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From chalkboards to AI chatbots: Pre-service teachers' readiness to reimagine ICT-Driven pedagogical innovations in a polycrisis

Melanie Bernadette Luckay

Department of Educational Studies, Faculty of Education, University of the Western Cape, Cape Town, South Africa
mluckay@uwc.ac.za
https://orcid.org/0000-0002-8601-1215

Oluwafemi Ebiseni Ebimomi

Department of Educational Studies, Faculty of Education, University of the Western Cape, Cape Town, South Africa
ebimomioluwafemi@gmail.com
https://orcid.org/0009-0003-1809-6020

Japhet Omolere Okuntade

Department of Educational Technology, College of Information and Communication Technology, Lagos State University of Education, Ijanikin, Lagos
okuntadejo@lasued.edu.ng
https://orcid.org/0009-0000-1760-7050

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Abstract

This study reflects on how pre-service teachers use their professional agency to be pedagogically fluid in polycrisis conditions. Innovative pedagogical practices cannot be understood as individual competence, particularly when using sophisticated ICT tools such as AI chatbots. Instead, pre-service teachers operate within an interconnected polycrisis. Contextual conditions interact to enable or constrain their capacity to innovate pedagogically, reframing pedagogical innovation as a shift from pre-service teachers' reliance on traditional chalkboards and whiteboards during crisis, to dynamic, technology-enhanced classrooms in which sophisticated ICT tools such as AI chatbots increasingly used beyond crisis conditions. This study employs a qualitative approach incorporating focus group discussions to investigate how pre-service teachers operate with fluidity within the interconnected polycrisis and develop professional agency for learners to experience equity, access, and engagement in classroom teaching and learning. Data were analysed through reflexive thematic analysis, revealing three main themes: rethinking pedagogy through AI and ICT integration, addressing equity and access in technology-rich teaching, and closing the gap between teacher training and real-world practice. The themes illustrate the interconnectedness and show how compounding polycrisis conditions, such as infrastructural, institutional, and socio-economic instability typical of Global South contexts, impact the development of pre-service teachers' professional agency in the classroom. The findings demonstrate the complexity of teacher education, as challenges of interconnected polycrisis conditions influence technological pedagogical innovations amongst pre-service teachers. Furthermore, they highlight the development of teacher agency as the pre-service teachers evolve within the teacher education programme to reimagine and innovate their classroom teaching practices.

Keywords: polycrisis, pedagogical innovation, chatbots, chalkboards, ICT

Introduction and background

In the South African context artificial intelligence (AI) is fast becoming a transformative resource for personalised learning and a new form of pedagogical reasoning for pre-service teachers (Langsford, 2021; Ndlovu et al., 2026; Sepula & Simuja, 2024; Stack, 2025). Yet across teacher education contexts, uptake is uneven and disappointing relative to policy expectations (Tarisayi, 2024; van Wyk et al., 2024). A large proportion of the empirical literature suggests a deficit explanation directed at pre-service teachers' professional agency, namely, a lack of digital skills or confidence to use ICT tools such as AI meaningfully (Campbell & Kapp, 2020; Meegan & Young, 2025). But this explanation is incomplete and signals a deeper problem: pre-service teachers are shaped by their teacher education training and school contexts, where overlapping polycrises shape their technological literacy, the choices they make, and, thus their professional agency (Campbell & Kapp, 2020).

AI readiness is enabled or constrained by contextual issues shaped by polycrisis. Research relies on theoretical models to explain AI readiness among teachers, which are also applicable to pre-service teachers (Frøsig & Romera, 2024; Tooze, 2021). The shift from a teacher-centred approach to more dynamic, ICT-driven learning spaces represents a significant change in the pedagogical practices of the 21st century (Abedi, 2024; UNESCO, 2021). However, existing theoretical models (e.g. TPACK, TAM) focus mainly on individuals in a stable context with constant infrastructure. Theoretical models that encapsulate context-specific conditions to guide our understanding of teacher professional agency in classroom practices are scarce, especially for pre-service teachers (Lee et al., 2025; List et al., 2020). Readiness to innovate pedagogically toward using AI in classroom practice should not be a checklist, but a system with context-specific conditions that support or deter pre-service teachers (Abedi, 2024; Schmitz et al., 2023). Framing conditions as a polycrisis rather than as a list of individual barriers to implementation is important because it explains why interventions addressing single conditions do not work (Homer-Dixon et al., 2022; Lawrence et al., 2024). However, the polycrisis conditions should be treated as interacting. Without such a lens, an intervention will have a limited effect if there is instability, for instance, a lack of institutional policy or uneven infrastructural conditions. Such instability can impact practices particularly for pre-service teachers who are developing their professional agency. Developing as a pre-service teacher in conditions of instability can impact their professional agency, including their confidence and technological habitus. This can lead to uncertainty, impacting their technological habitus, technological literacy, pedagogical readiness, and pedagogical innovation practices, and thus their ability to implement innovative pedagogical practices (Campbell & Kapp, 2020; Meegan & Young, 2025).

Higher education institutions preparing pre-service teachers for classroom practice must prepare them in light of the polycrisis conditions (Biesta et al., 2015; Tarisayi, 2024; van Wyk et al., 2024). Under the pressures of polycrisis conditions, especially where infrastructural and institutional support is needed, and where levels of technological literacy, pedagogical innovation readiness, and professional agency vary, many pre-service teachers in the Global South experience these interacting factors simultaneously (Meegan & Young, 2025). Often an

individual variable, for instance, only the pre-service teachers' professional agency, is the measure of success or failure in the use of sophisticated ICT tools such as AI chatbots, either rewarding them for success or reprimanding them for failure. Interventions targeting a single condition as part of the polycrisis, such as once-off training workshops, or in the case of infrastructure provision, financial resources often have limited success (Yildrim et al., 2026). Thus, models for teaching AI adoption in teacher education need to move beyond a linear, single-variable focus to interactive system-level foci capable of explaining the differentiated responses of pre-service teachers to the variable conditions of the polycrisis.

Many studies use single variables to determine pre-service teacher's professional agency to use ICT tools such as AI chatbots in the classroom, however, this can be considered a deficit model because all polycrisis conditions within a context probably inform pre-service teacher's choices when teaching (Meegan & Young, 2025). This study monitors pre-service teachers' views on pedagogical innovations through a polycrisis lens, focusing on conditions often experienced by pre-service teachers in the Global South.

Literature review

Polycrisis is not merely multiple crises occurring simultaneously. Rather, it is interconnected crises occurring simultaneously (Morin, 2008; Tooze, 2021). Conditions relevant to teacher education to teach with ICT tools, like infrastructural support, institutional support, variable levels of technological literacy, pedagogical innovation, readiness, and professional agency, impact pre-service teacher readiness to pedagogically innovate (Tooze, 2021). For instance, in order to teach with ICT tools like AI chatbots, a system of support must be present to allow the pre-service teacher to pedagogically innovate in the classroom. A single interruption causes tension across the entire systemic structure. While the pressures of policy in teacher education require the use of ICT tools in the classroom, the reality in the classroom is that the polycrisis impacts teachers' choices. For instance, an infrastructural crisis affecting digital access prevents pre-service teachers from using ICT tools in practice. As a result, pedagogical innovation is constrained, reducing teachers' confidence in engaging with ICT tools. This, in turn, widens the digital divide because learners are denied equitable opportunities to learn through the effective use of ICT (López-Fernández et al., 2021; Tondeur et al., 2017).

Technological literacy is an overarching construct through which this study conceptualises digital competence within the knowledge, skills, critical judgement, ethical awareness, and problem-solving capabilities (Mitcham, 1994). Within the hierarchy is ICT representing the broader digital infrastructure including internet connectivity, devices, learning management systems, and communication platforms. AI is a specialised subset of ICT that enables machines to perform cognitive tasks (Yildrim et al., 2026), generative AI extends AI to create new content, while AI chatbots are conversational applications of generative AI (GenAI) that support pedagogical tasks such as lesson planning, feedback, assessment, and personalised learning (UNESCO, 2023, 2024). Thus, AI literacy is conceptualised in this study as one component of a broader technological literacy rather than a separate competency. AI's sophistication lies in the fact that it enables machines to learn and understand logic like humans.

This technology is said to help simplify human life, which is very complex (Fitria, 2021). The use of AI-driven tools has become a promising innovation in educational reform, offering the potential to improve teaching, learning, and assessment by providing personalised learning experiences, immediate feedback, and reducing teachers' workload through automation of records and administrative tasks. Yet, a recent study shows that teachers lack motivation to incorporate ICTs and AI into educational environments (Collie & Martin, 2024). Therefore, Reiss (2021) suggests exploring how pre-service teachers accept AI-driven technologies, and identifying factors that influence their acceptance and use. Notwithstanding, sophisticated ICT tools like AI chatbots could present both opportunities and challenges for pre-service teachers; while they can promote learner engagement through personalised learning and responsiveness inside and outside the classroom, they also require a careful re-evaluation of teachers' roles and classroom dynamics.

The integration of AI tools into teacher education is in its early stages, especially in low- and middle-income settings where infrastructure, training, and policy frameworks are still developing (Kaye & Ehren, 2021). Importantly, implementing pedagogical innovation goes beyond just having digital tools; it requires a meaningful alignment between technological use and pedagogical goals. Traditional teacher training approaches, which often focus more on content mastery than on fostering pedagogical innovation, may fall short in preparing future teachers to handle the uncertainties and complexities of modern classrooms (van Wyk et al., 2024). Using AI for pedagogical innovation involves more than digital tools; it requires a stronger link between technology and the pedagogical intentions of pre-service teachers. There is a need for comprehensive digitalisation in the teacher preparation process. According to Beyer & Arndt (2024), this means shifting from the traditional approach to teacher education, which emphasises content and pedagogical knowledge, toward technological and pedagogical innovation, such as AI chatbots, that can better prepare the next generation of teachers.

Ideally, every pre-service teacher's goals should align with policy to use newer ICT technology tools, such as AI chatbots, to improve learner engagement because these can be ethically integrated into teacher education curricula and teaching practices to offer real-time, immediate feedback to learners during lessons (Abedi, 2024; Luckay & Marthinisen, 2023; Zaugg, 2024). This also highlights challenges related to digital equity, the digital divide, access to education, and the technological and pedagogical readiness of teachers, particularly pre-service teachers who often lack the tools needed to meet the demands of modern classrooms (Sepula & Simuja, 2024).

Theoretical framework

Many think that the polycrisis is simply "many crises" but this is incorrect; it means "many crises that interact with each other," like a spider web, and if one strand breaks then the entire web will be impacted. Arguably, teacher education works in the same way. If a teacher uses an ICT tool such as AI chatbots, then a polycrisis lens shifts our attention from a single variable directly restricting AI adoption to a number of interconnected crises—the polycrisis—limiting opportunities to teach with AI. For instance, a teacher's ability to use an ICT tool such as AI chatbots during teaching is likely to be reduced if the internet is not working. Indeed, poor internet is a result of infrastructural challenges, while interrupted electricity further reduces access to AI, lowering teachers' technological literacy and ultimately their confidence and teacher agency. Less AI integration also impacts schools and learners because schools remain digitally unequal, reinforcing the digital divide (Ayanwale et al., 2024; Reiss, 2021). This chain of events suggests that a single variable such as the internet not working is no longer the cause of decreasing opportunities for AI implementation, but that the cause is a network of interconnected crises conceptualised as the polycrisis.

Recent scoping reviews by Roe and Perkins (2025, 2026) show the limitations of these reviews, identifying a broader pattern in the field: research on GenAI's relationship to learner agency remains structurally tied to well-resourced, Anglophone institutional contexts, leaving the question of how autonomy and self-direction function under conditions of institutional precarity almost entirely unexamined. A significant gap exists where teacher and learner agency in many Global South contexts is already being shaped by overlapping crises such as economic, infrastructural, and epistemic marginalisation prior to any engagement with AI. Evidently AI adoption in the Global South is likely to be aspirational, especially for teachers and more so for pre-service teachers. Access and institutional context have not been further developed in the work of Roe and Perkins (2025, 2026) and Perkins et al. (2024).

While much of the literature on agency is framed as a binary between learner and teacher agency, pre-service teachers occupy a structurally distinct position that is often overlooked within this binary. They are students who are developing their agency as teachers in training (Luckay & Marthinisen, 2023; Luckin et al., 2022). They are simultaneously rehearsing the pedagogical agency that they are expected to model when qualified. Pre-service teachers occupy dual positions within a teacher education institution and in their school placements and are thus positioned centrally in teacher education (Kaye & Ehren, 2021). Placements in schools during teaching practice can place pre-service teachers in variable contexts, including well-resourced or under-resourced schools, urban or rural schools, multilingual schools, or schools where the environment is unsafe (Luckay & Marthinisen, 2023). Access to GenAI within these contexts can be variable. The access is thus not framed by what the pre-service teacher personally has, but by institutional and infrastructural conditions of the site in which they are at the time (Pedro et al., 2019; Reiss, 2021).

Thus, polycrisis conditions within diverse contextual environments exert the greatest influence on pre-service teachers' preparedness and technology integration. This is because many pre-

service teachers in South Africa, and more broadly across the Global South, are confronted with multiple and interconnected challenges including economic hardship, inadequate infrastructure, limited access to technological resources, and persistent systemic inequalities. These challenges do not occur independently; rather, they interact and reinforce one another, creating complex barriers that shape pre-service teachers' educational experiences, professional development, and capacity to integrate technology effectively into their teaching. Consequently, understanding teacher preparedness in these contexts requires recognising the cumulative impact of these overlapping crises because they fundamentally influence how pre-service teachers acquire technological competencies, exercise professional agency, and adopt contextually relevant pedagogical practices.

Agency within how learners use AI in the classroom can have a particular impact on pre-service teachers. Han et al. (2025) found that young learners frequently copied and pasted GenAI outputs without amendment, and for pre-service teachers the stakes of such behaviour extend beyond a single assignment. Without reflective and evaluative habits, termed evaluative judgement (Bearman et al., 2024), in lesson planning, microteaching, reflective journals, e-portfolios during teacher education, and so forth, pre-service teachers may develop uncritical GenAI practices that they could subsequently model for their learners. If this agency is not developed during their teacher education learning, it cannot easily be developed afterwards (Roe, 2025).

Situating pre-service teachers as a distinct agentic category, and placement conditions as a polycrisis variable shaping their formation within the institutional context of teacher education in the Global South, provides a lens for understanding the theory–practice divide and the digital divide. This theoretical perspective informs the interpretation of the findings of the study. It suggests that AI adoption cannot be understood solely as a matter of individual technological literacy. Rather, educators operate within an interconnected polycrisis in which infrastructural constraints, institutional uncertainty, and unequal opportunities for developing technological literacy collectively shape teachers' professional agency (Ayanwale et al., 2024). AI integration therefore emerges as a relational and context-dependent process in which broader systemic conditions either enable or constrain educators' capacity to innovate pedagogically (Perkins et al., 2024). Consequently, efforts to strengthen AI integration in teacher education require interventions that address not only technological skills but also the structural conditions that influence technological literacy and the development of teacher agency.

Methodology and procedure

This study adopted an interpretivist, qualitative case study design with a focus group discussion, chosen for its capacity to generate rich, context- specific understanding of how pre-service teachers experience and negotiate ICT tool use in conditions of infrastructural and institutional instability. Readiness is not a directly observable trait; rather, participants construct and narrate it in relation to their experiences at university and during placements at schools. The six participants were final year, 4th-year pre-service teachers within a Bachelor of Education programme, purposively selected to capture variation in disciplinary knowledge

and exposure to a variety of schools in the Western Cape Province of South Africa. Each participant was given a pseudonym to protect their identities: Siphelele, Candice, Siyabonga, Lisa, Luyanda, and Fuyokas. The participants included two male and four female pre-service teachers. Specifically, the six pre-service teachers were selected on the grounds that the research question requires information-rich cases capable of speaking to the interaction between structural conditions and individual practice rather than statistical representation. According to Braun & Clarke (2019), this sample size aligns with the principles of reflexive thematic analysis regarding participant numbers for interview or discussion-based studies. The focus group discussion was audio-recorded and transcribed to ensure data accuracy.

Data were generated through semi-structured interviews of 45–60 minutes, guided by an interview schedule structured around five sensitising concepts: infrastructure, technological literacy, pedagogical readiness, institutional support, and professional agency, while remaining open to participant-led accounts of how these conditions interacted with or compounded one another.

Data were analysed using Braun and Clarke's (2019) reflexive thematic analysis approach following a hybrid deductive-inductive coding process to identify patterns and meaning across the dataset. Initial coding was informed deductively by the five conceptual dimensions, while remaining inductively open to sub-themes and, critically, to patterns of interaction between dimensions that were not anticipated initially. Trustworthiness was addressed through member checking. Consistent with reflexivity principles, all data were coded, reviewed, and discussed by all authors of this study. We acknowledge one researcher's positionality as a teacher educator, which is not treated as a threat to validity but as an analytic resource, consistent with an interpretivist orientation.

Findings and discussion

Reflexive thematic analysis generated three themes that explain how pre-service teachers conceptualise the role of ICT tools such as AI chatbots within teacher education. Findings are presented theme by theme, each closing with a note on how it was seen to interact with the others, before a final synthesis subsection draws them together as an interacting system. The three themes are: (1) rethinking pedagogy through integrating AI chatbots and ICT, (2) addressing equity and access in technology-rich teaching, and (3) bridging the gap between teacher training and real-world practice. Together, these themes demonstrate that pre-service teachers' readiness to pedagogically innovate using AI extends beyond a single technological competence and their professional agency, but is shaped by contextual realities and the alignment between university preparation and professional practice directed by the polycrisis.

Theme 1: Rethinking pedagogy through the integration of AI chatbots and ICT

This theme captured the pre-service teachers' ability to reimagine teaching and aspire from traditional teaching practices to learner-centred interactive practices. The participants positioned AI as a partner rather than a replacement to promote learner engagement and

meaningful learning. This enabled them to move beyond the transmission of knowledge. Across the interviews it was evident that the pre-service teachers describe the use of ICT tools such as chatbots as a catalyst to transform classroom practice from traditional to collaborative innovative pedagogical practices for meaningful teaching and learning. Several participants demonstrated the benefits of AI-driven pedagogies, whether limited or high levels of exposure. They explained that AI stimulated learners' curiosity more than conventional teacher-centred approaches. For instance:

> I think the use of AI tools and ICT will make lessons more interactive, especially in some classes that are overcrowded. If, for example, I play a short educational video or I use AI to generate quizzes for my students, it could spark curiosity and make the class more interactive than the traditional lecture method. (Siphelele)

Similarly, Candice noted that from her limited experiences of using technology at schools during teaching practice, she observed enhanced learner engagement and participation. She aspired to use AI because it might yield better participation:

> During my lessons, I have used simple technology like my phone to bring real-world examples and pronunciation. I believe AI will do that better by helping the learners to practise spelling interactively, making the lesson more about the learners, and also allowing the students to ask questions.

Beyond efficiency, the participants viewed AI as a way to facilitate learner-centred classroom practices, shifting pedagogical practices toward innovation and allowing teachers to take on a more facilitative role. These constructivist perspectives in learning shifts learning from passive reception of information to interaction, inquiry, and dialogue. The pedagogical value they articulated was reinforced by Siyabonga who experienced a technologically rich learning environment during teaching practice. He contrasted digitally equipped schools with more traditional teaching environments, explaining that AI can create additional opportunities for teachers to promote higher order thinking skills:

> I had my teaching practice in a well-resourced school, where everything ran through computers and projectors, making my lessons more engaging, interactive, and learner-centred. I think it could go further with AI. AI will answer questions instantly, and it will allow me to focus on guiding the learners to think deeper instead of just teaching the content.

Participants viewed AI as a pedagogical tool to assist teachers to redistribute routine tasks while preserving teachers' central pedagogical responsibilities which enables them to spend more time on scaffolding for meaning learning. For instance, teachers can provide personalised feedback in large classrooms, clarifying concepts beyond the classroom and reflective learning:

> I feel AI could help create personalised feedback. For example, in large classes, it is impossible to help the learners equally, but AI chatbots could give immediate responses to questions and keep the learners engaged. (Lisa)

> Although we weren't trained to use ICT or AI directly, I am of the opinion that learning tools like ChatGPT can transform teaching. Instead of learners listening passively, they could ask the AI for clarification of some concept after the class. (Luyanda)

> I like to see AI being used for reflective learning, like for summarising what has been learnt and understood. It will help to shift lessons from just what's in the textbooks. (Fuyokas)

This suggests that applying AI technologies like chatbots, robots, and automated assessment tools could help simplify teaching and improve students' performance across various subjects (Lo, 2023; Martin et al., 2024). It supports the idea that using AI in teacher education can provide pre-service teachers with innovative tools for lesson planning, content development, and student support. According to respondents, this would inspire students' curiosity, making lessons more interactive compared to traditional classrooms. Therefore, effective integration of these technologies, as noted by Yim & Su (2024), would help align current pedagogical goals with specific methods that address the needs of 21st-century learners.

Although none of the respondents expressed concern about the potential limitations of AI, such as over-reliance that could undermine learners' critical thinking and interpersonal skills, this aligns with Luckin et al. (2022), who argued that although AI can enhance teaching and learning, it cannot fully replace the traditional, relational aspects of teacher-student interactions. The respondents' views suggest that using AI and ICT would allow pre-service teachers to focus on guiding learners to think more deeply instead of simply transmitting content through traditional pedagogical methods. This finding indicates that pre-service teachers are willing to use ICT-driven innovations to enhance pedagogy by providing personalised, interactive learning experiences.

These findings demonstrate AI was conceptualised primarily as a pedagogical innovation rather than a simple technological advancement. They reimagined their classroom teaching to have richer forms of learning characterised by facilitating learner engagement rather than technological efficiency. These findings confirm that GenAI can support lesson planning, assessment construction, and personalised feedback for learner engagement (Lo, 2023; Martin et al., 2024). Recent research has argued that teacher education must integrate AI as a pedagogical resource rather than a technical skill (Yim & Su, 2024). Participants recognised the use of AI as more than a technical skill, but rather as a tool to strengthen their pedagogical practices rather than diminishing them, supporting contemporary views that teachers acts as facilitators of learning in AI-enhanced learning environments. On the other hand, the overwhelmingly positive responses expressed by the participants, with none of them critically discussing AI, including algorithmic bias, inaccurate outputs, learner over-reliance, or the erosion of critical thinking skills, suggest that participants' understanding of AI remain aspirational rather than critically informed. This is a concern raised by Luckin et al. (2022).

Overall, the theme suggests that pre-service teachers are receptive to AI-enabled pedagogies and envision classrooms characterised by greater interaction, personalisation, and learner agency. However, the aspirations highlight a lack of critical engagement highlighting the need

for teacher education programmes to move beyond basic AI literacy to critical AI-technological literacy. Thus, AI readiness involves preparing pre-service teachers to make informed pedagogical decisions about when, why, and how AI should support learning rather than simply integrating technology for its own sake.

Theme 2: Addressing equity and access in technology-rich teaching

The second theme illustrates that the use of ICT tools is negotiated through structural inequalities shaped by a polycrisis. Although pre-service teachers aspired to use ICT tools such as chatbots in their future classrooms, the aspirations were moderated by unequal educational classroom contexts. They realised that access is not universal and that the transformative educational potential of ICT tools is contingent on learners' access to devices, internet connectivity, school infrastructure, linguistic inclusion, and safe learning environments. Thus, ICT tools such as chatbot use was viewed as not simply a pedagogical decision but as constrained by socio-economic conditions that shape educational opportunities through the digital divide (Bocchi & Gregg, 2019; Johnny & Martin, 2025; Okocha & Edafewotu, 2022). The participants repeatedly described unequal access to technology as the greatest obstacle to implementing the use of ICT tools. Infrastructural constraints were discussed as follows by participants:

> The biggest challenge that I saw was unequal access: some learners had no access to ICT devices and wi-fi, which makes it difficult to plan a tech-rich lesson. Even though there is a plan to use AI, it's pointless because most learners won't have access to it. (Siphelele)

> In my class, learners are not allowed to bring phones, and the computer lab also has a few computers. COVID-19 showed that some could learn online, while others would be left behind. This often makes me think about the best way to design my lessons to close these gaps. (Candice)

Beyond the challenges of access, there were safety concerns (such as crime) that could deter learners from using ICT tools outside the school. Hence, there should be policies to ensure that digital learning tools can be used in a safe environment, such as the school. The matter of linguistic barriers for learners was also raised. One respondent opined that many educational applications are developed in English, which could marginalise learners who use their home language, especially in early years' education. This calls for multilingual support for developing educational applications to promote inclusivity in learning. The findings highlight the challenges of negotiating equity in technology-enhanced instruction and the need for initiatives that address issues related to infrastructure, language, safety, and skills. Pre-service teachers must thus identify challenges that learners might encounter, and develop lessons that strike a balance between innovation and accessibility.

> At schools where everyone has access to laptops and other devices, learning could continue even during disruptions. Although in some schools, learners have no access to

> devices. To address this, it is important to combine digital and non-digital resources so that no learners will feel excluded. (Siyabonga)
>
> Language matters; some learners might struggle to navigate apps in English. To bridge the learning gap, one must consider multilingual support so that one learner will feel that technology is for a [particular] set of learners. (Luyanda)
>
> Inclusivity does not mean only access to devices, but also teaching digital skills for early years so that when the learners get to high school, they will be confident about using ICT. Otherwise, the digital divide might keep growing. (Fuyokas)
>
> The digital divide is made worse by issues like crime; even if learners have phones, the phones are unsafe to use after school. Hence, there should be policies that would make digital tools accessible safely within school hours and spaces. (Lisa)

Rather than rejecting AI, the participants advocated for context-responsive pedagogical innovation in which technology complements rather than replaces existing teaching approaches. Their accounts suggest that equitable AI integration depends not only on infrastructure but also on policies and pedagogies that acknowledge diverse educational realities. Ultimately, the goal is not to prioritise technology for its own sake, but to design resilient education systems that remain accessible, inclusive, and effective in the face of disruption.

Theme 3: Closing the gap between teacher training and real-world practice

The theme captures the disconnect participants experienced between university-based teacher preparation and the realities of contemporary classrooms. They emphasised the theoretical value of ICT despite being provided with limited opportunities to develop practical competence in using ICT tools in authentic classroom learning environments during teaching practice. Evidently, many participants found that they encountered AI-supported pedagogy for the first-time during school placement rather than university training. This supports the findings of Borthwick and Hansen (2017), who state that teacher education programmes often fail to provide practical, hands-on training in technology integration. This is evident in some responses from the participants:

> At the university, lecturers mention the use of technologies, but no real practice in using them to teach. When I eventually got to the school of practice, I felt unprepared. AI tools could help to bridge the gap by providing digital resources to adapt even with limited equipment. (Siphelele)

Despite being taught about ICT and other digital tools, there was no hands-on or practical experience, which caused a feeling of unpreparedness during teaching practice.

> We weren't shown how to create ICT-based lessons for large, under-resourced classes. If teacher education included practical projects using AI and ICT, it would help us improve in real schools. (Candice)

From interactions with other respondents, pre-service teachers seldom learn how to design ICT-supported lessons for large, under-resourced classrooms, which are common in many public schools.

> During my teaching practice, I saw tech used fully and realised what's possible. But in teacher training, we mostly hear theory. Using AI chatbots or creating e-lessons during training would make us more confident to try them in practice. (Siyabonga)

For some, the difference between theory-based learning in the university classroom and the practical demands of teaching only becomes clear during teaching practice. One respondent reflected on how observing effective use of technology in real classroom settings showed what was possible, suggesting that incorporating AI tools or e-lesson design into teacher training could boost confidence to experiment in practice. This view aligns with Koehler and Mishra's (2009) TPACK framework, which stresses that pedagogical knowledge becomes meaningful when applied in authentic teaching contexts.

> We are taught using the old methods, where the lecturers talk and we listen, yet we are expected to teach interactively during our practice. If we use ICT tools in training, it will be natural and easier to bring such to practice. (Lisa)

> The biggest challenge is turning knowledge into practice. The use of AI and ICT can offer templates to be used, and they can offer immediate feedback and ideas. These will make the process of lesson planning simpler and more connected to classroom realities. (Fuyokas)

Overall, this theme conveys that teacher education programmes need to make teaching more interactive, real, and intuitive, which helps bridge the gap between training and practice beyond unexpected interruptions (Ngao et al., 2022; Steketee, 2005). Similarly, other participants highlighted the potential of newer technologies like AI tools to directly support lesson planning and the design of learning resources. Some also suggested that a dedicated module on ICT-integrated lessons, supported by AI chatbots to recommend learning materials, could save time and reduce planning stress during school practice. This aligns with the findings of Holmes et al. (2019), who observed that AI-assisted tools can significantly simplify lesson preparation.

Other respondents expressed concerns about the mismatch between the pedagogical models taught during the teacher education programme and those expected during practice. While teacher education curricula often rely on traditional lecture-based delivery, the pre-service teachers, on the other hand, are expected to implement a learner-centred, interactive, and technology-infused methodology in lessons during teaching practice and professional practice. This highlights the gap between what is taught in the teacher education programme and what is expected in the modern classroom.

The final respondent highlighted the importance of translating pedagogical knowledge into practice enhanced by technology, identifying this as the most difficult part of teacher training. Shah (2023) argues that this challenge can be reduced by the use of AI chatbots and ICT tools, which can help develop lesson templates, instructional ideas, and offer immediate feedback to learners. This view aligns with research on scaffolding in teacher education (Bennett & Lockyer, 2008), suggesting that AI chatbots can serve as a form of digital scaffolding that supports innovative practices in teacher training programmes through the integration of technology into pedagogy.

Conclusions

Collectively, these findings suggest that AI competence develops most effectively when technological knowledge is embedded with authentic teaching experiences (Ayanwale et al. 2024; Roe, 2025; Roe & Perkins, 2025, 2026). Rather than positioning AI as an additional content area, teacher education programmes should integrate AI thoughtfully throughout curriculum design, microteaching, lesson planning, and teaching practice so that pre-service teachers develop confidence through repeated situated experiences (Frøsig & Romero, 2024, Roe & Perkins, 2026).

This study highlights the need to rethink traditional teaching models in the transition to a digital landscape in education. As teacher education struggles to contend with the advancement of ICTs and the use of AI chatbots, it becomes imperative for pre-service teachers to be equipped with the practical skills to innovate teaching and adapt to the needs of their students using the technologies (Langsford, 2021; Ndlovu et al., 2026) and abroad (Collie & Martin, 2024; Meegan & Young, 2025; Reiss, 2021; Roe, 2025, Roe & Perkins, 2026; Shah, 2023; Yim & Su, 2024). The findings emphasise the importance of digital pedagogy in the teacher education curriculum so that pre-service teachers can use technology to improve access, promote equity, and facilitate student engagement. Solving these problems requires that teaching must be conceptualised in a way that properly migrates from the traditional model to the use of technologies (Luckay & Marthinisen, 2023).

This study also reveals that while pre-service teachers showed willingness to integrate technology, polycrisis challenges, such as limited access, inequality, the digital divide, and other contextual challenges in South African schools, remain significant barriers that are common in Global South contexts. Often, research in the Global North does not capture the nature of the polycrisis we experience in the Global South (Aoun, 2024; Ayanwale et al., 2024; Langsford, 2021; Luckay & Martinisen, 2023; Ndlovu et al., 2026; Ngao et al., 2022; Okocha & Edafewotu, 2022; Roe, 2025; Roe & Perkins, 2026) and specifically, in the South African context (Biesta et al, 2015). Teacher education institutions must establish supportive environments that involve practical training, mentorship, and collaborative learning to help close the gap between theory and practice. In these environments, pre-service teachers can explore, reflect on, and improve their methods of using ICT, especially AI driven ICT, to enhance innovative pedagogies with the support of these communities of practice. Ultimately, comprehensive changes in theory, practice, and policy that recognise technology as an essential

element of pedagogical innovation are required for the successful integration of AI and digital technologies in teacher training (UNESCO, 2023, 2024).

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