The Promise and Paradox of AI in Doctoral Education

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Abstract
This paper proposes a conceptual model of adaptive artificial intelligence (AI) support for doctoral education that operationalizes supported autonomy across three interconnected dimensions of doctoral student development: cognitive, affective, and social. Each dimension represents a distinct but overlapping area where AI can provide responsive scaffolding while preserving student agency and intellectual ownership. This framework provides a structured approach to understanding how AI tools can enhance rather than diminish doctoral development when thoughtfully integrated into mentorship and supervision structures. Challenges and ethical use are addressed along with implications for doctoral programs. We suggest a balanced use of AI, a clear framework or guidelines for ethical use, and doctoral student supervision (dissertation chair) to reduce feelings of isolation, student attrition, and use of students' time.

Keywords: Adaptive artificial intelligence (AI), support for doctoral students, doctoral programs, artificial intelligence and doctoral education, doctoral student attrition, online doctoral programs

Brown, K., & Shelton, K. (2026). The promise and paradox of AI in doctoral education. *Online Learning, (30)*2, 82-105. https://doi.org/10.24059/olj.v30i2.5842

Traditionally, doctoral education programs have been grounded in the idea of an independent scholar and researcher who demonstrates autonomy and mastery through largely solitary work during the dissertation phase. However, this model often leads to isolation and, at times, stagnation, particularly since structured coursework and faculty contact are often diminished (Ali & Kohun, 2007; Rockinson-Szapkiw et al., 2014; Wegener et al., 2016). Because of unstructured format and periods of isolation, doctoral student attrition rates are high and concerning (Breitenbach, 2023; Wegener et al., 2016; Young, 2019).

However, the emerging paradigm of the AI-augmented scholar redefines student independence as supporting autonomy or maintaining intellectual ownership while leveraging AI to scaffold critical aspects of the research and writing process. In this new model, generative AI functions as a dynamic, adaptive support system rather than a static writing aid. Artificial intelligence (AI) provides immediate, context-sensitive feedback (Tensen et al., 2025), helps overcome cognitive bottlenecks such as writer's block or imposter syndrome (Chakraverty, 2019), and fosters reflective learning rather than rote automation (Holmes et al., 2019; Kasneci et al., 2023), all of which can greatly enhance a doctoral program (Migliore, 2024). Doctoral programs that integrate the use of AI can enrich the student educational journey while also better preparing them for necessary future professional skills such as decision making, strategic thinking, and ethical considerations (Migliore, 2024).

The purpose of this article is to introduce an AI-augmented scholar framework. This framework positions AI as a doctoral student's critical friend in conjunction with human mentorship. Between AI and doctoral advisors, students will be better prepared to avoid isolation and persist through research while maintaining momentum and confidence throughout the dissertation process.

From Manual to Augmented Scholarship

Before the early 2000s, academic research was primarily a time-intensive and manual endeavor. Scholars at all stages, especially those in the early phases of their careers, relied on physical libraries, printed indexes, and institutional access to locate and synthesize information. Even though some artificial intelligence tools (machine learning) did exist, they were still in their infancy. Locating relevant scholarship required hours of consulting card catalogs, journal indices, and paper-based bibliographies, and access to the knowledge needed for research was often constrained by geographic and institutional boundaries. These barriers not only limited efficiency but also reinforced disparities in scholarly opportunity and pace of discovery.

The turn of the millennium marked a pivotal transformation with the widespread adoption of the internet and digital databases. The digitization of journals and the emergence of online repositories such as JSTOR (1995), PubMed (1996), and Google Scholar (2004) have revolutionized information accessibility (Jacso, 2005). This digital revolution democratized research by allowing scholars to retrieve and cross-reference materials almost instantaneously.

The median number of databases consulted by researchers rose from one in 1994 to four in 2014 (Lam & McDiarmid, 2016), illustrating how digital tools expanded both the speed and scope of inquiry. For the first time, access to knowledge became less dependent on institutions

providing access and more on digital connectivity.

As digital infrastructure matured, scholarship evolved beyond information retrieval toward collaboration and openness. The open access movement, galvanized by the Budapest Open Access Initiative (2001), promoted the free exchange of ideas and dismantled paywalls that restricted participation in global knowledge production (Suber, 2012). Platforms such as Academia.edu and ResearchGate enabled researchers to share preprints, collaborate across disciplines, and build professional networks that blurred traditional institutional boundaries (Jordan, 2019). These developments shaped what Weller (2011) termed as the "digital scholar": a model in which online engagement, data sharing, and public scholarship became central to academic identity and productivity.

The current wave of AI integration represents the next evolutionary stage in this continuum. While the Internet expands access to knowledge, AI extends interpretive and generative knowledge capacity (Liu & Jagadish, 2024). Emerging tools powered by large language models (LLMs) and machine learning now support literature synthesis, data analysis, and the generation of research hypotheses. These technologies signal a shift from digital scholarship to augmented scholarship, in which AI functions not merely as an information-retrieval mechanism but as an adaptive partner in reasoning, writing, and discovery (Holmes et al., 2019; Kasneci et al., 2023; Liu & Jagadish, 2024).

For the AI-augmented scholar, these developments offer adaptive and continuous support in the research process. Just as digitization provided increased access to information, AI now provides tools for scaffolding by providing real-time, personalized assistance that enhances how scholars think, write, and learn (Lin et al., 2023). This shift sets the stage for understanding how doctoral students can leverage AI tools not only to increase efficiency but also to cultivate autonomy, confidence, and persistence within the dissertation process.

AI Support Tools for Doctoral Student Research

The use of AI in higher education has rapidly increased with the emergence of generative AI (GAI) tools using large language models (LLMs) such as OpenAI's ChatGPT and Google's basis (Rong & Chung, 2024). Despite both students and faculty being initially suspicious of AI usage, doctoral students are now finding AI tools particularly helpful in academic writing, which, to complete their degree, doctoral students must grasp. Many AI tools now support and enhance the dissertation process by helping with topic suggestions, locating recent or related research, creating outlines, writing and editing a literature review, analyzing data collected for their research, and even aiding in the presentation of the findings. In fact, one empirical study found that ChatGPT improves the doctoral experience by performing automated tasks, saving time by simplifying research, and alleviating stress and cognitive load (Ringo, 2024).

In addition, Oliinyk et al. (2024) found that AI can contribute to the improvement of research competencies needed for dissertation research, with AI tools providing access to academic databases and suggesting related journal articles and relevant datasets (Omodan, 2025). This kind of access saves time and allows doctoral students to focus on the more critical areas of the research study (Boyd & Harding, 2025; Lesh & Lancaster, 2024). Moreover, Li and Lin

(2025) showed that doctoral students appreciated the personalized instant feedback, further saving them time. While students must not depend solely on AI tools to complete their research, these emerging AI tools can offer non-judgmental, early-stage support to prepare for meetings with supervisors.

Currently, there are a plethora of AI tools available to doctoral students, many of them free to use while others charge different fees for levels of access. We provide just a small list of potential specific AI tools doctoral students are using or could use to assist with their research; of course, the large language models such as *ChatGPT, Gemini, Claude, CoPilo*t and others may also be used. We acknowledge there are many more tools available.

Literature Review and Writing

Many AI tools can assist with better literature review development by identifying, summarizing, and synthesizing scholarly literature (Fabiano et al., 2024). In fact, Bista and Bista (2025) recently found that doctoral students had improved clarity in their writing when using AI support while Nguyen et al. (2023) saw increased performance in writing tasks. Buss et al. (2025) asserted that doctoral students had more confidence using AI tools when the instructors introduced it as an option. However, doctoral students should be taught [and reminded] to cross-verify any information used and the importance of human oversight (Fabiano et al., 2024).

Many tools are available for searching and supporting the literature review. For example, *Elici*t assists doctoral students in finding, summarizing, and extracting key information from academic articles, and *Research Rabbit* offers visual mapping of article collections. Article summaries provided by tools like *SciSummary* and *Semantic Scholar* can save students a lot of time from having to read articles that do not really match the research. *Iris.AI* takes a more visual approach by analyzing research papers and generating concept maps, while *Liner Scholar AI* specializes in literature review comparisons and writing and offers hypothesis and survey generation capabilities. Similarly, *Undermind AI* supports targeted literature searches and helps refine research questions. *Trinka AI* provides specialized proofreading for grammar and spelling mistakes tailored to academic writing.

For more accurate citations, *Scite AI* provides comprehensive searches over 1.5 billion citations, connecting supporting research and enabling citation checking and cross-referencing through Smart Citations. *Scholar AI* complements this process by searching relevant information, generating citations, and extracting data from figures and tables within articles. *Consensus AI* assists doctoral students with searching and analyzing peer-reviewed literature, while *AskYourPDF* facilitates chatting with, summarizing, and extracting information from PDF-formatted research articles. *SciSpace* offers comprehensive support, including deeper literature review capabilities, and provides article summaries and writing assistance.

Data Analysis

Dissertation data analysis can be improved with the use of AI tools. For example, researchers working with qualitative data can use robust platforms that offer transcription and analysis capabilities. *NVivo* and *ATLAS.ti* both provide transcription and qualitative data analysis functions, while *MAXQDA* also offers data coding, organization, and presentation assistance. For researchers working with quantitative data, the most common tools already being used, such as

SPSS and *SAS,* are now much more enhanced by AI to assist with data preparation and pattern detection. Additional tools include *Tabl*eau, which uses AI-powered features like "Ask Data" for natural language queries and automated insight generation from datasets, and *Power BI* (Microsoft), which incorporates AI visuals and intelligent data discovery.

While we provided a very small list of tools, many others offer doctoral students immediate, on-demand support that better adapt to students' schedules. Dissertation work rarely happens during traditional business hours when faculty may be less available due to their own research travels or reduced institutional presence.

AI's availability does not diminish the importance of supervisor mentorship; rather, it makes that mentorship more effective by ensuring students arrive at supervisor meetings with more developed questions, clearer drafts, and more focused needs (Krumsvik, 2025; Tensen et al., 2025). Instead of spending face-to-face time on preliminary feedback that AI could provide ("this paragraph is unclear" or "you need more evidence for this claim"), supervisors can focus on higher-order guidance that requires disciplinary expertise, career mentorship, and scholarly relationships that have been nurtured and sustained by human interaction.

A Framework for Adaptive and Continuous Support

In many doctoral programs, the dissertation phase traditionally becomes a primarily independent endeavor. Students often take classes together in cohorts, forming bonds and experiencing success and struggle collectively. Then there is a clear shift from the excitement of beginning research to the sudden realization there are periods of isolation in the research and writing phase. This abrupt transition from structured, socially connected coursework to solitary dissertation work has long been identified as a critical juncture where many students falter due to the disappearance of support structures precisely when the work becomes most challenging (Carter-Veale et al., 2016; Lovitts, 2008; Mensah, 2025).

However, we suggest the isolation of the dissertation phase can be improved if we redefine independence itself as supported autonomy. Supported autonomy in doctoral education refers to students' capacity to independently direct their research while strategically leveraging appropriate support structures (Jameson et al., 2023). It reconceptualizes independence as the ability to identify needs, critically evaluate resources, and maintain intellectual ownership while engaging productively with supervisors, peers, tools, and technologies (Choi et al., 2021). True autonomy emerges from knowing when and how to seek support, while supported autonomy utilizes various sources to gain needed support.

This reframing coincides with how the dissertation process works as a distributed, collaborative enterprise where success depends on effectively orchestrating resources rather than working in isolation. As Aitchison and Mowbray (2015) argued, the myth of the solitary doctoral scholar obscures the reality that all successful academics strategically mobilize various forms of support, from peer feedback to writing groups to editorial assistance. Supported autonomy makes this reality explicit and positions it as a legitimate and essential part of doctoral student development.

Theoretical Foundation: Vygotsky's Sociocultural Learning

Vygotsky (1978) offered a theoretical foundation for understanding supported autonomy through three interconnected concepts: socially mediated learning, the zone of proximal development (ZPD), and scaffolding. His Sociocultural Learning framework challenges the myth of isolated knowledge construction, positioning all learning, including advanced doctoral work, as inherently social and tool mediated. Learning, in this view, is not merely an individual cognitive process but emerges through interaction with more knowledgeable others, cultural tools (including language and technology), and social contexts that shape what and how we come to know.

The ZPD, defined as the distance between what learners can do independently and what they can accomplish with appropriate support, directly applies to the dissertation phase (Morton et al., 2014). Doctoral students develop expertise in areas where they are not yet fully independent scholars such as designing original studies, synthesizing academic literature, contributing novel theoretical insights, and mastering the discourse conventions of their disciplines. The dissertation represents work at the edge of students' current capabilities, squarely within their ZPD. Without appropriate scaffolding to bridge the gap between current and desired competence, students may struggle unnecessarily or fail to reach their potential (Morton et al., 2014).

Scaffolding, temporary support structures that are gradually removed as competence develops, provides the mechanism for moving students through their ZPD toward genuine independence. Critically, effective scaffolding is adaptive and responsive by providing maximum support when learners need it most and fades systematically as learners internalize skills and strategies (Taber, 2018). In doctoral education, scaffolding has traditionally come from supervisors, coursework, writing centers, and peer networks (Liechty et al., 2009). However, these supports are often inconsistently available, particularly during the dissertation phase when formal structures recede but student needs remain acute. This creates what we might call a “scaffolding gap” or a mismatch between the support students need and the support available to them.

AI Supporting Autonomy in Practice: Bridging the Scaffolding Gap

In our work with doctoral students, we have observed that learning and growth flourish in carefully designed social contexts that bridge the scaffolding gap between coursework and dissertation. Collaborative writing circles exemplify this principle: students gather regularly to share drafts, ask questions, and provide peer feedback in facilitated sessions. These circles serve multiple functions simultaneously. They build confidence through helping others, as students discover they have valuable insights to offer even while struggling with their own work (Tyndall et al., 2019). They also normalize the struggle of academic writing, countering the imposter syndrome that thrives in isolation (Bravata et al., 2019; Craddock et al., 2011; Wang & Li, 2023) when students assume everyone else finds the process easier. Writing circles also create accountability structures that counter the drift and procrastination that can emerge without external deadlines. In addition, they provide regular, low-stakes opportunities for students to practice articulating their ideas and responding to questions, essential skills for navigating defenses and peer review.

Moreover, writing circles bridge the transition from faculty-guided coursework to self-directed research by providing a "middle space" where students can test ideas, receive feedback, and develop their scholarly voice in a lower-stakes environment than formal supervisor meetings or conference presentations (Tyndall et al., 2019). This transition space aligns with Vygotsky's (1978) concept of the ZPD as peers and facilitators provide just enough support to help students accomplish what they cannot yet do entirely alone—revise a confusing paragraph, identify gaps in an argument, or gain perspective on a methodological dilemma—while leaving intellectual ownership firmly in student hands. Over time, students internalize the questioning strategies and feedback approaches modeled in these sessions, gradually needing less external support as they develop more sophisticated self-monitoring capabilities.

Scaffolding is particularly important for students navigating the dissertation process. Typically, the student's first encounter at dissertation stage involves tackling challenges with topic selection, creating an original research design, developing an extended argument, and managing ambiguity over years that at times have no direct connection to coursework. While doctoral coursework provides essential scaffolding through structured assignments, regular deadlines, and immediate faculty presence, this support often dissipates abruptly at the dissertation stage. Students who thrived with weekly seminars and frequent feedback suddenly find themselves working in relative isolation, expected to self-regulate over months or years with only occasional supervisor check-ins. The scaffolding gap created by this transition is especially pronounced for students who lack strong external support networks, including part-time students balancing work and family obligations, international students far from home support systems, and first-generation doctoral students without family models of extended academic work. Pittaway et al. (2023) recommends that scaffolding support should focus on dissertation students completing smaller tasks and then moving to larger tasks during the research process; we believe the use of artificial intelligent tools can provide that kind of incremental support.

AI as Complementing Human Mentorship

The scaffolding gap also creates an opening for AI tools to complement traditional mentorship structures in meaningful ways. Students may hesitate to reveal uncertainty or confusion to faculty advisors, particularly given the power dynamics at play in the supervisor-student relationship (Lovitts, 2001), or if they are legitimately concerned about appearing incompetent or unprepared. The dissertation phase increases students' vulnerability by requiring them to engage in writing and research in new ways. In this context, AI can serve as a "first responder" for half-formed ideas, initial draft feedback, or methodological questions, allowing students to refine their thinking before engaging supervisors (Tensen et al., 2025). This parallel resembles how students might rehearse a difficult conversation with a friend before approaching a supervisor or how they might revise a draft multiple times before sharing it. AI simply provides another tool for this preparatory work.

Moreover, AI can provide adaptive scaffolding that responds to individual student development (Vygotsky, 1978). A student early in the dissertation process might use AI to generate initial literature search terms, understand methodological options, or create preliminary outlines, relatively direct support for foundational work. As the same student progresses, AI use might shift to more Socratic functions: asking the student to justify theoretical choices, identify

limitations in their arguments, or consider alternative interpretations of data. This progression mirrors effective human mentorship, which adapts from more directive guidance for novices to increasingly questioning and challenging stances as students develop expertise. The key difference is that AI can provide this responsiveness at scale and on demand in ways that individual supervisors, however dedicated, cannot match, given their finite time and multiple competing responsibilities.

Conceptualizing Supported Autonomy

Supported autonomy is a fundamentally different way of understanding what independence means in doctoral education. In this framework, autonomy is demonstrated not by students working in isolation, but by:

- **Making informed decisions about research direction and methodology.** Students exercise intellectual independence when they can articulate why they chose specific theoretical frameworks, research designs, or analytical approaches because they critically evaluated options and made strategic choices aligned with their research questions and epistemological commitments (Creswell & Creswell, 2023).

- **Critically evaluating feedback and resources from multiple sources (human and technological)**. Rather than accepting all input, autonomous scholars develop the capacity to weigh feedback and advice from generative AI tools (Shulman, 1991). It is important to recognize when feedback reflects genuine limitations in their work and make principled decisions about what to incorporate and what to set aside.

- **Strategically deploying available scaffolds (supervisors, peers, AI tools, literature) to advance scholarly goals**. Independence includes recognizing when additional perspectives would strengthen the work and actively seeking appropriate support (Zimmerman, 2002). This might mean bringing a statistical question to a methodologist, asking a writing center consultant to review argument flow, or using AI to generate alternative phrasings of a complex idea (Pintrich, 2000).

- **Gradually internalizing supported processes to reduce dependence over time.** Effective scaffolding is designed to fade (Vygotsky, 1978). Students who initially rely heavily on external feedback from supervisors, peers, or AI should progressively develop more sophisticated self-monitoring and self-evaluation capabilities (Zimmerman, 2002). The goal is not permanent dependence on any support structure but rather the development of internalized questioning and revision practices (Pintrich, 2000).

- **Maintaining ownership of intellectual work while acknowledging the distributed nature of knowledge production**. Supported autonomy requires students to remain the primary decision-makers and authors of their work even while receiving substantial input from others (Hutchins, 1995). This means clearly distinguishing between using AI to explore ideas versus allowing AI to generate ideas and between receiving feedback on drafts versus having others substantially rewrite the work (Miao & Holmes, 2023).

Supported autonomy shifts the measure of doctoral success from “How much did you do

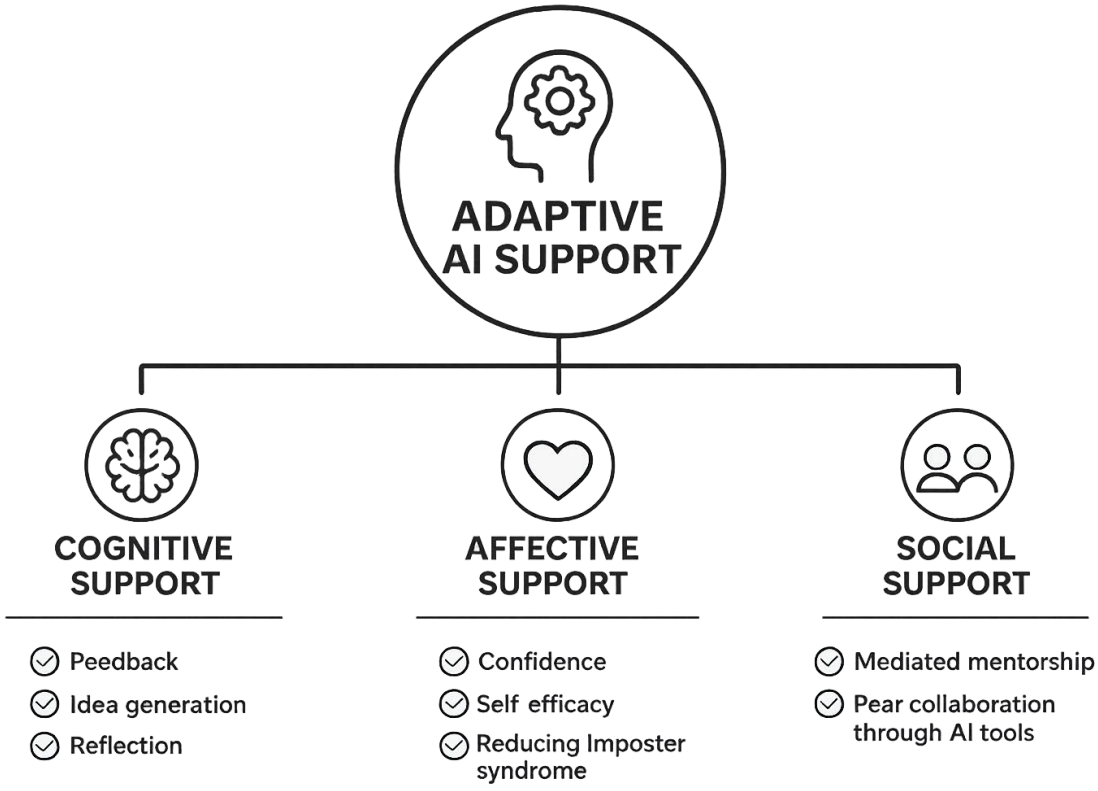
alone?" to "How effectively did you orchestrate resources to produce original, rigorous scholarship while developing transferable capacities for independent inquiry?" This reframing has profound implications for how we design doctoral programs, train supervisors, and integrate emerging technologies like AI into the dissertation process. Rather than viewing AI tools with suspicion as potential threats to academic integrity or student development, we can ask: How might these tools be integrated as adaptive scaffolds that support the development of genuine scholarly autonomy?

Conceptual Model of Adaptive AI Support for Doctoral Education

To answer this question, we propose an adaptive AI support framework that operationalizes supported autonomy across three interconnected dimensions of doctoral student development: cognitive, affective, and social. Each dimension represents a distinct but overlapping area where AI can provide responsive scaffolding while preserving student agency and intellectual ownership. This framework provides a structured approach to understanding how AI tools can enhance rather than diminish doctoral development when thoughtfully integrated into mentorship and supervision structures.

Figure 1

Adaptive AI Support



Note: Figure generated by ChatGPT AI using the proposed dimensions of the conceptual model.

Cognitive Support

Within the adaptive AI support framework, cognitive support addresses the intellectual scaffolding students require as they navigate the complex demands of dissertation research (Ge, 2010). AI tools, when integrated alongside faculty and peer support, can fundamentally reshape how students receive and comprehend research guidance throughout the dissertation process. Doctoral students frequently encounter obstacles at various phases of their work: clarifying theoretical frameworks, designing methodological approaches, synthesizing literature, or structuring arguments (Bista & Bista, 2025). Quality and timely feedback proves instrumental in helping students move through these challenges (Nicol & Macfarlane-Dick, 2006). Faculty dissertation chairs should ideally provide substantive and regular feedback to support student progress (Burrington et al., 2022). However, the realities of contemporary doctoral education often create significant delays. The number of doctoral students requiring supervision, combined with grading responsibilities and other institutional obligations, means that feedback loops can stretch across weeks or even months (Gardner, 2009). This lag frustrates students who may misunderstand advisor schedules or availability, leading to stalled progress and mounting anxiety.

The supervisory relationship should cultivate space for idea generation and deep reflection, creating an iterative loop that enables students to question their own assumptions, refine research strategies, and develop more sophisticated analytical frameworks (Welsh & Dehler., 2013). When students need a conceptual push, faculty members can serve as thought partners, helping brainstorm alternatives or reframe problems. However, competing demands on faculty time may delay these supportive interactions, leaving students waiting for guidance at critical junctures in the research process.

AI offers a complementary form of cognitive support that addresses the time constraints of traditional mentorship. Functioning as an “always-available” critical friend, AI may strengthen credibility, transferability, and dependability by prompting analytic reflexivity and structural clarity, but responsibility for establishing trustworthiness remains with the researcher (Hutchins, 1995; Lincoln, & Guba, 1985). This constant availability of support is especially valuable when supervisor feedback may be delayed due to workload or scheduling conflicts. Students can use AI tools to refine their thinking and then share these ideas with faculty, keeping advisors informed while maintaining progress between formal meetings.

Generative AI also supports brainstorming for research questions, theoretical frameworks, and methodological approaches, helping students move beyond writer's block or the paralysis of confronting a blank page. The technology can prompt students to reflect on and question their own assertions and connections, providing a valuable metacognitive check for those who may feel hesitant to reveal confusion or gaps in understanding to their advisors (Welsh & Dehler, 2013).

AI can provide cognitive scaffolding in ways that complement rather than replace human expertise. Students who use AI to work through preliminary questions or test early drafts arrive at advisor meetings better prepared, with more focused inquiries and clearer articulation of their challenges. This efficient preparation can enhance the quality of faculty-student interactions by ensuring that limited face-to-face time addresses higher-order concerns requiring disciplinary

expertise rather than preliminary feedback AI can readily provide. Faculty members remain essential to the process, but AI can help optimize when and how their expertise is deployed.

The adaptive nature of AI support allows it to calibrate intensity based on student needs (Vygotsky, 1978) and departmental values. For instance, chatbots can be trained to emphasize Socratic questioning methods that encourage student reflection rather than providing directive answers. Early-stage researchers might receive more structured prompts that help them understand conventions of literature reviews or research design, while advanced students encounter more challenging questions that push them to justify theoretical choices or consider alternative interpretations of their findings. Faculty oversight remains critical in establishing these parameters, ensuring that AI tools align with program pedagogies and disciplinary norms (Nicol & Macfarlane-Dick, 2006). This adaptive element enables AI to provide timely cognitive support while respecting the intellectual authority and ethical guidelines faculty must maintain. By offering responsive, immediate feedback that bridges the gaps between advisor meetings, AI cognitive support can enhance doctoral student persistence while simultaneously reducing some of the mentorship burden that contributes to faculty overload. The goal is not to replace the irreplaceable elements of human mentorship but to create a more sustainable support ecosystem where technology handles routine cognitive scaffolding, freeing faculty to focus on the nuanced, discipline-specific, and relational dimensions of doctoral education that only human mentors can provide.

Affective Support

Cognitive scaffolding supports the intellectual side of dissertation work, while affective support focuses on the emotional and psychological factors that shape whether doctoral students persist and succeed. The dissertation stage can pose academic challenges and threaten students' confidence. Studies show that the emotional strain of doctoral work is a key reason for student dropout and affects overall well-being (Sverdlik et al., 2018). Imposter syndrome often worsens during the dissertation phase, when students typically work alone and without the familiar structures of the classroom (Bravata et al., 2019; Wang & Li, 2023).

Affective challenges in doctoral work may come from how vulnerable the process can feel. Sharing unfinished work for feedback is daunting because it requires students to confront their limits and expose their insecurities (Lovitts, 2001; King & Kitchener, 1994). These vulnerabilities can help or erode students' confidence; this is especially true for students from historically underrepresented groups who may already feel out of place in academic settings (Stubb et al., 2011). Without adequate emotional support, students may shy away from seeking feedback, missing the opportunity to strengthen their work.

AI tools can provide students with a safe space to try out ideas without worrying about being judged. AI provides a low-pressure environment for testing out concepts, building arguments, or expressing confusion. Students can ask simple questions, rewrite the same paragraph as many times as they need to, or explore side ideas without feeling they are wasting time or showing weakness. While supervisors provide disciplinary judgment and expert feedback, AI offers 24/7 drafting support and a non-judgmental platform. This kind of safety encourages students to take risks and practice, which helps them build much-needed skills.

Generative AI can also help students recognize that struggling with dissertation work is normal and build confidence by allowing them to achieve small, manageable goals (Bandura, 1997). By breaking big dissertation tasks into smaller steps with AI support, students enjoy consistent small successes that, cumulatively, give students the confidence to take on bigger challenges. Over time, they build a record of solving problems, which negates the idea that success is just about luck (Clance & Imes, 1978).

Affective AI support can adjust its encouragement and challenges to fit students' needs. At the start of the dissertation, AI may provide more positive feedback to help students feel confident and less anxious. As students improve, AI can continue to be supportive while also asking tougher questions to help them think more deeply. This approach resembles human mentoring with consistent access since AI is always available (Sverdlik et al., 2018).

Social Support

Beyond cognitive and affective dimensions, doctoral success also depends on social support structures that connect students to mentors and peers (Anttila et al., 2024; Rockinson-Szapkiw et al., 2014). Doctoral education is inherently relational, despite the persistent narrative of solitary scholarship (Dysthe et al., 2006). Students develop scholarly identities through ongoing interactions with advisors, peers, and intentional academic networks that situate their work within larger conversations. The dissertation phase, however, often disrupts these social connections precisely when students need them most. Coursework cohorts may disappear when students begin pursuing their research projects. As a result, face-to-face interactions with supervisors become less frequent, and extended periods of independent work can leave students feeling disconnected (Ciampa & Wolfe, 2023).

This social isolation has significant consequences for persistence and learning. One study found that doctoral students with strong relationships within their academic communities have greater control over their work, are happier, and complete their degrees more quickly (Vekkaila et al., 2018). Conversely, social isolation correlates with increased attrition, diminished well-being, and slower progress (Ali & Kohun, 2007; Mensah, 2025). Students need regular opportunities to articulate their emerging ideas, receive varied perspectives, and experience themselves as legitimate participants in scholarly discourse. Supervision alone cannot meet all these social needs, particularly given the power dynamics and evaluation pressures inherent in advisor-student relationships (Manathunga, 2007).

AI tools offer novel approaches to augmenting rather than replacing the social dimensions of doctoral education. Rather than substituting for human connection, AI can enhance the quality and efficiency of mentorship relationships by serving as a “first responder” that helps students refine questions and drafts before supervisor meetings. Students can use AI to clarify their thinking, identify gaps in arguments, or explore preliminary ideas before bringing more developed work to advisors. This preparation makes limited face-to-face time more productive, allowing supervisors to focus on higher-order guidance that requires disciplinary expertise and relational knowledge rather than preliminary feedback. The results create more substantive and satisfying mentorship exchanges, rather than reducing human interaction. AI support becomes especially valuable as it provides a form of connection that bridges geographical, temporal, and social distances, offering always-available interaction when human

networks prove inaccessible (Martinez, 2024).

The concept of mediated mentorship recognizes that technology can facilitate rather than replace human relationships (Dysthe et al., 2006). AI serves as an intermediary, helping students prepare for human interactions, practice articulating ideas, and maintain momentum between formal meetings. These mediated interactions can create scaffolding that makes face-to-face exchanges more productive and less anxiety inducing. By enhancing both the quality of mentorship and opportunities for peer collaboration, AI tools can support the social networks that sustain students through the challenges of doctoral work (Vekkaila et al., 2018).

Challenges and Ethical Complexities

As with any new technology, challenges connected to psychological, pedagogical, and ethical dimensions will arise and must be addressed. The literature is consistent with multiple concerns regarding AI use in higher education. For example, Oliveira et al. (2024) noted that some doctoral students fear AI adoption and that this fear must be acknowledged and addressed with a strategy to support them. Without proper support, resistance to AI can intersect with imposterism or low self-efficacy, where AI tools can reinforce those feelings of inadequacy rather than provide support. In addition, student misuse can further extend editing bias (Bender et al., 2021). Applicable training with transparent, ethical guidelines can support doctoral students' understanding of the use of AI to help them reach their goals (Bista & Bista, 2025).

Grichko et al. (2025) and many others noted the need for AI literacy and recommended drafting guidelines and providing training. Literacy initiatives and institutional policy should address both technical solutions, and the pressures students face with time management and ethical use (Archana et al., 2025). When students feel overwhelmed by time constraints, it can lead to improper and even unethical use of AI.

Boyd and Harding (2025) and Rahiman and Kodikal (2024) urged researchers to address privacy and data security issues that may arise when users do not understand the potential risks to their safety and protection. In addition, Boyd and Harding (2025), Van dis et al. (2023), and many others point out that there is often a lack of transparency and accountability and recommend that guidelines should be provided for reporting AI use. This can result in a tension whereby encouraging AI use and requiring transparency may discourage experimentation. Yet non-disclosure is also problematic when AI use is invisible to faculty. Through training, feedback, and human mentorship, AI can be reframed to help institutions better understand student gaps and misunderstandings.

The most frequently noted challenges in the literature concern ethical use of AI for writing and researching with students not understanding they cannot just copy and paste results from their query. Migliore (2024) urged users to understand the responsible use of AI, while Zou and Huang (2023) addressed student overuse and the challenge of information accuracy, since AI tools can make mistakes and “hallucinate” source references when sources cannot be easily located. The danger of AI use without training is that students may develop AI literacy but lose the ability to develop independent research skills that will support them professionally. In addition, it could hinder them from becoming experts in their research topic if AI did all the

literature review for them.

The biggest concern for AI use in doctoral programs is plagiarism and ethical misuse (Grichko et al., 2025; Van dis et al., 2023; Ziyanak & Abrams, 2026). Much of the AI literature acknowledges that many users do not understand the importance of original work and often copy and paste directly from AI tools without verifying their validity. Traditional plagiarism frameworks assume human authorship and intentional deception. However, the advent of AI may begin to challenge the notions of who owns the ideas and how writing assistance infringes on human ideas. The ethics of AI use should be clearly identified for both students and faculty, with clear examples and institutional guidance for both students and faculty (Boyd & Harding, 2025). Beyond individual ethics, systemic issues also surface as AI discussions become more prominent. Most recently, Akbar (2025) pointed out that major tech companies may be violating doctoral students' intellectual property rights by major technology companies conducting large-scale data sweeps. The dissertation represents the hard work and time of students' original research. Companies using it for training data without consent or compensation is a concern for both doctoral programs and students.

Implications for Doctoral Education and Future Directions

While AI offers many resources for doctoral students, and we do advocate for both student and faculty use of AI, we must acknowledge that this has presented challenges for the supervisor (dissertation chair), such as having to search for false references, plagiarism, and even overuse of AI tools for writing. In addition, for supervising faculty, there must be a redesign of pedagogy to best integrate AI student use in the research process (Swindell et al., 2024). Moreover, the importance of teaching students the process and practice of research is even greater as faculty demonstrate AI as a tool and when it should be used as a support for the researcher (Grichko et al., 2025).

Many researchers have urged that clear policy and guidelines that address both ethics and best practice must be established and clearly communicated for doctoral students using AI in the dissertation research (Bista & Bista; 2025; Boyd & Harding, 2025; Grichko et al., 2025; Krumsvik, 2024; Lesh & Lancaster, 2025; Oliveira et al., 2024; Rahiman & Kodikal, 2024). These guidelines should "serve as a foundation for human academic processes and as critical components in the development and refinement of intelligent tools designed to assist and enhance the doctoral journey" (Krumsvik, 2025, p. 9456). Lesh and Lancaster (2024) created an Ethical Use of Generative AI in Doctoral Programs: Compliance Rubric that is an excellent model for doctoral student integration and faculty use of AI tools. The rubric focuses on major areas such as ethical use, plagiarism, attribution, biases, monitoring and evaluation, and training and support and can provide clear expectations for AI use. They also recommend it be used for periodic evaluation and assessment for improvement.

In addition to providing guidelines for student use of AI, doctoral supervisors can demonstrate effective use of AI by providing support resources such as guided tutorials and example prompts for students to use to get started with topic selection or searching for supporting research (Li & Lin, 2025). In fact, Grichko et al. (2025) recommended a gradual introduction throughout the doctoral program. But to do this successfully, faculty should first be

trained and armed with best practices to model effective and ethical use (Bista & Bista, 2025; Oliveira et al., 2024). As with any new technology, institutions must provide ongoing training for continued use of AI as it is quickly evolving. Offering this kind of faculty support will also help with how quickly and effectively a faculty member can integrate the tools.

AI Balance for Doctoral Education

No matter what people think about AI, it has changed society in significant ways. Higher education is shifting from viewing AI as a novel form of learning to recognizing it as a tool for supporting learning. We should move beyond the debate over AI's usefulness and concentrate instead on how it can be applied in specific contexts to benefit students (Johnson et al., 2024). In doctoral programs, AI can support reimagining and alignment with teaching and learning goals, thereby fully supporting doctoral students (Swindell et al., 2024). When doctoral programs create systems that support the AI-augmented scholar, the program supports students' educational and professional journeys by enabling them to learn how to ethically incorporate AI skills effectively (Migliore, 2024). Integrating these skills into the program will increase persistence in doctoral programs by addressing students' varied learning styles while maintaining accountability and clear expectations for research production (Spaulding & Rockinson-Szapkiw, 2012).

Supporting the AI-augmented scholar addresses the educational and affective domains that hinder research output. Tinto's student integration theory (1975) holds that the program environment can foster or hinder resilience and persistence when students are not socially and academically integrated into the institution's norms. As such, addressing the human relationship aspect for scholars is vital to their persistence in the program and beyond. In fact, Lesh and Lancaster (2024) and Henricksen et al. (2024) assert that, to best support the AI scholar, we must balance AI integration, human judgment, and ethical decision making.

AI can provide additional support for doctoral students with technical and basic concerns. However, the human connection between students and faculty is still important to any successful doctoral student journey. Using AI to enhance technical skills creates opportunities for faculty to engage more intentionally when providing in-person support. Research shows that belongingness and academic integration are associated with lower attrition rates (Spaulding & Rockinson-Szapkiw, 2012). Therefore, maximizing the time between students and professors to deepen thinking rather than correcting will support a healthy learning environment and encourage persistence among doctoral students. As a result, if faculty intentionally embed AI-enabled continuous support into the doctoral experience, it can re-imagine the doctoral experience for students by creating additional pathways for support. This kind of student support aligns with research on doctoral persistence, showing that consistent engagement and timely feedback are key predictors of student completion (Gardner, 2009; Jairam & Kahl, 2012).

Finally, for AI to be fully accepted, the field must coalesce around a tacit agreement on what constitutes ethical use and the related transparency of use. Bista and Bista (2025) recommend that to fully harness the current and future capabilities of AI, both faculty and students need training in its proper use and the potential challenges it presents. Maintaining a balance in human interaction is essential to better prepare students to use AI throughout their educational and professional journeys (Bista & Bista, 2025).

Declarations
The authors declare no conflicts of interest

Artificial Intelligence Use Disclosure
AI was used to generate the Figure 1 Conceptive Model image, locate relevant research articles, and some editing of the manuscript.

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