It was in the latter part of the course that students' confidence truly became apparent to me, particularly when they were tasked with providing constructive peer feedback. Their reflections on the process of providing feedback to a peer revealed an enhanced ability to recollect and employ course concepts. I believe that the consistent feedback from AI tools not only solidified their understanding of academic writing concepts, but also facilitated a comfort with the AI that paralleled the familiarity one might have with human peers. This familiarity contributed to their increased confidence and ability to critically engage with the material and their own learning processes

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## Learner Agency

The use of AI tools was also perceived to empower participants to take a more active role in their learning and writing development. For instance, students can choose whether to implement AI-generated feedback and attempt to ‘close the gap<sup>2</sup>’ before submitting an assignment. A prime example of students’ active role in the learning process is captured in a participant’s reflection on why they “did not agree with ChatGPT’s answer” and how they used the AI’s feedback to evaluate aspects of their academic argument paper:

The main difference between my response and that of ChatGPT was around counterargument and rebuttal. ChatGPT offered more commentary and explanation regarding what it identified as the counterargument and rebuttal. It caused me to analyze the paper differently and even helped me understand counterargument and rebuttal a little better. (P4)

When asked to reflect on how their approach to academic writing had evolved, several participants shared how they determine what aspects of the writing to offload to AI. The ability to selectively incorporate AI into the writing process seemed to cultivate a more personalized and self-directed learning experience. For example, one participant used AI to improve the “flow, structure, and organization” (P1) of their writing while another used AI to produce “a concise summary” of a research article (P2). The ability to selectively integrate AI into the writing process cultivates a more personalized and self-directed learning experience, allowing students to tailor their writing process to their unique needs and objectives.

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## Professor Insights

Witnessing students engage with AI tools not as passive recipients but as critical partners in their academic writing development has been encouraging. They have shown that they are not just following AI suggestions blindly but are making informed decisions about their learning and writing. This critical engagement with AI feedback has enabled them to better understand complex concepts and refine their writing in ways that are most beneficial to their individual learning paths. It has been particularly rewarding to see how this engagement has translated into improved writing skills, a deeper understanding of course material, and a stronger sense of control over their academic growth

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*RQ3: What are the broader ethical and social implications of human-AI writing in doctoral writing pedagogy?*

## Ethical AI Use and Academic Integrity

There are several notable implications of human-AI writing practices for institutional policies in doctoral education. Given the hybrid human-AI writing process that evolved through students’ collaboration with AI, there is an urgent need

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<sup>2</sup> “Close the gap” typically refers to reducing the disparity between a learner’s current abilities and desired performance or understanding.

for institutions to develop clear and prominently displayed policies regarding ethical AI use and academic integrity. During the focus group interview, participants shared that each course they were enrolled in had differing AI policies or that the AI policy was “hidden in the back” (P1) of the syllabus.

Further, policies on ethical AI use should clearly demarcate appropriate AI usage. One participant used AI to “spark new ideas” (P4), another used it to provide “examples of reporting verbs” (P2), while another shared how they only used AI “once I believe my paper is complete” (P3). These differences in AI-application strategies show the wide range of possibilities when incorporating AI into the writing process; without clear guidelines, students may take liberties that could compromise academic standards and the originality of their work. Therefore, it is critical that institutional policies not only promote the ethical use of AI but also provide structured frameworks that can accommodate diverse approaches and learning styles. Equally important is the need to educate students on the potential of AI as a tool for leveling the educational playing field. By demystifying AI technologies and their capabilities, institutions can prevent the avoidance that stems from fear or misunderstanding, thus ensuring that all students can benefit from these advancements without falling behind in either their academic work or employment skills.

**AI Literacy, Interdisciplinarity, and Employability** Ethical and responsible AI use is inextricably linked to AI literacy, or the knowledge and skills to understand, interact with, and critically evaluate AI. One participant shared how the use of AI in the course was “intimidating at first” (P2) due to how ChatGPT had been sensationalized in the news. Another participant’s reflection captured the disconnect that often occurs between users’ expectations of AI and its inner workings: “My inherent trust in the AI tool to provide robust feedback is likely flawed as I do not know the mechanisms it uses...” (P1). Clear institutional policies on AI use, coupled with the cultivation of AI literacy, also bear significance for fostering transparency and accountability when AI is integrated into the writing process.

Ethical AI use, reinforced by a functional and critical understanding of AI capabilities and limitations, can also enable graduate students with the adaptive skills to become not only disciplinary insiders but also to explore multi- and interdisciplinary areas for collaboration. Moreover, AI literacy is not a static requirement but an emerging sought-after skill in the modern workforce. As AI continues to be embedded in multiple contexts and platforms, understanding its ethical application becomes an essential employability skill. Graduates who demonstrate proficiency are more likely to be viewed as valuable assets capable of bridging the gap between advanced technology and human expertise. Thus, by emphasizing not only functional AI literacy but also ethical use, institutions are setting a standard for academic integrity and enhancing graduate student readiness for a job market that values awareness of ethical norms, technological savvy, and an ability to work with emerging technologies.

## AI For Formative Feedback

Participants' use of AI as a mechanism for formative feedback also points to the potential for integrating AI into formative assessment strategies. By leveraging AI's capabilities, institutions can offer more personalized and timely feedback to doctoral students. This can be particularly valuable in interdisciplinary fields, where faculty expertise may not cover all the diverse areas a doctoral research project might touch upon. As quoted earlier, one participant used AI to "put thoughts together in a different perspective" (P2) when crafting an academic argument, while another used AI to explore the perspectives of professionals outside of their discipline such as an "HR professional" (P4).

Moreover, the use of AI in formative assessment can help prepare students for the realities of a workforce increasingly reliant on technology. It can also foster critical thinking skills, as students learn to evaluate and integrate AI-generated feedback with human input. One student expressed their appreciation for AI-generated feedback and recognition of its growing role in education and professional development: "I believe that AI's feedback should be taken into serious consideration, not only because it exists, but it's our world now" (P1). However, institutions must be cautious to ensure that the integration of AI in formative assessment does not compromise the development of critical thinking and originality. Policies should guide students to use AI as a tool for enhancing their work, not as a crutch that diminishes their intellectual engagement or the development of their own voice and analytical skills.

## Discussion

Inspired by Eaton's (2023) conceptualization of hybrid, human-AI writing, we sought to investigate the nature of human-AI writing practices that emerge from the incorporation of AI into a doctoral writing course. We aimed to identify how these writing practices shape doctoral students' academic writing development. Additionally, we aimed to identify the wider institutional implications of these practices, particularly in relation to the broader and social implications of human-AI writing in doctoral writing pedagogy.

Overall, we found that incorporating AI into the academic writing course resulted in a change to the traditionally accepted writing process. The change is evidenced by a hybrid human-AI adaptive flow of continuous ideation, feedback, analysis, and refinement. This characterization aligns closely with Eaton's (2023) conceptualization of hybrid writing, in which AI is not just a tool but a collaborator in the writing process, reshaping the way writing is approached, executed, and evaluated. Three related but distinct 'collaborative practices' emerged from this hybrid human-AI writing process: (1) dynamic brainstorming, (2) continuous negotiation of meaning, and (3) comparative evaluation. These practices were perceived to positively impact students' writing development, enhancing their cognitive and metacognitive engagement, confidence, and sense of agency.

Automated writing feedback and negotiation of meaning were identified as core features of the hybrid human-AI writing process. The use of AI for automated, real-time feedback is not novel. Prior studies have demonstrated the promise of AI applications and natural language processing tools for automated writing evaluation (Zawacki-Richter et al., 2019) and personalized feedback through digital nudging (Wambsganss et al., 2022). However, the recent availability of generative AI tools like ChatGPT allows access to technology that goes beyond the capabilities of traditional rule-based AI writing tools such as Grammarly, QuillBot, and ProWritingAid.<sup>3</sup> Unlike these tools, ChatGPT functions as a conversational agent capable of engaging in extended dialogues while preserving the context throughout the interaction (Parker et al., 2023). Further, much of the emerging research on AI assisted feedback have primarily focused on language learners (see Godwin-Jones, 2024; Liu et al., 2021; Tseng & Warschauer, 2023). However, there is no known empirical research on how these tools impact students' academic writing development within the context of doctoral education.

Drawing parallels between second language acquisition research and the use of AI in learning academic English, the hybrid human-AI interaction within the writing process emerges as a strategy for linguistic and cognitive development. This aligns with a theory of second language acquisition which can be applied to the teaching of academic English as a kind of second “language” or “dialect.” Because of the specialized grammatical, lexical, and syntactical conventions (not to mention the discipline-specific aspects) of academic language, learning to “converse” and “negotiate meaning” may mimic the process of acquiring a new language. Long's (1981) Interaction Hypothesis (see also Gass & Mackey, 2006; Long, 1983, 1996) posits that comprehensible input provides opportunities for improved output via the negotiation of meaning. For example, if an interlocutor does not understand, they can ask for clarification. This could happen with a human or with an AI chatbot, where the response helps the user to refine their understanding and produce better linguistic output. By interacting with an LLM like ChatGPT, students engage in a form of meaning negotiation that is grounded in the receipt of feedback, another key component of Long's (1981) hypothesis. A final piece of the hypothesis, which is approximated through human-AI interaction is the modification of language by one of the interlocutors. While ChatGPT does not necessarily modify its language, it can adapt its responses based on interactions with the user, which is parallel to the kind of human-to-human adaptive interaction that results in the learner getting comprehensible input. We propose that, in essence, interacting with a tool like ChatGPT could approximate the interactive, negotiated learning process that Long outlined. It can provide the context, or zone of proximal development (Vygotsky, 1978) for a novice research writer to develop this ‘other language.’

Our findings challenge Darvishi et al.'s (2023) conclusion that AI writing assistance constrains learner agency. Key differences in our approaches may account for this discrepancy. Specifically, our 14-week study engaged intrinsically

<sup>3</sup> Digital writing assistance tools to improve writing quality by checking for grammatical errors, suggesting style improvements, and, in some cases, detecting plagiarism.

motivated doctoral students in sustained, interactive dialogue with ChatGPT to iteratively refine their academic writing. This collaborative integration of AI over an extended period enabled deeper habituation to and critical reflection on the AI's capabilities. In contrast, Darvishi et al.'s 8-week automation of one-way feedback for undergraduates allowed minimal integration or critique. Consequently, while automated feedback tools may fall short, emerging generative AI chatbots functioning interactively in incremental and sustainable ways (Gruba & Hinkleman, 2012) may empower students to take greater ownership over developing sophisticated writing skills. The conversational properties of AI models like ChatGPT could facilitate an autonomous, iterative refinement process essential for doctoral-level academic writing conventions. Our qualitative evidence of strengthened confidence, engagement, and sense of control contrasts Darvishi et al.'s (2023) purely quantitative measures, signaling AI's potential to catalyze, rather than constrain, learner agency given sufficient duration and interaction.

Building on the discussion of AI's potential to empower learner agency, the current findings also align with several of Graham's (2023) observations regarding the evolving role of AI in writing instruction and practice. The current study reveals notable parallels, particularly within the context of student-AI interactions. Consistent with Graham's observations, the results indicate a marked shift in students' perceptions of AI from a basic writing tool to a collaborative partner. This attitudinal transformation echoes Graham's discussion of how AI adds multidimensional complexity to writing. Additionally, the dialogic negotiation of meaning evidenced between students and AI further aligns with Graham's emphasis on rich engagement between writers and intelligent technologies. Through iterative cycles of prompt engineering, output evaluation, and text revision, the students in this study demonstrated the type of multidimensional recursive process described by Graham. The collaborative human-AI writing process is illustrated in Fig. 1. This model depicts the fluid interaction between generating ideas, constructing draft text, and refining expressions that defined how students recursively developed their academic writing skills. The visual encapsulates the dynamic brainstorming, writing, and revision cycle facilitated through integration of AI feedback.

Furthermore, the identification of an emergent "Hybrid Human-AI Writing Process" supports Graham's advocacy for a post-process approach to writing instruction—one that moves beyond discrete linear stages. Both the current findings and Graham's work point to the need for a more adaptive, integrated model of writing, where human-AI collaboration is continuous and evolving. This paradigm shift embodies Eaton's (2023) conceptualization of "postplagiarism"—a holistic writing methodology centered on ethical co-creation of ideas between humans and AIs. In all, the parallels between the present study and Graham's scholarship reinforce the transformative potential of AI to profoundly reshape writing theory, pedagogy, and practice.

## Strengths and Limitations

This study exhibits several significant strengths. First, the study's engagement in real-world scenarios, focusing on doctoral students' experiences with AI in their



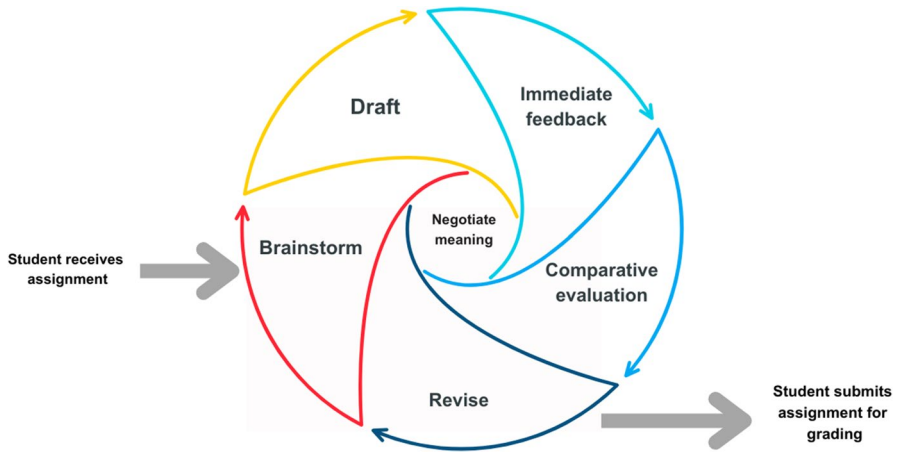


Fig. 1 The Collaborative Human-AI Writing Process

writing course, adds a layer of authenticity and relevance to the findings. Further, close collaboration with both students and the professor fostered a sense of joint ownership, enhancing the potential for integrating the insights into teaching practices and future research. The community-engaged PR methodology enabled participants to actively contribute through idea creation, joint analysis, and feedback processes. This not only empowered participants but also had reciprocal benefits for their personal and educational development. Additionally, the involvement of student co-researchers and an external focus group facilitator enhanced descriptive validity through multiple observer corroboration (Johnson, 1997). Interpretive validity was strengthened through member checking and the use of verbatim quotes, ensuring accurate representation of participants' perspectives (Johnson, 1997).

This study is also subject to several limitations that warrant consideration. The small participant group, comprising only one professor and four students, limits the external validity and broader applicability of the findings (Johnson, 1997). Replicating this study with larger and more diverse groups of doctoral students across different disciplines, as well as longitudinal studies tracking students' AI use and writing development, could provide a deeper understanding of how AI integration shapes doctoral writing processes across various academic settings. Second, the voluntary nature of student involvement may have introduced selection bias, as these students might have higher motivation or unique views compared to the average student population (Etikan et al., 2016). Employing randomized participant selection could address this issue. The study also involves potential power imbalances due to the professor's concurrent role as a researcher, possibly influencing student input (Walsh, 2014). Lastly, the demanding nature of PR raises scalability concerns (Cargo & Mercer, 2008). Evaluating the practicality of broader applications of such methods, while considering resource limitations and stakeholder burden, is essential.

## Conclusion

This research into human-AI writing practices in the context of doctoral student writing pedagogy reveals several notable potentials and challenges. The study underscores the emergence of a hybrid human-AI writing process in a post-digital age, which not only has the potential to enhance the writing abilities of doctoral students but also redefines the traditional paradigms of academic integrity, writing pedagogy, and may even evolve the writing process. Through dynamic brainstorming, continuous negotiation of meaning, and comparative evaluation, students demonstrated increased cognitive and metacognitive engagement, confidence, and learner agency. This evolution in writing practices signifies a shift towards a more integrated, collaborative approach to academic writing, where AI tools are not mere aids but partners in the creative process.

The findings of this study have implications for various stakeholders in higher education. For educators, particularly those involved in doctoral writing instruction, these findings suggest the need for thoughtful integration of AI tools into curricula, focusing on developing students' AI literacy and critical thinking skills in relation to AI use. It remains unclear whether the integration of AI in writing processes could lead to a dependency that undermines students' ability to think and write independently. For doctoral learners, embracing AI as a collaborative tool in the writing process can potentially enhance their learning and prepare them for an AI-integrated workforce.

The findings of this study present researchers with new avenues for investigating the effects of AI integration on academic writing development and its potential to support various aspects of the research process. Administrators and policymakers in academic institutions face the challenge of adapting policies and curricula to ethically integrate AI technologies, including developing clear guidelines on AI use in academic work and updating academic integrity policies. Collectively, these implications underscore the need for a collaborative approach in navigating the evolving landscape of AI in doctoral education, including requiring AI literacy across disciplines.

**Author Contributions** J.P. conceptualized the study, conducted the study, analyzed data, and prepared the initial draft of the manuscript. V.M. contributed to the conceptualization of the study, conducted the focus group interview, analyzed data, and contributed to the development of the manuscript. A.A., S.E., S.F., and S.B. contributed to the collection of data and edited the manuscript. K.B. contributed to the conceptualization of the study and contributed to the development of Table 1 and Figure 2.

**Data Availability** No datasets were generated or analysed during the current study.

## Declarations

**Competing Interests** The authors declare no competing interests.

**Disclosure** During the preparation of this work the author(s) used GPT-4 by OpenAI and Claude 3.5 Sonnet by Anthropic to brainstorm ideas for how to structure their argument and succinctly describe the hybrid human-AI writing process that emerged as a finding. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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