

Balancing innovation and mentorship in postgraduate supervision through activity theory and artificial intelligence

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Abstract. This study presents a systematic literature review that maps the emerging role of Artificial Intelligence (AI) in postgraduate research supervision. Using Cultural-Historical Activity Theory (CHAT) as an analytical framework, the review synthesises insights from 14 peer-reviewed sources to examine how AI technologies mediate supervisory practices across functional and emancipatory models. The study addresses four objectives: (1) the impact of AI on functional supervision through task automation, (2) its role in fostering collaboration and intellectual autonomy, (3) its ethical implications for academic integrity and power dynamics, and (4) its potential to integrate functional and emancipatory approaches. Findings highlight emerging opportunities for efficiency and self-directed learning, but also reveal critical tensions concerning ethics, relational depth, and epistemic risk. The primary contribution of this review is to synthesise a fragmented field of scholarship and map a research agenda based on these identified contradictions. We conclude that AI's potential to enhance supervision is contingent on its balanced implementation with human mentorship to preserve pedagogical depth. It is crucial to note that these findings represent initial patterns rather than conclusive long-term outcomes. The study thus recommends targeted future research, nuanced institutional policies, and comprehensive training for supervisors to guide the responsible adoption of AI in higher education.

Keywords: artificial intelligence, postgraduate supervision, activity theory, functional and emancipatory mentoring, academic integrity, AI ethics in higher education

1. Introduction and background

Postgraduate supervision is critical in guiding students through academic writing, critical inquiry, and research development. Supervision practices vary globally due to differences in institutional traditions, educational philosophies, and national policies. For example, the UK emphasises research-intensive, one-on-one supervision to foster student independence, while the US combines coursework with committee-based supervision to ensure regular feedback [32]. These approaches reflect distinct views on academic autonomy, mentorship, and the role of institutions in shaping doctoral education.

This study examines how artificial intelligence (AI) is transforming supervisory models across various national contexts, including China, South Africa, Zimbabwe, and the United States, with a focus on the humanities and social sciences. These disciplines are particularly vulnerable to AI disruption, as AI tools may enhance technical productivity while challenging the epistemic and relational aspects of mentorship.

Historically, postgraduate supervision has been framed by three primary models: functional supervision, which focuses on project management; emancipatory supervision, which promotes student autonomy; and co-supervision, which fosters interdisciplinary feedback and shared accountability [17, 18, 27, 44]. These models emphasise human interaction, iterative feedback, and ethical guidance, areas potentially disrupted by AI integration.

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While the role of AI in education is increasingly explored, most studies focus on the performance of specific tools (e.g., ChatGPT, Grammarly, and AI-driven data analysis). Less attention has been given to how these tools influence the structural, relational, and ethical dimensions of postgraduate supervision. AI tools can enhance efficiency, democratise access to resources, and support students in under-resourced institutions [8, 57]. Similar findings are reported by Mwansa, Ngandu and Dasi [37], who demonstrated how simulation tools, such as Cisco Packet Tracer, can enhance practical skills and bridge resource gaps in higher education contexts. Their work demonstrates the potential of digital technologies to support learning and supervision in areas with limited infrastructure. However, AI tools also raise concerns regarding academic integrity, over-reliance on generative tools, and inequalities in access that may deepen educational disparities [31, 41]. Moreover, the increasing accessibility of AI tools shifts traditional supervisory power dynamics, requiring mentoring practices that emphasise mutual respect, ethical guidance, and collaboration [20].

This study contributes to addressing these gaps by synthesising the existing, yet limited, scholarship on AI in postgraduate supervision. Rather than claiming definitive insights into long-term transformations, the focus of the study is to analyse the emerging contradictions, tensions, and possibilities that AI introduces into supervisory relationships and frameworks. This approach enables the mapping of the current terrain and the identification of critical areas for future empirical investigation. Using Cultural Historical Activity Theory (CHAT), the analysis moves beyond tool use to investigate how AI reconfigures activity systems, altering tools, roles, community norms, and outcomes. In doing so, it addresses the need for a deeper, systemic understanding of educational technologies within supervisory ecosystems.

The main objectives of the study include: 1) to investigate the impact of AI on functional supervision through the automation of routine tasks in supervisory practice; 2) explore how AI can foster collaboration between supervisors and students and support intellectual autonomy; 3) critically analyse the ethical implications of the use of AI in supervision with a focus on academic integrity, power dynamics and overdependence; and 4) identify how AI can enhance both emancipatory and functional models of supervision by balancing efficiency with relational and intuitive aspects. These objectives are exploratory in nature and are designed to synthesise fragmented evidence and identify central contradictions that warrant deeper, future empirical investigation. They are not intended to provide definitive causal conclusions on the long-term impact of AI.

2. Literature review

This section reviews how AI intersects with three dominant models of postgraduate supervision: functional, emancipatory, and co-supervision. It also examines the ethical and pedagogical implications and identifies the gaps, challenges, and future research directions.

2.1. Traditional supervision models: functional, emancipatory, and co-supervision

Postgraduate supervision has traditionally been structured around three foundational models that emerged in response to evolving institutional demands and disciplinary norms. The functional model emphasises structured project oversight, focusing on research timelines, deliverables, and administrative coordination [27, 56]. This model is commonly associated with STEM disciplines and reflects a managerial view of supervision. Emancipatory supervision, conversely, promotes student autonomy, critical thinking, and reflexivity, aligning with Freirean principles of dialogic engagement and mutual learning [17, 29]. It is often adopted in the humanities and social sciences, where knowledge production is characterised by reflexivity and interpretation. The co-supervision model involves multiple supervisors contributing varied expertise, thereby enriching feedback and reducing power imbalances, though it can also result in coordination challenges and conflicting guidance [21, 27, 44].

Internationally, these models manifest differently. Supervision models vary not only by academic discipline but also by broader institutional and national traditions. For instance, the United Kingdom

typically employs a research-intensive, one-on-one model with minimal coursework, while the United States favours a committee-based structure integrated with formal coursework, reflecting deeper historical and cultural assumptions about mentorship and academic development [32]. Despite their utility, these models are not without limitations: the functional model may be overly bureaucratic, the emancipatory model may lack structure, and co-supervision may suffer from fragmented communication.

2.2. AI and the reconfiguration of traditional models

AI tools are increasingly integrated into supervisory contexts, reshaping how these models operate. In functional supervision, tools such as scheduling software, automated progress tracking, and collaborative platforms streamline administrative tasks, allowing supervisors to focus on intellectual mentorship [8, 45] – however, over-automation risks reducing personal academic engagement.

Emancipatory supervision is being transformed by AI platforms like ChatGPT and Elicit, which assist students in refining arguments, generating literature summaries, and receiving rapid feedback [28]. While these tools support autonomy, they also risk encouraging over-reliance, diminishing students' capacity for critical reflection and independent reasoning [58].

In co-supervision, AI facilitates consistency by consolidating feedback and managing multiple reviewer inputs. Tools that summarise conflicting suggestions or track revisions reduce delays and miscommunication [4, 31]. However, such tools cannot fully replicate human intuition, empathy, or the nuanced negotiation often required in interdisciplinary contexts.

2.3. Ethical, pedagogical, and relational implications

AI integration introduces complex ethical questions. Tools like Grammarly and ChatGPT improve accessibility and writing quality but also blur authorship boundaries and may undermine academic integrity [9, 10, 25]. While AI supports efficiency, it can reduce deep engagement with content, especially if students bypass manual analysis or revision [50].

Further ethical concerns arise from biased datasets, limited representation of marginalised voices, and the potential for AI-generated content to obscure original thinking [41, 50, 54]. In resource-constrained settings, AI can democratise access but also widen gaps if institutional readiness is low [7, 35]. A growing concern is how AI changes epistemic relationships in supervision. Traditionally, supervisors acted as gatekeepers of knowledge. With AI offering independent pathways to information and feedback, students may challenge conventional hierarchies, necessitating a shift toward co-learning and adaptable mentorship [4, 49].

Moreover, academic institutions have yet to develop consistent guidelines regarding the use of AI in supervision. Few universities offer clear policies for supervisors and students, resulting in uncertainties around acceptable practices, transparency, and intellectual ownership [7].

2.4. Gaps, challenges, and future research directions

Despite the growing scholarship on AI in education, a critical gap remains in understanding how these tools reshape the core values and practices of postgraduate supervision, particularly in the humanities and social sciences. Most studies focus on the efficacy of tools, productivity gains, or ethical risks in isolation, rather than examining their interplay. Few integrate these elements into a broader exploration of how AI transforms relationships, academic identity, and epistemic authority in supervision.

Moreover, little research has examined long-term impacts: How does sustained AI use affect students' critical thinking, originality, and scholarly development? What happens to supervisory dynamics when AI mediates most academic interactions? These questions remain underexplored, particularly in low-resource or non-Western contexts where digital infrastructure is uneven and institutional policies are underdeveloped.

Future research should investigate how AI tools can support supervision without displacing essential pedagogical relationships. Longitudinal studies are necessary to determine whether AI enhances or undermines the reflective, dialogic, and transformative aspects of research training. There is also a need to develop policy frameworks that support the ethical use of AI while accounting for disciplinary differences, institutional readiness, and cultural diversity in supervision practices.

3. Theoretical framework

To fully grasp the systemic implications of AI in supervision, this study adopts the CHAT as the theoretical framework to explore the impact of AI on postgraduate supervision. As AI technologies become increasingly embedded in educational contexts, understanding how these tools interact with human agents (supervisors and students), the surrounding institutional environment, and the pedagogical aims of supervision is crucial. This research examines how AI can enhance the functional aspects of supervision, such as automating routine tasks, and contribute to emancipatory outcomes, including fostering collaboration, promoting intellectual autonomy, and addressing ethical considerations within the supervisory process. CHAT is particularly useful in analysing technology-driven educational methods and has been widely applied in educational technology research [11, 34, 36, 38], making it an appropriate framework for understanding AI integration into postgraduate guidance.

3.1. Fundamental elements of activity theory

CHAT, rooted in the work of Vygotsky, Leontiev, and Engeström, offers a comprehensive framework for understanding the dynamic interactions between individuals, tools, and social systems within a cultural context [6]. Human activity, according to CHAT, is composed of six interconnected elements: the subject (e.g., supervisors or students), the object (e.g., the goals of supervision such as effective oversight and academic progress), the tools (e.g., AI technologies like chatbots, plagiarism checkers, writing aids like ChatGPT, and Grammarly), the community (e.g., educational institutions and departments), the division of labour (e.g., roles and responsibilities in supervision), the rules (e.g., institutional policies, ethical guidelines), and the outcome (e.g., the transformation or learning achievement, such as completing a thesis or gaining independence) [12].

These elements interact continuously, influencing and reshaping each other. CHAT is particularly well-suited for analysing technology-driven educational methods because it emphasises the role of mediating tools, such as AI, in transforming activity systems. In postgraduate supervision, AI functions as a tool that mediates interactions between supervisors and students, reshaping both the functional (e.g., administrative tasks and feedback) and emancipatory (e.g., intellectual autonomy and collaboration) aspects of the supervision process. Furthermore, CHAT helps identify contradictions and tensions that arise when technology is integrated into educational practices, such as tensions between automation and human mentorship, or between efficiency and ethical concerns related to academic integrity [51].

3.2. Justification for the use of CHAT

CHAT is essential for this study due to its capacity to analyse how AI tools mediate human activity in complex educational environments. Previous studies have shown that CHAT can help explore how technology reshapes educational practices, such as how learning management systems and collaboration platforms alter the roles of teachers and students [24]. In this study, CHAT will be used to examine how AI tools influence supervisory practices, particularly in relation to task automation, fostering collaboration, and addressing ethical implications such as academic integrity and power dynamics [12].

CHAT's capacity to examine contradictions within activity systems is particularly relevant for this study. As AI is integrated into postgraduate supervision, tensions may arise between the automation

of tasks and the need for human interaction, or between efficiency and the need for personalised mentorship. These contradictions will be explored to understand the opportunities and challenges AI introduces into the supervisory process. Identifying and analysing these contradictions is crucial for understanding the challenges and opportunities AI introduces in educational supervision. This study aims to uncover these contradictions and provide insights into how they can be addressed, ensuring that the integration of AI enhances rather than undermines the supervisory process. Key contradictions may include [48]:

- Mediation of supervisory activities (e.g., feedback, proposal vetting, literature guidance) (tools → object).
- Altered roles and expectations between supervisors and students (division of labour).
- Challenges to academic norms around originality and authorship (rules).
- Reconfiguration of the postgraduate experience in both functional (efficiency) and emancipatory (transformative learning) ways (outcome).

3.3. Theoretical framework in previous and current use

CHAT has been widely applied to analyse technology-mediated educational practices. For example:

- In a study on expansive learning and contradictions, Engeström [13] explored how distributed collaboration in organisational and educational contexts leads to transformative learning by highlighting contradictions in activity systems.
- In a study on the development of digital agency in higher education, Ganduri, Collier-Reed and Shaw [14] employed CHAT to investigate the emergence of digital agency among first-year engineering students, identifying contradictions that drive change. The study emphasised CHAT's utility in understanding the complexities of student engagement with technology in higher education.
- Clifford [5] used CHAT to analyse how students and lecturers collaboratively address contradictions in technology-mediated educational practices. Utilising the Change Laboratory methodology, they reimagine and enact changes to these practices, aiming to redefine “authenticity” beyond mere preparation for economic work.
- In a study on AI in Education (AIED), Uden and Ching [48] proposed a CHAT-based framework for a sustainable and ethical AIED ecosystem, focusing on collaboration among stakeholders in AI-mediated education. This informs the current study by emphasising the importance of collaborative agreements in AI-mediated postgraduate supervision. The focus on socio-cultural contexts and stakeholder involvement helps guide the integration of AI tools into supervision, ensuring that AI's role is aligned with ethical considerations and effective supervision practices, thereby promoting both efficiency and human mentorship in the supervisory process.

These studies highlight CHAT's utility in understanding how technological tools mediate human activity in educational settings. They demonstrate how CHAT can be used to uncover contradictions arising from the integration of new technologies. This study builds on these insights by applying CHAT to explore the impact of AI on postgraduate supervision, focusing on the contradictions between the functional and emancipatory roles of AI and how these contradictions can be resolved to improve supervisory practices in a modern society.

3.4. Relevance of contradictions and their application

Contradictions, a core concept in CHAT, are tensions that arise within the components of an activity system. In this study, contradictions may arise as AI is integrated into the supervisory process. For instance, while AI can automate routine tasks, it may conflict with the need for personalised mentorship. Similarly, the shift in academic power dynamics, such as when AI provides students with independent access to research insights, may undermine traditional mentorship roles. By identifying

and analysing these contradictions, CHAT helps uncover how AI affects the overall activity system of postgraduate supervision and offers strategies for resolving these tensions to enhance both functional and emancipatory aspects of supervision.

3.5. Relationship between the theoretical framework and methodology

The theoretical framework aligns closely with the systematic literature review (SLR) methodology employed in this study. The SLR facilitates the comprehensive collection and synthesis of existing research on AI in postgraduate supervision, while CHAT provides a structured lens for interpreting the findings. By applying CHAT to the SLR results, this study can identify patterns and contradictions in how AI is used in supervision and explore the broader implications for the field of educational technology.

In analysing the SLR, CHAT will be applied to examine how AI technologies mediate interactions between supervisors, students, and institutional structures. The analysis will focus on functional aspects (e.g., AI automating tasks such as grading, providing feedback, and performing administrative duties), emancipatory aspects (e.g., AI fostering collaboration and intellectual autonomy), and ethical implications (e.g., challenges to academic integrity and power dynamics).

4. Methodology

This study uses a qualitative research approach to examine the role of AI in postgraduate supervision. A Systematic Literature Review (SLR) was employed to rigorously and transparently synthesise interdisciplinary evidence on how AI impacts functional and emancipatory models of postgraduate supervision. The purpose was to find, assess, and summarise all pertinent secondary data results that align with the research objectives [33]. A primary benefit of a systematic review is that it makes evidence more immediately accessible to academics and decision-makers. In our endeavours to conduct a high-quality systematic literature review that is transparent, rigorous and follows a repeatable comprehensive methodology, we adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guideline [42]. For this study, two researchers were involved in conducting PRISMA. It is good practice to have a minimum of two researchers involved, as this ensures that in-built measures to minimise individual bias and error are implemented at all stages of the review [15, 22].

The structured literature review is designed to synthesise existing research on AI in postgraduate supervision, focusing on four key themes: (1) AI and traditional supervision models, (2) AI-driven tools in postgraduate supervision, (3) ethical and pedagogical considerations, and (4) challenges and future implications. The literature is sourced from peer-reviewed journal articles, books, conference papers, institutional reports, and policy documents published between 2015 and 2025. The databases that store relevant academic literature align with this study, including Google Scholar, ScienceDirect, Scopus, Education Resources Information Center (ERIC), and Web of Science. The choice of databases was influenced by the need to collect a broad range of credible scholarly articles, journals, and conference papers that encompass multiple perspectives and diverse sources of information. Studies were selected based on predefined inclusion criteria that focus on research exploring the application of AI in postgraduate mentorship, academic integrity, and research automation. In contrast, studies related to undergraduate education or AI applications outside academia are excluded.

A thematic synthesis approach was applied to analyse the 14 studies, following the three-step method as demonstrated by Thomas and Harden [47]. First, findings were line-by-line coded inductively while remaining sensitised to CHAT elements. Second, these codes were grouped into descriptive themes, including automation, collaboration, and ethics. Third, themes were translated into analytical constructs, revealing CHAT-informed contradictions (e.g., Tools vs. Rules). This method enabled a structured synthesis of diverse literature while preserving theoretical depth. This approach led to the classification of research findings. Following the presentation of the SLR, a comparative analysis was conducted to assess the differences in the role of AI across various

supervisory models, followed by a narrative summary that consolidates the conceptual discussions and identifies research gaps. In line with the review approach, the two researchers employed a multidisciplinary and multi-professional approach.

The article search commenced with a comprehensive list of search terms, as provided in table 1. Each database search yielded a broad range of evidence from a wide range of resources, including peer-reviewed journals, conference proceedings, dissertations/theses, and reports ($n = 96$). The search strategy employed a combination of thesaurus terms from each database, along with suitable keywords, to ensure maximum retrieval related to the research objectives.

Table 1
Search terms.

#	Database	Search term	Number of sources
1	Google Scholar	((“Artificial Intelligence” OR “AI”) AND (“post graduate supervision” OR “postgraduate supervision” OR “postgrad supervision”)) AND (“emancipatory” OR “functional mentoring”))	89
2	ScienceDirect	((“Artificial Intelligence” OR “AI”) AND (“post graduate supervision” OR “postgraduate supervision” OR “postgrad supervision”))	1
3	Scopus	((“Artificial Intelligence” OR “AI”) AND (“post graduate supervision” OR “postgraduate supervision” OR “postgrad supervision”))	3
4	ERIC	((“Artificial Intelligence” OR “AI”) AND (“post graduate supervision” OR “postgraduate supervision” OR “postgrad supervision”))	1
5	Web of Science	((“Artificial Intelligence” OR “AI”) AND (“post graduate supervision” OR “postgraduate supervision” OR “postgrad supervision”))	2
<i>Total</i>			96

Following the initial search, the screening of scholarly works began. After removing duplicates and scholarly works not published between 2015 and 2025, both researchers independently screened the titles and abstracts of the articles to determine their relevance. Articles were included if they addressed the research objectives. Studies were excluded if they did not meet the inclusion criteria, such as being outside the scope of postgraduate supervision or not being peer-reviewed. As presented in figure 1, the SLR process resulted in fourteen (14) scholarly works being included for this review.

To ensure consistency and minimise bias in the SLR selection process, inter-coder reliability was assessed using Cohen’s κ , a statistic that measures the agreement between two coders while accounting for chance agreement [19]. A Cohen’s κ value of 0.76 was achieved, indicating substantial agreement, based on an observed agreement of 0.88 and an expected agreement of 0.50. This value suggests that the coders’ decisions were generally aligned and that the screening process was reliable.

In instances where discrepancies occurred between the two coders regarding article inclusion or data extraction, a resolution process was implemented. This involved further discussion between the coders to clarify their reasoning. Where consensus was not reached, a third researcher, who is an author of this study, was consulted to provide direction and resolve the disagreement [42]. Given that a Cohen’s κ value of 0.76 was achieved, the occasional disagreements that occurred were based on subjective judgment. These disagreements were addressed through further discussion and, when necessary, consultation with the third researcher.

The selected scholarly literature from the title and abstract screening was then assessed in full by both researchers to determine if they met all inclusion criteria. Scholarly works were excluded if they did not directly address the research objectives. Upon completing the full-text review, relevant data were extracted from the selected articles. This included study objectives, methodology, keywords, and key findings.

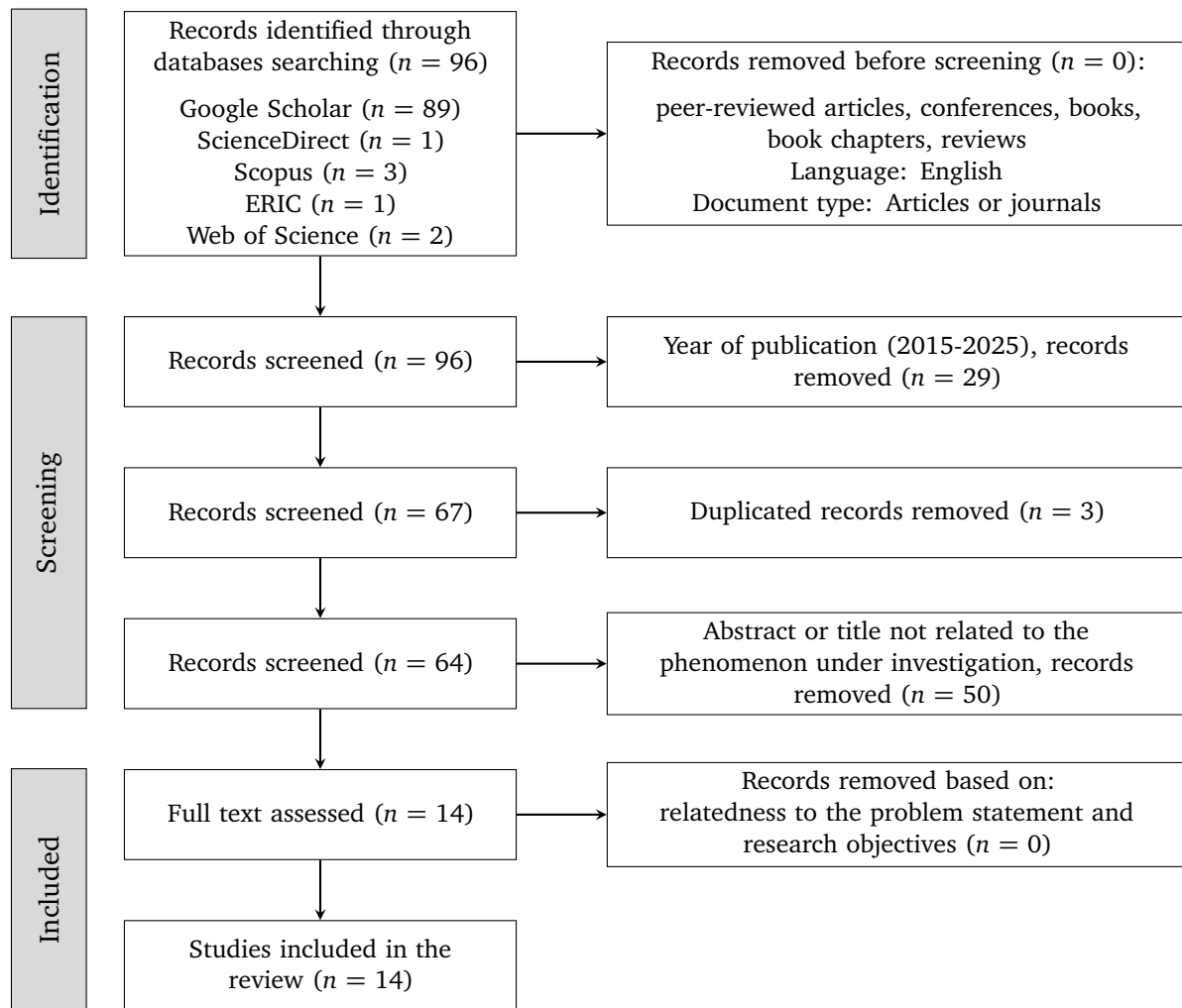


Figure 1: Diagram showing the PRISMA process.

5. Results and analysis

As outlined in the previous section, fourteen (14) scholarly works were selected for detailed analysis. It is essential to acknowledge that the body of robust empirical research on AI in supervision remains relatively small and nascent. Therefore, the conclusions drawn in this study should be viewed primarily as a means to map a pressing research agenda and conceptual framework for the field, rather than as comprehensive findings on long-term impacts. Table 2 presents the extent to which each work aligns with the study’s four research objectives. This alignment was established through a close reading of article abstracts and findings, with additional in-depth analysis to identify conceptual contributions.

Although most included works were peer-reviewed journal articles, two were scholarly books that did not follow the conventional abstract format. These were retained due to their theoretical significance and relevance to postgraduate supervision. Specifically, Parry and Pilbeam [43] conceptualise doctoral education through the dimensions of product, person, and process, which directly align with the study’s exploration of supervision models. Waghid [52], whose work is foundational in African higher education, offers a critical pedagogical lens that supports deeper ethical and philosophical engagement with emancipatory supervision. The inclusion of these texts reflects a deliberate effort to balance empirical evidence with conceptual depth, particularly in addressing Objectives 3 (ethical

implications) and 4 (balancing efficiency with liberatory mentorship).

Table 2: The study alignment with four research objectives.

No	Article title	Author(s)	Keywords matched	SLR objective 1	SLR objective 2	SLR objective 3	SLR objective 4
1	A content analysis of tweets on toxic doctoral supervision	Okere [40]	Postgraduate supervision, Emancipatory, Mentoring	Indirectly relevant (explores dysfunctions; implies need for functional AI-enabled systems)	Limited; focuses on breakdowns in collaboration, not AI support	Highly relevant (examines power, ethics, academic integrity)	Relevant through critique of non-emancipatory supervision
2	'Just get them over the line': Neoliberalism and the execution of 'excellence'	Andrew [2]	Postgraduate supervision, Functional mentoring, Emancipatory	Moderately relevant (discusses bureaucratic processes that AI could address)	Moderately relevant (explores relational support systems)	Relevant (power, performativity in supervision)	Highly relevant (emphasises relational, intuitive mentoring)
3	Exploring graduate students' perception and adoption of AI chatbots in Zimbabwe: Balancing pedagogical innovation and development of higher-order cognitive skills	Kouam and Murchowe [26]	AI, Postgraduate supervision	Highly relevant (automation of learning tasks by chatbots)	Moderately relevant (AI support for learning interaction)	Touches on ethics, but not central	Somewhat relevant (AI as support in functional processes)
4	Book review. Brookfield, Stephen D., Rudolph, Jürgen & Tan, Shannon (2024). Teaching well: Understanding key dynamics of learning-centre classrooms. Routledge	Waring [55]	AI, Emancipatory	Not addressed directly	Not addressed directly	Highly relevant (critical theory, ethical critique)	Conceptually relevant (emancipatory discourse)
5	Awareness, benefits, threats, attitudes, and satisfaction with AI tools among Asian and African higher education staff and students	Ahmad et al. [1]	AI, Postgraduate supervision (contextual)	Highly relevant (AI adoption, tool use in admin/learning)	Moderately relevant (perceived support vs barriers)	Touches on ethical concerns, satisfaction, risk	Somewhat relevant (AI for routine + relational balance)

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Table 2 – Continued from previous page

No	Article title	Author(s)	Keywords matched	SLR objective 1	SLR objective 2	SLR objective 3	SLR objective 4
6	Attributes and Relationships in the Supervisor – Supervisee Partnership: An Autoethnographic Study	Govender [16]	Postgraduate supervision, Emancipatory	Not directly relevant	Highly relevant (focus on relationships and collaboration)	Touches on power dynamics	Highly relevant (relational, emancipatory supervision)
7	Impact in Doctoral Education: Product, Person and Process	Parry and Pilbeam [43]	Postgraduate supervision	Not clear (textbook, abstract missing)	Potential conceptual relevance	Not clear	Possibly relevant for theoretical grounding
8	Doctoral supervision in virtual spaces: A review of research of web-based tools to develop collaborative supervision	Maor, Enzor and Fraser [30]	AI, Virtual supervision	Highly relevant (use of academic technology platforms)	Highly relevant (supports interaction and collaboration)	Touches on integrity and support structures	Relevant (balancing tech with pedagogy)
9	Philosophical Adventures in African Higher Education: Cultivating Doctoral Encounters Within Democratic Citizenship Education	Waghid [52]	Emancipatory, Philosophy	Not addressed	Conceptual relevance to autonomy	Potentially relevant (philosophical critique)	Relevant to emancipatory framing
10	Teaching Philosophy in a Teaching Portfolio: Domain Knowledge and Guidance	Ngene [39]	Emancipatory, Postgraduate pedagogy	Not directly addressed	Moderately relevant (developing voice)	Conceptual link to empowerment	Highly relevant (focus on emancipatory development)
11	Using AI-driven chatbots to foster Chinese EFL students' academic engagement: An intervention study	Wang and Xue [53]	AI, Autonomy, Collaboration	Highly relevant (routine feedback via chatbots)	Highly relevant (fostering autonomy and collaboration)	Partially relevant (on overdependence risk)	Relevant (AI enabling both autonomy and support)
12	Structural Vetting of Academic Proposals	Iwashokun and Ade-Ibijola [23]	AI, Functional supervision	Highly relevant (automates review tasks)	Limited collaboration support	Limited	Supports functional model
13	Technology-enabled undergraduate and postgraduate research supervision	Sim, Northcote and Lim [46]	AI, Postgraduate supervision	Highly relevant (AI for assessment and support)	Highly relevant (supports interaction)	Moderate (raises implications)	Highly relevant (blends functional / emancipatory)
14	Postgraduate Supervision in a ChatGPT World: What's Next?	Wright [57]	AI, Postgraduate supervision	Highly relevant (ChatGPT handling tasks)	Highly relevant (support for student voice and collaboration)	Highly relevant (ethical risks, power, overdependence)	Highly relevant (balances efficiency with critical dialogue)

The findings in table 2 from the SLR provide valuable insights into the evolving role of AI in postgraduate supervision. The analysis is structured according to the study's four primary objectives, which are each mapped to core elements of CHAT. The objectives guide a thematic synthesis of the 14 reviewed studies, offering a cross-study analysis of patterns, contradictions, and implications.

- Objective 1: Investigate how AI automates routine tasks in functional supervision (CHAT focus: tools → subject → object).
- Objective 2: Explore how AI fosters collaboration and supports intellectual autonomy (CHAT focus: community, tools, division of labour).
- Objective 3: Examine ethical implications of AI in supervision, including issues of academic integrity and power (CHAT focus: rules, community, contradictions).
- Objective 4: Assess how AI enhances both functional and emancipatory models of supervision (CHAT focus: tools, division of labour, outcomes).

Rather than summarising articles individually, the findings are grouped by theme and examined through CHAT (table 3). Convergences and divergences in the literature are highlighted, with contradictions within activity systems identified where applicable.

Through the CHAT framework, this analysis shows that AI is not a neutral tool; it reconfigures supervision ecosystems. The effective integration of AI demands more than adopting tools; it requires ethical reflection, revised supervisory roles, and intentional cultural shifts in how mentorship is understood. Contradictions between tools and outcomes, or rules and labour, serve as valuable pressure points for reimagining postgraduate supervision in the digital age.

6. Discussion

This section builds on the CHAT-informed analysis by critically synthesising the findings into forward-facing insights. Rather than reiterating themes, this discussion explores the intersections between the four objectives, addresses emerging contradictions and tensions, and proposes strategic responses for institutions and supervisors navigating the integration of AI. Table 4 presents a structured synthesis aligning each of the study's four research objectives with their corresponding CHAT elements, key findings from the 14 reviewed studies, and critical discussion insights.

Table 4 supports cross-objective integration, highlighting converging and diverging findings across empirical literature. For example, while Objective 1 highlights how AI tools alleviate routine workload (tools → subject → object), Objective 3 surfaces ethical contradictions around authorship, integrity, and power dynamics (rules → tools; community → rules). Each objective is not only thematically analysed but also interpreted through CHAT's lens to expose deeper systemic shifts and institutional implications. This alignment highlights the complexity of AI's role in supervision, extending beyond technical affordances to encompass ethical, relational, and cultural dimensions.

The results reveal a persistent tension between administrative streamlining and pedagogical depth. Although AI tools such as ChatGPT [1] and Grammarly [53] reduce workload and increase turnaround time, essential formative engagement may be sidelined [46, 57]. Supervision should therefore be designed with careful attention to how human feedback can complement AI efficiency, particularly in contexts requiring critical thinking and epistemic autonomy. Institutions must equip supervisors to thoughtfully calibrate their use of AI while preserving the relational dimensions of mentoring.

Beyond individual practice, AI tools alter how supervision is socially and structurally organised, reshaping community roles and the flow of intellectual labour [26, 30]. CHAT illuminates how disruptions to the division of labour impact collaboration norms. Supervisors increasingly require both emotional intelligence and digital fluency to navigate this evolving landscape, and institutions should embed these competencies into staff development programmes [2, 16].

Importantly, contradictions around academic integrity, authorship, and fairness should not be viewed merely as risks but as opportunities for institutional reflection and innovation. Wright [57], Okere [40], and Waring [55] highlight how AI challenges traditional rules, creating misalignment

Table 3
Thematic synthesis of literature through CHAT framework.

Theme	Converging evidence	Diverging evidence	CHAT interpretation	Implications
Automation in functional supervision	AI tools (ChatGPT, Grammarly, and structured vetting systems) reduce supervisors' cognitive and logistical load, enabling them to focus on complex mentoring [46]. AI improves response time and consistency in formative feedback, positively impacting student confidence [53].	Over-automation may reduce supervisors' relational engagement, leading to detachment from students' developmental needs [46, 57].	AI serves as a mediating tool between the subject (supervisor/student) and the object (thesis progress). A contradiction arises when the efficiency of tools undermines the pedagogical intent of formative supervision (tool → outcome contradiction).	Institutions should encourage hybrid use of AI that supports administrative efficiency without displacing human aspects of mentoring.
AI and the reconfiguration of collaborative supervision	AI enables students to take greater ownership of learning, preparing more effectively for supervisory meetings [26, 53]. AI expands the supervision “community” by creating alternative support channels [46].	True collaboration is rooted in trust and affective mentorship, which AI cannot replicate [2, 16]. AI detection tools misidentifying authentic work complicates relational trust [3].	AI reconfigures “community” and “division of labour”, but the relational component remains irreplaceable. Key CHAT contradiction: community → tools → object.	AI should be positioned as a supplementary resource in collaborative ecosystems, not a substitute for mentorship.
Ethical tensions and power dynamics	Contradictions exist between traditional academic rules and the capabilities of generative AI [40, 55, 57]. AI can reinforce and challenge power hierarchies [40]. Excessive reliance on AI can erode critical engagement and academic voice [1, 53].	Ethical concerns are viewed as manageable with clear guidelines [1]. Inconsistent institutional policies create uncertainty among supervisors and students [46, 57].	Tensions expose the contradictions between rule-based and community-based systems. AI reshapes expectations of authorship/originality, challenges power structures, and introduces risks of overdependence (rules → tools; community → rules contradictions).	Universities must revise their academic integrity policies, develop guidelines for the responsible use of AI, and provide training to supervisors and students.
Balancing functional and emancipatory supervision	Supervision should promote critical thinking and reflexivity [2, 16, 39]. Conceptual basis exists for maintaining humanistic educational values [43, 52].	Over-prioritising productivity risks reducing education to a mechanistic process [55].	Hybrid models align tools, division of labour, and outcomes when implemented thoughtfully. Contradictions emerge when institutional pressures for productivity override pedagogical depth (tool → outcome contradiction).	Supervisors should be supported in developing AI literacy aligned with transformative and student-centred pedagogies.

between institutional policy and technological practice. Rather than relying solely on detection tools, institutions should foster a culture of ethical inquiry and co-created standards. CHAT helps identify where established rules no longer align with emerging practices, providing a framework for recalibrating expectations and ensuring policies evolve accordingly.

The evidence suggests a hybrid model that combines administrative efficiency with pedagogical care [39, 43, 46]. This calls for a reframing of AI not just as a tool, but as a partner in fostering epistemic justice. Supervisors must be supported in navigating the dual imperative of supporting

Table 4
Alignment with objectives, CHAT, and thematic evidence.

SLR objective	CHAT focus	Key findings	Discussion summary
1	Tools → subject → object	AI tools like ChatGPT, Grammarly, and vetting systems automate administrative and feedback tasks, reducing cognitive load and improving efficiency. However, concerns exist over relational disengagement and loss of formative depth.	There is a persistent tension between administrative automation and pedagogical depth. Institutions should promote the use of hybrid AI by streamlining tasks without displacing formative human engagement. CHAT reveals contradictions between tool use and intended pedagogical outcomes, prompting supervisory design to strike a balance between both.
2	Community, tools, division of labour	AI-enabled tools foster collaboration and decentralise supervision. Chatbots and shared platforms promote student autonomy and efficient interactions. However, authentic collaboration rooted in trust and emotion cannot be replicated by AI.	Supervision is being reconfigured socially and structurally. CHAT highlights how AI changes the flow of labour and redefines community. Supervisors need digital fluency and emotional intelligence to balance relational mentorship with tech-mediated collaboration. Staff development must embed these hybrid skills.
3	Rules, community, contradictions	Key concerns involve plagiarism, authorship, surveillance, and overdependence. Literature reveals mismatches between institutional policies and emerging AI norms. Students risk losing agency if AI becomes a crutch for critical thinking.	Ethical contradictions are not just risks; they are opportunities for institutional growth. CHAT helps to surface, for example, where outdated rules clash with new realities. Institutions must evolve policies to co-create ethical norms with supervisors and students, shifting from enforcement to inquiry.
4	Tools, division of labour, outcome	Literature support hybrid models that balance efficiency with student-centred development. AI can aid functional processes while promoting voice and reflexivity if used intentionally. The risk remains of reducing supervision to productivity metrics.	CHAT reveals that balancing efficiency and emancipation requires institutional and pedagogical shifts. Supervisors must navigate dual goals: research output and researcher development. AI literacy should encompass critical reflection to promote epistemic justice, rather than merely focusing on output efficiency.

research outputs and developing researchers.

7. Conclusion

This study makes several key contributions to the emerging field of AI in postgraduate education. First, it synthesises a fragmented body of literature into a structured framework spanning four domains: functional automation, collaboration, ethical governance, and hybrid supervision. Second, it introduces cultural-historical activity theory as a robust analytical lens that moves beyond cataloguing benefits and risks, enabling systemic analysis of how AI generates contradictions and reshapes supervisory practices. Third, it makes a significant contribution to agenda setting by mapping these tensions into a framework and roadmap for future empirical, philosophical, and policy-oriented research. Finally, it offers practical insights for institutions, emphasising the need for ethical guidelines, supervisor training, and balanced integration strategies that preserve the relational values of mentorship.

The CHAT-based analysis reveals that AI alters the structures, values, and relationships underpinning supervision, resulting in contradictions between tools, rules, communities, and outcomes. While

AI can enhance efficiency through automation, it also introduces relational and epistemic risks if adopted without critical consideration. Its potential to foster autonomy and collaboration depends on institutions safeguarding trust, reflection, and mentorship. Ethical tensions surrounding authorship, originality, and surveillance underscore institutional lag and the need for dynamic policy reform. The value of AI in supporting both functional and emancipatory supervision, therefore, hinges on intentional integration, guided by epistemic justice and pedagogical care.

Given the limited empirical evidence, these conclusions should be regarded as agenda-setting rather than definitive. Future research should investigate how tensions evolve as AI becomes more sophisticated and embedded in supervisory systems. Key priorities include developing AI tools that assess conceptual understanding rather than surface-level similarity, and advancing institutional policy, supervisor training, and digital literacy to enable responsible adoption.

Data availability statement

All data analysed in this study are derived from publicly accessible, peer-reviewed literature. No new empirical data were generated or collected for this research. A complete list of sources reviewed is available in the reference section

Declaration on Generative AI

AI-assisted tools were used to enhance the clarity, tone, and consistency of the writing. Specifically, OpenAI's ChatGPT (GPT-4, 2024) was used to refine academic phrasing and improve sentence structure in sections such as the abstract, introduction, and discussion. Grammarly was employed to identify grammatical issues and improve stylistic coherence. DeepSeek was used to assist with language polishing and consistency checking. All intellectual content, thematic interpretations, and critical analysis reflect the authors' original contributions. The authors retained full control over the writing process and made all final editorial decisions. No AI tool was used to generate citations, analyze data, or interpret results. All AI-enhanced text was carefully reviewed, verified, and edited to ensure alignment with academic standards and research integrity.

References

- [1] Ahmad, M., Subih, M., Fawaz, M., Alnuqaidan, H., Abuejheisheh, A., Naqshbandi, V. and Alhalaiqa, F., 2024. Awareness, benefits, threats, attitudes, and satisfaction with AI tools among Asian and African higher education staff and students. *Journal of Applied Learning & Teaching*, 7(1), pp.57–64. Available from: <https://doi.org/10.37074/jalt.2024.7.1.10>.
- [2] Andrew, M.B., 2024. 'Just get them over the line': Neoliberalism and the execution of 'excellence'. *Journal of Applied Learning & Teaching*, 7(1), pp.182–192. Available from: <https://doi.org/10.37074/jalt.2024.7.1.25>.
- [3] Baron, P., 2024. Are AI detection and plagiarism similarity scores worthwhile in the age of ChatGPT and other generative AI? *Scholarship of Teaching and Learning in the South*, 8(2), pp.151–179. Available from: <https://doi.org/10.36615/sotls.v8i2.411>.
- [4] Bond, M., Khosravi, H., De Laat, M., Bergdahl, N., Negrea, V., Oxley, E., Pham, P., Chong, S.W. and Siemens, G., 2024. A meta systematic review of artificial intelligence in higher education: a call for increased ethics, collaboration, and rigour. *International Journal of Educational Technology in Higher Education*, 21(1), p.4. Available from: <https://doi.org/10.1186/s41239-023-00436-z>.
- [5] Clifford, S., 2022. The use and value of cultural historical activity theory in institutional educational technology policy. *Studies in Technology Enhanced Learning*, 3(1). Available from: <https://doi.org/10.21428/8c225f6e.06989392>.
- [6] Cong-Lem, N., 2022. Vygotsky's, Leontiev's and Engeström's Cultural-Historical (Activity)

- Theories: Overview, Clarifications and Implications. *Integrative Psychological and Behavioral Science*, 56(4), pp.1091–1112. Available from: <https://doi.org/10.1007/s12124-022-09703-6>.
- [7] Cowling, M., Crawford, J., Allen, K.A. and Wehmeyer, M., 2023. Using leadership to leverage ChatGPT and artificial intelligence for undergraduate and postgraduate research supervision. *Australasian Journal of Educational Technology*, 39(4), pp.89–103. Available from: <https://doi.org/10.14742/ajet.8598>.
- [8] Dai, Y., Lai, S., Lim, C.P. and Liu, A., 2023. ChatGPT and its impact on research supervision: Insights from Australian postgraduate research students. *Australasian Journal of Educational Technology*, 39(4), pp.74–88. Available from: <https://doi.org/10.14742/ajet.8843>.
- [9] Delello, J.A., Sung, W., Mokhtari, K., Hebert, J., Bronson, A. and De Giuseppe, T., 2025. AI in the Classroom: Insights from Educators on Usage, Challenges, and Mental Health. *Education Sciences*, 15(2), p.113. Available from: <https://doi.org/10.3390/educsci15020113>.
- [10] Eke, D.O., 2023. ChatGPT and the rise of generative AI: Threat to academic integrity? *Journal of Responsible Technology*, 13, p.100060. Available from: <https://doi.org/10.1016/j.jrt.2023.100060>.
- [11] Engeness, I. and Gamlem, S.M., 2025. Exploring AI-Driven Feedback as a Cultural Tool: A Cultural-Historical Perspective on Design of AI Environments to Support Students' Writing Process. *Integrative Psychological and Behavioral Science*, 59(1), p.23. Available from: <https://doi.org/10.1007/s12124-025-09894-8>.
- [12] Engeström, Y., 2001. Expansive Learning at Work: Toward an activity theoretical reconceptualization. *Journal of Education and Work*, 14(1), pp.133–156. Available from: <https://doi.org/10.1080/13639080020028747>.
- [13] Engeström, Y., 2008. *From Teams to Knots: Activity-Theoretical Studies of Collaboration and Learning at Work*. Cambridge University Press. Available from: <https://doi.org/10.1017/CBO9780511619847>.
- [14] Ganduri, L., Collier-Reed, B. and Shaw, C., 2023. A Cultural-Historical Activity Theory Approach To Studying The Development Of Students' Digital Agency In Higher Education. *51st Annual Conference of the European Society for Engineering Education (SEFI)*. Technological University Dublin. Available from: <https://doi.org/10.21427/Z2FC-5M29>.
- [15] Gough, D., Oliver, S. and Thomas, J., 2017. *An Introduction to Systematic Reviews*. 2nd ed. SAGE Publications Ltd.
- [16] Govender, N., 2023. Attributes and Relationships in the Supervisor – Supervisee Partnership: An Autoethnographic Study. In: M.A. Samuel and H. Mariaye, eds. *Transforming Postgraduate Education in Africa*. Durban: CSSALL, *Alternation African Scholarship Book Series*, vol. 14, chap. 6. Available from: <https://alternation.ukzn.ac.za/wp-content/uploads/2025/10/06-Govender-min.pdf>.
- [17] Grant, B.M., 2005. *The Pedagogy of Graduate Supervision : Figuring the Relations between Supervisor and Student*. Ph.D. thesis. The University of Auckland, Aotearoa New Zealand. Available from: <https://web.archive.org/web/20220617043356/https://researchspace.auckland.ac.nz/bitstream/handle/2292/295/02whole.pdf>.
- [18] Haggis, T., 2002. Exploring the 'Black Box' of Process: A comparison of theoretical notions of the 'adult learner' with accounts of postgraduate learning experience. *Studies in Higher Education*, 27(2), pp.207–220. Available from: <https://doi.org/10.1080/03075070220119986>.
- [19] Halpin, S.N., 2024. Inter-Coder Agreement in Qualitative Coding: Considerations for its Use. *American Journal of Qualitative Research*, 8(3), pp.23–43. Available from: <https://www.ajqr.org/download/inter-coder-agreement-in-qualitative-coding-considerations-for-its-use-14887.pdf>.
- [20] Harrison, S. and Grant, C., 2015. Exploring of new models of research pedagogy: time to let go of master-apprentice style supervision? *Teaching in Higher Education*, 20(5), pp.556–566. Available from: <https://doi.org/10.1080/13562517.2015.1036732>.
- [21] Hemer, S.R., 2012. Informality, power and relationships in postgraduate supervision: supervising PhD candidates over coffee. *Higher Education Research & Development*, 31(6), pp.827–839.

- Available from: <https://doi.org/10.1080/07294360.2012.674011>.
- [22] Higgins, J.P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., Welch, V. and Flemyng, E., eds, 2024. *Cochrane Handbook for Systematic Reviews of Interventions version 6.5 (updated August 2024)*. Cochrane. Available from: <https://www.cochrane.org/handbook>.
- [23] Iwashokun, O. and Ade-Ibijola, A., 2022. Structural Vetting of Academic Proposals. *International Journal of Advanced Computer Science and Applications*, 13(7), pp.772–782. Available from: <https://doi.org/10.14569/IJACSA.2022.0130790>.
- [24] Kaptelinin, V. and Nardi, B., 2007. Acting with technology: Activity theory and interaction design. *First Monday*, 12(4). Available from: <https://doi.org/10.5210/fm.v12i4.1772>.
- [25] Khalifa, M. and Albadawy, M., 2024. Using artificial intelligence in academic writing and research: An essential productivity tool. *Computer Methods and Programs in Biomedicine Update*, 5, p.100145. Available from: <https://doi.org/10.1016/j.cmpbup.2024.100145>.
- [26] Kouam, A.W.F. and Muchowe, R.M., 2024. Exploring graduate students' perception and adoption of AI chatbots in Zimbabwe: Balancing pedagogical innovation and development of higher-order cognitive skills. *Journal of Applied Learning & Teaching*, 7(1), pp.65–75. Available from: <https://doi.org/10.37074/jalt.2024.7.1.12>.
- [27] Lee, A., 2008. How are doctoral students supervised? Concepts of doctoral research supervision. *Studies in Higher Education*, 33(3), pp.267–281. Available from: <https://doi.org/10.1080/03075070802049202>.
- [28] Luckin, R., 2025. Nurturing human intelligence in the age of AI: rethinking education for the future. *Development and Learning in Organizations: An International Journal*, 39(1), pp.1–4. Available from: <https://doi.org/10.1108/DLO-04-2024-0108>.
- [29] Manathunga, C., 2007. Supervision as mentoring: the role of power and boundary crossing. *Studies in Continuing Education*, 29(2), pp.207–221. Available from: <https://doi.org/10.1080/01580370701424650>.
- [30] Maor, D., Ensor, J.D. and Fraser, B.J., 2016. Doctoral supervision in virtual spaces: A review of research of web-based tools to develop collaborative supervision. *Higher Education Research & Development*, 35(1), pp.172–188. Available from: <https://doi.org/10.1080/07294360.2015.1121206>.
- [31] Marengo, A. and Pange, P.J., 2024. Envisioning General AI in Higher Education: Transforming Learning Paradigms and Pedagogies. In: D. Guralnick, M.E. Auer and A. Poce, eds. *Creative Approaches to Technology-Enhanced Learning for the Workplace and Higher Education*. Cham: Springer Nature Switzerland, *Lecture Notes in Networks and Systems*, vol. 1150. Available from: https://doi.org/10.1007/978-3-031-72430-5_28.
- [32] McCallin, A. and Nayar, S., 2012. Postgraduate research supervision: a critical review of current practice. *Teaching in Higher Education*, 17(1), pp.63–74. Available from: <https://doi.org/10.1080/13562517.2011.590979>.
- [33] Mengist, W., Soromessa, T. and Legese, G., 2020. Method for conducting systematic literature review and meta-analysis for environmental science research. *MethodsX*, 7, p.100777. Available from: <https://doi.org/10.1016/j.mex.2019.100777>.
- [34] Mentz, E. and de Beer, J.J., 2021. Cultural-Historical Activity Theory as a lens in mixed methods research on self-directed learning. *South African Journal of Higher Education*, 35(5), p.163–183. Available from: <https://doi.org/10.20853/35-5-4364>.
- [35] Mofolo, M. and Lukman, Y., 2024. Enhancing quality through postgraduate supervision remodeling in higher education institutions. *Insights into Regional Development*, 6(3), pp.27–39. Available from: <https://doi.org/10.70132/y5362559939>.
- [36] Murphy, E. and Rodriguez-Manzanares, M.A., 2008. Using activity theory and its principle of contradictions to guide research in educational technology. *Australasian Journal of Educational Technology*, 24(4). Available from: <https://doi.org/10.14742/ajet.1203>.
- [37] Mwansa, G., Ngandu, M.R. and Dasi, Z.S., 2024. Enhancing Practical Skills in Computer Networking: Evaluating the Unique Impact of Simulation Tools, Particularly Cisco Packet Tracer, in Resource-Constrained Higher Education Settings. *Education Sciences*, 14(10), p.1099.

- Available from: <https://doi.org/10.3390/educsci14101099>.
- [38] Ngandu, M.R. and Kariyana, I., 2022. Influence of tablet PCs on learning processes in technical-oriented practical programmes at a historically disadvantaged rural-based higher education institution. *PONTE International Scientific Researchs Journal*, 78(9). Available from: <https://doi.org/10.21506/j.ponte.2022.9.8>.
- [39] Ngene, N.C., 2023. Teaching Philosophy in a Teaching Portfolio: Domain Knowledge and Guidance. *Advances in Medical Education and Practice*, 14, pp.1231–1248. Available from: <https://doi.org/10.2147/AMEPS428897>.
- [40] Okere, O.O., 2024. A content analysis of tweets on toxic doctoral supervision. *Journal of Applied Learning & Teaching*, 7(1), pp.226–234. Available from: <https://doi.org/10.37074/jalt.2024.7.1.26>.
- [41] Omodan, B.I. and Marongwe, N., 2024. The Role of Artificial Intelligence in Decolonising Academic Writing for Inclusive Knowledge Production. *Interdisciplinary Journal of Education Research*, 6(S1), pp.1–14. <https://www.researchgate.net/publication/385156943>, Available from: <https://doi.org/10.38140/ijer-2024.vol6.s1.06>.
- [42] Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J.M., Hróbjartsson, A., Lalu, M.M., Li, T., Loder, E.W., Mayo-Wilson, E., McDonald, S., McGuinness, L.A., Stewart, L.A., Thomas, J., Tricco, A.C., Welch, V.A., Whiting, P. and Moher, D., 2021. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 372, p.n71. Available from: <https://doi.org/10.1136/bmj.n71>.
- [43] Parry, E. and Pilbeam, C., 2024. *Impact in Doctoral Education: Product, Person and Process*. Routledge. Available from: <https://doi.org/10.4324/9781003342014>.
- [44] Pearson, M. and Brew, A., 2002. Research Training and Supervision Development. *Studies in Higher Education*, 27(2), pp.135–150. Available from: <https://doi.org/10.1080/03075070220119986c>.
- [45] Renkema, M. and Tursunbayeva, A., 2024. The future of work of academics in the age of Artificial Intelligence: State-of-the-art and a research roadmap. *Futures*, 163, p.103453. Available from: <https://doi.org/10.1016/j.futures.2024.103453>.
- [46] Sim, K.N., Northcote, M. and Lim, C.P., 2023. Technology-enabled undergraduate and post-graduate research supervision. *Australasian Journal of Educational Technology*, 39(4), p.1–5. Available from: <https://doi.org/10.14742/ajet.9149>.
- [47] Thomas, J. and Harden, A., 2008. Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, 8(1), p.45. Available from: <https://doi.org/10.1186/1471-2288-8-45>.
- [48] Uden, L. and Ching, G.S., 2024. Activity Theory-based Ecosystem for Artificial Intelligence in Education (AIED). *International Journal of Research Studies in Education*, 13(5), pp.41–54. Available from: <https://doi.org/10.5861/ijrse.2024.24000>.
- [49] Van den Bosch, K., Schoonderwoerd, T., Blankendaal, R. and Neerincx, M., 2019. Six Challenges for Human-AI Co-learning. In: R.A. Sottilare and J. Schwarz, eds. *Adaptive Instructional Systems*. Cham: Springer International Publishing, *Lecture Notes in Computer Science*, vol. 11597, pp.572–589. Available from: https://doi.org/10.1007/978-3-030-22341-0_45.
- [50] Vieriu, A.M. and Petrea, G., 2025. The Impact of Artificial Intelligence (AI) on Students' Academic Development. *Education Sciences*, 15(3), p.343. Available from: <https://doi.org/10.3390/educsci15030343>.
- [51] Vygotsky, L.S., 1978. *Mind in Society: Development of Higher Psychological Processes*. Harvard University Press. https://w.pauldowling.me/rtf/2021.1/readings/LSVygotsky_1978_MindinSocietyDevelopmentofHigherPsycholo.pdf, Available from: <https://doi.org/10.2307/j.ctvjf9vz4>.
- [52] Waghid, Y., ed., 2025. *Philosophical Adventures in African Higher Education: Cultivating Doctoral Encounters Within Democratic Citizenship Education*, Routledge Research in Higher Education. Routledge.

- [53] Wang, Y. and Xue, L., 2024. Using AI-driven chatbots to foster Chinese EFL students' academic engagement: An intervention study. *Computers in Human Behavior*, 159, p.108353. Available from: <https://doi.org/10.1016/j.chb.2024.108353>.
- [54] Ward, A., Manoharan, S. and Ye, X., 2024. Exploring Academic Integrity in the Age of Generative AI. *2024 21st International Conference on Information Technology Based Higher Education and Training (ITHET)*. pp.1–5. Available from: <https://doi.org/10.1109/ITHET61869.2024.10837603>.
- [55] Waring, P., 2024. Book review. Brookfield, Stephen D., Rudolph, Jürgen & Tan, Shannon (2024). *Teaching well: Understanding key dynamics of learning-centre classrooms*. Routledge. *Journal of Applied Learning & Teaching*, 7(1), pp.427–428. Available from: <https://doi.org/10.37074/jalt.2024.7.1.5>.
- [56] Wisker, G., 2012. *The Good Supervisor: Supervising Postgraduate and Undergraduate Research for Doctoral Theses and Dissertations*. 2nd ed. Palgrave-Macmillan.
- [57] Wright, A., 2024. Postgraduate Supervision in a ChatGPT World: What's Next? *10th International Conference on Higher Education Advances (HEAd'24)*. Valencia, 18-21 June 2024. Available from: <https://doi.org/10.4995/HEAd24.2024.17244>.
- [58] Zhai, C., Wibowo, S. and Li, L.D., 2024. The effects of over-reliance on AI dialogue systems on students' cognitive abilities: a systematic review. *Smart Learning Environments*, 11(1), p.28. Available from: <https://doi.org/10.1186/s40561-024-00316-7>.