Journal of Education and e-Learning Research
Vol. 13, No. 4, 65-75, 2026
ISSN(E) 2410-9991 / ISSN(P) 2518-0169
DOI: 10.20448/jeelr.v13i4.9692
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Reconceptualizing student teachers' AI literacy in the Global South: Towards a teacher AI-readiness mapping framework

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Abstract

The responsible use of AI in the classroom begins with teachers' knowledge and skills needed to integrate AI into the educational context. This study used a qualitative single-case study design to examine AI literacy and readiness among pre-service teachers in the Global South. Grounded in a conceptual framework combining AI literacy and technology acceptance, the study explores how pre-service teachers perceive, use, evaluate, and envision AI as their professional roles evolve. Data were generated from open-ended questionnaire responses from 197 first-year Bachelor of Education students enrolled at the University of South Africa, an open distance e-learning institution. Through iterative engagement with the data, six interrelated themes emerged: AI knowledge, AI skills, AI ethics, AI confidence, AI critical reflection, and AI pedagogical imagination. The findings indicate that AI readiness extends beyond technical competence or familiarity with tools. It is developmental, uneven, and shaped by contextual conditions such as access, language, and institutional guidance. Based on these insights, a framework is proposed to map teacher AI readiness and identify readiness gaps. The findings emphasise that teacher education programmes should go beyond tool training to include ethical clarity, policy guidance, confidence, critical thinking, pedagogical design, and equitable access.

Keywords: AI literacy, Global South, Open distance e-learning, Pre-service teachers, Teacher AI-readiness.

Citation | Berg, G. V. D., & Mudau, K. (2026). Reconceptualizing student teachers' AI literacy in the Global South: Towards a teacher AI-readiness mapping framework. *Journal of Education and E-Learning Research*, *13*(4), 65–75. 10.20448/jeelr.v13i4.9692
History:
Received: 3 July 2026
Revised: 14 September 2026
Accepted: 6 October 2026
Published: 3 November 2026
Licensed: This work is licensed under a Creative Commons Attribution 4.0 License
Publisher: Asian Online Journal Publishing Group

Funding: This study received funding from The Commonwealth of Learning.
Institutional Review Board Statement: The Ethical Committee of the University of South Africa's College of Education, South Africa, has granted approval for this study on 14 February 2024 (Ref. No. 2024/02/14/90255224/19/AM).
Informed Consent Statement: Participants provided electronic informed consent by selecting a checkbox in Google Forms to confirm that they had read the study information and agreed to participate in the study.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.
Disclosure of AI Use: The authors used OpenAI's ChatGPT for language editing, clarity, and conciseness. All AI-assisted suggestions were critically evaluated, revised where needed, and verified against the original text. The authors take full responsibility for the accuracy, originality and integrity of the final manuscript. During data analysis, Galaxi.ai was used as a secondary comparison mechanism to identify potentially overlooked patterns or alternative groupings. It did not undertake primary coding, generate the final themes or make interpretive decisions. All outputs were evaluated against the original data, and responsibility for the analysis remained with the researchers.

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Contribution of this paper to the literature

This study reconceptualises AI literacy as multidimensional teacher AI readiness, shaped by contextual conditions in the Global South. Based on the empirical findings, the study presents a Teacher AI-readiness Mapping Framework that integrates knowledge, skills, ethics, confidence, critical reflection and pedagogical imagination. The framework can help teacher education programmes identify readiness gaps and provide targeted support.

1. Introduction

Rapid integration of artificial intelligence (AI) in education is often framed as a technical or pedagogical challenge, driven by questions about tool adoption, efficiency, and innovation. However, AI is also reshaping how knowledge is produced and accessed. Much of the emerging literature focuses on how teachers use AI tools and their perceptions of their potential for teaching and learning (Hong, 2023; Zhang, Schießl, Plößl, Hofmann, & Gläser-Zikuda, 2023). Although such studies offer valuable descriptive insights, the more fundamental concern this research addresses is what it means to be a genuinely AI-ready teacher. In this context, AI literacy has emerged as a key concept. The term generally refers to the knowledge, skills and ethical awareness required to understand how AI systems function, evaluate their output critically, and use them responsibly in different contexts (Miao & Cukurova, 2024; Ng, Leung, Chu, & Qiao, 2021; Zhang, Diao, Ma, Tang, & Ding, 2024). Although this definition highlights important competencies, it does not necessarily explain whether individuals can enact these capacities in educational contexts. For this reason, a distinction is made between AI literacy and AI readiness. While AI literacy refers to the competencies that enable people to understand and use AI technologies, AI readiness refers to the ability to apply these competencies meaningfully within specific institutional, socio-cultural, and infrastructural contexts (Balasa, 2025). Teacher readiness includes not only knowledge and technical skills, but also ethical judgement, confidence, critical reflection, and the ability to imagine pedagogically appropriate uses of AI (Lademann, Henze, Honke, Wollny, & Becker-Genschow, 2026). Yet, these dimensions of readiness remain under-theorised, especially in contexts where access to digital infrastructure and exposure to AI are uneven (Maimela & Mbonde, 2025). Developing AI readiness is particularly important for pre-service teachers in South Africa and similar Global South contexts, where digital inequality may constrain meaningful engagement with AI. Addressing these complexities is therefore an important responsibility of teacher education programmes (Acheampong et al., 2025).

Global policy frameworks (e.g., the UNESCO AI Competency Framework for Teachers and the EU Digital Competence Framework for Educators) guide and emphasise the development of AI competencies for teachers. However, such frameworks often rely on implicit beliefs of stable connectivity, digital exposure, and institutional governance that are not consistently available across Global South contexts. Additionally, teachers may use AI tools confidently while remaining uncertain about their epistemological reliability, ethical implications, or pedagogical appropriateness (Chiu, Ahmad, Ismailov, & Sanusi, 2024; Dilek, Baran, & Aleman, 2025). These limitations demonstrate that AI readiness cannot be equated with technology use and acceptance.

Based on the above, this study is guided by the following research question.

How can teachers' AI literacy be reconceptualised in the Global South to support a multidimensional understanding of teacher AI readiness?

Drawing on data from pre-service teachers at an open distance e-learning (ODeL) university in South Africa, the research examined how the dimensions of AI literacy are used and perceived in practice and how they intersect to shape readiness. Based on the analysis, the study presents an empirically derived framework for mapping teacher AI readiness and identifying readiness gaps.

2. Literature Review

2.1. Conceptual Framework: AI Literacy and Technology Acceptance for Understanding Teacher AI Readiness

AI literacy is conceptualised differently across the literature, reflecting different views on what individuals need to know and be able to do when engaging with AI. Long and Magerko (2020) conceptualise AI literacy broadly as a set of technical, cognitive, and ethical competencies, providing a valuable foundation for general use of AI. On the other hand, Ng et al. (2021) propose a definition for AI literacy, consisting of four components: 1) knowledge and understanding of AI, 2) practical application of AI, 3) evaluation of AI's effectiveness and implications, and 4) awareness of the ethical issues surrounding AI applications. This understanding extends AI literacy beyond technical knowledge, although, as with Long and Magerko, it does not focus on how these capacities apply to teacher education contexts. Miao and Cukurova (2024) positions AI competence within teachers' professional practice. Its 15 competencies are organised across five dimensions: a human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning. Although it functions as a normative framework specifying competencies to be developed, it does not explain how issues relevant to this study, such as uneven access, limited prior exposure, language diversity, institutional guidance or policy uncertainty, may enable or constrain the development of AI literacy. Based on this synthesis, we define AI literacy in teacher education as a multidimensional, contextually situated capacity that includes knowledge and understanding of AI, practical use of AI tools, critical evaluation of AI-generated outputs, ethical awareness, and pedagogical application. Enhancing AI literacy in teacher education is widely recognised as essential for preparing teachers to engage with AI responsibly and critically.

In addition to AI literacy, this study is also informed by the broader literature on technology acceptance and technology integration in education. Established models such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) have shown that technology adoption is shaped by aspects such as perceived usefulness, perceived ease of use, performance expectancy, effort expectancy, social influence, facilitating conditions and behavioural intention (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003). These concepts help explain why pre-service teachers may adopt, hesitate to use, or avoid AI. However, acceptance should not be equated with readiness. A pre-service teacher may perceive AI as useful and use it regularly, but may lack the capacity to evaluate its outputs or make ethically defensible decisions about integrating it into teaching

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and learning. On the other hand, a student may possess emerging critical and ethical awareness but avoid AI because of limited access or unclear institutional guidance. TAM and UTAUT are therefore not used here as comprehensive explanations of teacher AI readiness, but as sensitising concepts to understand how usefulness, ease of use, confidence and facilitating conditions intersect with AI literacy.

2.2. AI-Generated Knowledge, Ethics and Pedagogical Judgement

Generative AI systems produce linguistically fluent information that may appear authoritative, yet their outputs are not always accurate, contextually appropriate, or aligned with disciplinary knowledge. In teacher education, AI tools are often used pragmatically for content creation, lesson planning, explanations, summarisation, assessment preparation and language support, but this does not necessarily indicate a deep understanding of how AI-generated knowledge is produced or validated (Harianti, Kadarohman, & Anwar, 2025). These epistemological challenges are particularly significant in Global South contexts, where AI systems may not adequately reflect local knowledge, linguistic diversity or socio-economic realities (Cross & Feldman, 2025). Pre-service teachers, therefore, need to develop the ability to judge when AI can be trusted, when its outputs require verification, and how AI-generated content should be combined with human reasoning and contextual knowledge.

Ethical awareness is another important but complex dimension of AI literacy. Existing studies identify concerns around academic integrity, authorship, algorithmic bias, misinformation, dependency, privacy and the wider social consequences of AI integration in schools (Holmes et al., 2022; Nguyen, Ngo, Hong, Dang, & Nguyen, 2023). However, awareness of these concerns does not necessarily enable teachers or students to make confident ethical decisions. While some may recognise the usefulness of AI tools, others may avoid their use because they are uncertain about acceptable practices and are uncertain about ethical boundaries and professional responsibilities (Holmes et al., 2022; Nazim & Alzubi, 2025). Such uncertainty can influence whether AI is used confidently, cautiously or avoided altogether.

Pedagogical judgement connects technical, epistemological and ethical capacities to teachers' professional practice. It involves the ability to envision, justify, and oversee ethically situated uses of AI within curriculum design, assessment, learner engagement, and teacher decision-making (Wyatt-Smith, Adie, & Harris, 2024). There is therefore a need for human oversight to sustain professional judgement, which is essential for AI-mediated teaching (Ester Mariñoso, Caballero García, Morales Jareño, & Cañadas Rodriguez, 2025). The literature highlights an important distinction between using AI to complete teaching tasks and making informed pedagogical decisions about its use. Teachers must be able to evaluate when AI should be used, when it should be resisted, and how potential harm can be reduced.

2.3. Critical Reflection and Pedagogical Imagination for AI-Mediated Teaching

Critical reflection enables teachers to evaluate both the advantages and challenges of these technologies. Walter (2024) connects critical thinking with AI literacy, stating that meaningful engagement with AI requires more than technical proficiency. Critical reflection should, however, not be understood as the ability to detect only incorrect information. It also involves examining how AI may influence curriculum decisions and assessment practices. In doing so, it enhances their ability to translate their understanding of AI into informed professional judgement. This includes the innovation and foresight to imagine how AI can meaningfully and ethically improve teaching and learning in appropriate, context-specific ways. Policy documents, research papers, and professional discussions emphasise the transformative potential of AI in education (Bozkurt, 2023) while empirical studies show that teachers often struggle to move beyond basic AI applications, limiting meaningful pedagogical integration (Mhlanga, Denhere, & Moloi, 2022). This contrast suggests that recognising AI's possibilities does not automatically lead to meaningful pedagogical integration. Without opportunities to critically examine AI's pedagogical implications during teacher preparation, AI use may remain instrumental rather than intentionally pedagogical (Sun, Tian, Sun, Fan, & Yang, 2024). Scholars therefore contend that teacher education must explicitly address how AI influences curriculum design, assessment practices, learner engagement, and teacher judgement (Onal & Kulavuz-Onal, 2024). In the Global South, pedagogical imagination is further limited by unequal access to digital resources, infrastructural challenges, and policy uncertainty (Labuschagne, Ramaila, & Dhurumraj, 2023; Vesna, Sawale, Kaul, Pal, & Murthy, 2025). Consequently, pre-service teachers' visions of AI-enhanced learning may be aspirational, still developing, or disconnected from classroom realities. This underscores the need for deliberate preparation for AI-mediated teaching.

Based on the literature, three limitations were identified. First, AI literacy frameworks identify important competencies but do not necessarily focus on teachers' professional practice. Second, teacher competency frameworks do not adequately provide the needed insights into how readiness may develop in uneven or constrained contexts. Lastly, technology acceptance models explain willingness and opportunity to incorporate technology but do not focus on ethical use, critical reflection, and pedagogical imagination. For these reasons, this study addresses these limitations by proposing a Teacher AI-readiness Mapping Framework. This framework is not intended to replace existing literature on literacy, competency, or technology acceptance. Instead, it builds on the literature and serves as a diagnostic lens for identifying where readiness is emerging, where the gaps are, and where institutional support is needed.

3. Background and Context of the Current Study

The integration of AI, and specifically generative AI, into education is often seen as a way to democratise access to knowledge and reduce inequality. However, scholars warn that AI could also worsen existing disparities, especially where access to digital infrastructure is uneven (Reiss, 2021). In South Africa, as in many parts of the Global South, teachers and learners encounter ongoing differences in connectivity, device access, and data affordability, with rural areas most affected (Mwansa, Ngandu, & Mkwambi, 2025). Although situated in the Global South, this study uses the context analytically to highlight structural factors shaping AI readiness rather than to compare it with Global North settings. Also, the Global South should not be treated as homogeneous, as contexts differ significantly in infrastructure, policy development and technological innovation. These differing realities

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shape how AI is used, understood, evaluated and trusted. ODeL institutions, the focus of this study, add another layer of complexity. Students are required to exercise substantial self-regulation and develop advanced digital competencies. In these settings, AI is viewed ambivalently. On the one hand, it offers potential support through assistance with language, information, and summarisation that can enhance learning and foster academic success. However, AI may also contribute to digital exclusion when technical, financial, or cognitive barriers prevent learners from fully engaging with AI tools.

4. Methodology

4.1. Research Design

The study employed an interpretive qualitative paradigm, making it well-suited for exploring how individuals construct meaning (Kivunja & Kuyini, 2017). A single case study was adopted, focusing on first-year Bachelor of Education students enrolled at a South African open distance e-learning institution. This context was appropriate because ODeL students are expected to engage with digital tools in largely self-directed learning environments.

4.2. Methods

The study was conducted in the College of Education at the University of South Africa, an open distance e-learning (ODeL) institution. The university has a student population of more than 400,000, and its College of Education trains more than 40% of teachers in the country. It serves students across diverse geographical and socio-economic contexts. A total of 424 first-year student teachers were invited to participate through their institutional email addresses, and 197 completed the questionnaire. The participants were registered for the Senior Phase and Further Education and Training teaching phases. They represented diverse rural, urban and semi-urban contexts. Of the participants, 125 were female, 68 were male, and 4 did not disclose their gender. The focus on first-year students was deliberate, as they offered insight into emerging rather than fully developed AI literacy and readiness.

Data were generated using an open-ended questionnaire created in Google Forms. The instrument was designed after reviewing relevant literature on AI literacy and teacher readiness (Dilek et al., 2025; Holmes et al., 2022; Long & Magerko, 2020; Miao & Cukurova, 2024; Ng et al., 2021). The questionnaire covered five conceptual areas: 1) knowledge and understanding of AI systems; 2) practical use and skill development; 3) ethical concerns and academic integrity; 4) perceived preparedness; and 5) pedagogical imagination and future classroom application. The open-ended format allowed participants to describe their experiences, uncertainties, and aspirations in their own words. The instrument was reviewed by three academics with expertise in AI and teacher education, after which minor wording and alignment revisions were made. Although the questionnaire enabled responses from a relatively large cohort, it did not allow for probing or follow-up questions. The analysis focused on patterned meanings across the dataset rather than detailed individual narratives.

4.3. Data Analysis

Data were analysed using reflexive thematic analysis, guided by Braun and Clarke (2019). The analysis was initially informed by the conceptual areas that shaped the questionnaire, while still allowing for refinement and the identification of patterns across the responses. The process was both deductive and inductive. The conceptual framework was used to focus on different dimensions of AI literacy, while the final themes were developed through repeated engagement with the data.

All responses were exported from Google Forms to an Excel spreadsheet, and were read several times to gain familiarity with the dataset. Initial coding was conducted manually within the literature-informed domains, after which more specific codes were generated to capture recurring patterns, contradictions, and tensions. The data were then coded manually, with codes assigned to sections relevant to the research question. Coding consistency was supported by applying similar codes across the dataset. The coding was treated as iterative rather than fixed, enabling us to revisit earlier responses when we refined codes. Particular attention was given to contradictions, such as participants reporting frequent AI use while expressing low confidence in AI or admitting ethical risks while remaining uncertain about acceptable practices. Such comparisons contributed to the distinction between AI knowledge, AI skills, AI confidence, AI critical reflection, and AI pedagogical imagination. Themes were refined until each theme captured a distinct but interrelated dimension of teacher AI readiness.

Researcher reflexivity was maintained throughout the process. As researchers in ODeL and teacher education, we recognised that our interest in the topic and our disciplinary knowledge could influence our decisions. We therefore reflected critically and used reflexive notes to document interpretive decisions and assumptions. We conducted the initial coding separately and discussed and compared our notes before consolidating and finalising the codes and themes.

To support reflexivity, Galaxi.ai, an AI-assisted tool, was used to cross-check emerging themes. Anonymised data was entered, and the tool was not used to generate themes or conduct primary coding. Its coding was compared with the researchers' initial coding, theme development, and interpretive decisions. The process allowed us to identify potentially overlooked patterns or areas needing further examination. Any differences were resolved through renewed engagement with the responses. The AI tool, therefore, served solely as a secondary comparison mechanism to identify potential blind spots or overlooked patterns. In line with the paper's critical stance toward AI, its use was treated cautiously and transparently, with human oversight.

Trustworthiness, as explained by Lincoln and Guba (1985), was addressed throughout the process. Credibility was enhanced through repeated engagement with the complete dataset, comparison across responses, and attention to both recurring patterns and contradictions.

Dependability was achieved by documenting changes to codes, establishing thematic boundaries, and making ongoing decisions as the analysis progressed. Confirmability was strengthened through researcher reflexivity, continued checking of interpretations against the original data, and the inclusion of participants' verbatim quotes. Transferability was addressed by providing a detailed description of the institutional setting, participant group, research methodology, and study context.

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4.4. Ethical Considerations

The study was conducted in accordance with the principles stated in the Declaration of Helsinki. We obtained ethical clearance from the College of Education at the University of South Africa (Reference number 2024/02/14/90255224/19/AM). Participation was voluntary; electronic informed consent was obtained as part of the questionnaire, and anonymity was ensured. Consent was obtained through a checkbox in Google Forms, which participants selected to confirm that they had read the study information and agreed to participate. Each participant was assigned a pseudonym in the form of S1-S197, which was used when quoting participants.

5. Findings and Discussion

Six interrelated themes were developed (see Table 1).

Table 1. Themes and their explanations.

Theme	What it entails
1. AI Knowledge	Understanding what it is and what it does
2. AI Skills	What students can do using AI tools
3. AI Ethics	Concerns about plagiarism, dependency and harm
4. AI Confidence	Comfort, hesitation, and structural conditions
5. AI Critical Reflection	Questioning limits, bias, and accuracy
6. AI Pedagogical Imagination	Envisioning AI in future classrooms

5.1. AI Knowledge – Understanding What it is and what it Does

AI Knowledge refers to pre-service teachers' understanding of what AI is, how it functions, and how it differs from other digital technologies. It is therefore both epistemological and practical, involving more than mere familiarity with particular tools. When asked about their knowledge and use of technology and AI tools, participants displayed uneven and sometimes fragmented understandings. Aside from MS Word, which students were required to use for assignments, 29 participants identified themselves as non-users of AI or other advanced technologies. Most responses were vague, suggesting limited exposure to AI, fear of plagiarism and cheating, and an emerging stage of AI engagement rather than a lack of capacity (Hong, 2023; Onal & Kulavuz-Onal, 2024; van den Berg & du Plessis, 2023).

Although many participants reported using AI tools, few explained how AI systems function or how AI-generated outputs are produced. Their responses focused mainly on practical uses, particularly writing support, explanations of difficult concepts, summarisation, assignment guidance and language assistance. The most frequently mentioned tools included Grammarly, ChatGPT, Copilot, MetaAI and QuillBot, while some participants also mentioned conventional search engines such as Google. Grammarly was commonly used to improve grammar, punctuation, sentence structure and paraphrasing, which is significant given that most students study in English as an additional language. ChatGPT and related tools were used mainly to clarify concepts, support academic writing and assist with understanding assignment expectations, consistent with previous research on students' pragmatic use of generative AI (Eke, 2023).

One participant offered a detailed account of how AI supported learning, language development and accessibility.

"I use ChatGPT to read my summaries aloud, and sometimes I chat with the app on my phone. I also use it to summarise my thoughts or, sometimes, to explain what is being taught or expected because English is not my first language. I also use it to spell-check and check my grammar because of my learning disabilities (dyslexia and ADHD). I sometimes ask ChatGPT to mark my assignments before I submit them so it can give me some pointers on what to improve. If I am stuck, I ask ChatGPT to do research for me and summarise research papers." (S65)

This response illustrates that AI was experienced not only as a productivity tool but also as a source of academic and language support. However, participants rarely referred to higher-order uses such as evaluating sources, interrogating AI-generated knowledge, designing pedagogical activities or understanding the limitations of AI outputs. This suggests a gap between operational familiarity and deeper epistemological understanding.

The findings indicate that AI knowledge among pre-service teachers is developing, although unevenly. Exposure to AI tools does not automatically translate into an understanding of AI as a knowledge-producing system. This distinction is important because teacher AI readiness requires more than the ability to use tools; it requires conceptual understanding of what AI is, how it works, its limitations, and how its outputs should be evaluated in academic and pedagogical contexts.

5.2. AI Skills – What Students Can Do Using AI Tools

AI skills are the practical, applied competencies that enable pre-service teachers to use AI tools purposefully in their learning and emerging professional practice. While AI knowledge concerns understanding what AI is and how it works, AI skills focus on what students can do with AI, including searching for information, clarifying concepts, improving communication, evaluating outputs, and creating learning resources. These skills involve adaptive judgement, problem-solving, and the ability to align AI use with academic or pedagogical purposes (Popenici & Kerr, 2017).

Participants reported using AI and related digital tools for a range of academic tasks, including clarifying difficult concepts, improving written work, summarising information, preparing assignments and navigating online learning platforms. Several students associated AI use with improved digital literacy, particularly in learning how to work across online platforms and use AI tools to support independent study. As one participant explained: "I've learned how to use different digital tools and platforms effectively, including how to navigate online resources and how to use AI tools like ChatGPT" (S20). In an ODeL context, this form of digital navigation is important because students are expected to manage much of their learning independently and through mediated environments (Maphalala & Nkosi, 2025).

A recurring skill involved using AI to support understanding. Students described using AI to simplify complex concepts, explain assignment requirements, generate examples, and provide alternative explanations. This suggests

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that AI was often used as cognitive scaffolding, especially when students needed additional support outside formal teaching spaces. Some participants also connected the use of AI to critical thinking. For example, one participant described actively evaluating AI-generated content to ensure that it aligned with educational objectives (S42). This indicates that, for some students, AI use was not only about receiving answers but also about judging whether AI-generated outputs were relevant, accurate, and educationally appropriate.

Communication skills also emerged as an important aspect of AI literacy. These included the ability to ask clear questions, formulate useful prompts, and evaluate whether AI responses were suitable for the task. Although only a few participants explicitly referred to prompt formulation, some responses suggested an emerging awareness that the quality of AI output depends partly on the quality of human input. This aligns with broader understandings of AI literacy, where communication with AI systems, purposeful prompting, critical evaluation, and reflective use are central competencies (Long & Magerko, 2020; Walter, 2024).

Students also reported using AI to create or support learning materials, including quizzes, games, flashcards and lesson ideas. These examples are important because they show movement beyond personal academic support towards emerging pedagogical application. While such examples were not yet highly developed, they suggest that some student teachers were beginning to imagine AI as a resource for teaching, learner engagement and activity design.

Research-related skills were also mentioned, although often in general terms. Students stated that AI helped them "find information" (S118), but they did not clearly distinguish between basic information searching, source evaluation, and more advanced academic research processes. This indicates a need for explicit support in AI-assisted research literacy, including how to verify information, evaluate sources, avoid fabricated references, and use AI without replacing independent academic judgement.

Finally, students associated AI skills with writing development, particularly in English. One participant stated, "AI improved my English, and I am now better at writing my assignments" (S5). This finding is important in a multilingual higher education context. However, because writing support was also discussed under AI knowledge, the emphasis here is not on the tools themselves but on the applied skill of using AI to improve communication, confidence, and academic participation.

The findings in this theme suggest that pre-service teachers' AI skills are developing. Students are beginning to use AI for academic support, digital navigation, conceptual clarification, communication, research assistance and basic pedagogical design. However, their skills appear stronger in practical task support than in critical evaluation, research literacy, and pedagogical integration. This confirms that AI skills are connected to knowledge, confidence, ethics, critical reflection and emerging professional identity.

5.3. AI Ethics - Concerns About Plagiarism, Dependency and Harm

AI literacy involves ethical awareness, including honesty, responsibility, bias recognition and safe use. In this study, ethical concerns were prominent, particularly regarding plagiarism, academic dishonesty, intellectual property, misinformation, and incorrect guidance, issues also widely discussed in the literature (Holmes et al., 2022; Nguyen et al., 2023). Many students expressed their worries about plagiarism and academic dishonesty. For example.

"I'm struggling so much with the ethical concerns part of it. Using AI, for me, feels like cheating… The biggest concern for me is that, at my request, it'll be as original as I want, structured as I want, and referenced as I want. That feels morally and ethically wrong to me because it basically does everything." (S52)

This response shows that students did not necessarily view AI as a neutral study aid. They distinguished between using AI as guidance and allowing it to replace their own thinking. For some, ethical uncertainty led to avoidance, suggesting that non-use may reflect fear of misconduct or unclear institutional rules rather than rejection of AI. This tension between recognising AI's usefulness and fearing academic integrity breaches is also noted in the literature (Holmes et al., 2022; Nazim & Alzubi, 2025).

Others warned of intellectual dependency and erosion of thinking.

"There are people who are solely dependent on AI tools, which can lead to laziness, and these students may plagiarise to pass or may think they understand what they're learning when, in fact, they don't. These students who rely on these tools every day will not be able to apply the theory in the workplace." (S89)

Student comments expressed concern about the quality of learning when AI is used uncritically, with many stating that overreliance on AI could diminish cognitive effort and undermine independent meaning-making. Participants also recognised the risk of misinformation, emphasising the importance of verifying AI-generated content rather than accepting outputs uncritically (S113). Beyond academic settings, some students raised broader societal worries, noting that excessive reliance on AI could weaken human reasoning and lead to long-term dependency (S52). Ethical concern served both as a protective mechanism and as a constraint on experimentation. This dual role suggests that ethics may function as a dimension of readiness and a moderating force that influences whether and how literacy is enacted. Collectively, these reflections reveal an emerging ethical awareness of how AI influences learning practices and teacher identity, as confirmed by Nguyen et al. (2023).

5.4. AI Confidence – Comfort, Hesitation, and Structural Conditions

AI confidence refers to students' comfort, self-efficacy and willingness to engage with AI tools. In teacher education, confidence matters because it influences whether future teachers experiment with AI, avoid it, or use it uncritically in their learning and future classrooms (Hania, Waqas, & Chunyan, 2025). Students' confidence levels varied considerably. While some reported gaining confidence through regular use of AI tools, others showed uncertainty and hesitation, often due to concerns about plagiarism, inaccuracy, or misuse. Students described different learning approaches and highlighted the importance of training and support to increase their confidence. Several participants noted that access to workshops, mentoring, and learning resources is necessary to develop skills and keep up with new technologies. These responses indicate that confidence in AI is not fixed but a skill that grows over time within supportive learning environments. For some students, confidence grew as AI became a means to overcome learning barriers. Here, confidence is linked to empowerment and demonstrates a strong sense of self-efficacy. For example:

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"AI enables me to create audio files of my study materials … making me more confident in my abilities to use AI and helping to scaffold the learning experience so I don't have to focus on my barriers. AI can't create new knowledge, but it can bridge information to help me see connections between views. I can't see a future in technology without AI" (S66).

Confidence was also linked to ethical certainty and clarity regarding institutional guidelines. Students who demonstrated a better understanding of acceptable AI use within the university context reported greater confidence, suggesting that policy awareness plays an important role in shaping responsible AI engagement (S67). Confidence, therefore, depended not only on access to tools but also on clear rules, opportunities for experimentation and support that addressed students' learning need.

5.5. AI Critical Reflection – Questioning Limits, Bias and Accuracy

AI literacy requires critical reflection, which includes the ability to assess and evaluate AI-generated information. In this context, Eke (2023) and Sun and Hoelscher (2023) highlight the importance of reflection in recognising both opportunities and challenges for the responsible use of AI in education. Critical reflection involves acknowledging that AI systems can be inaccurate, biased, or incomplete, and developing procedures to verify AI outputs through alternative sources. Several participants demonstrated significant epistemological awareness, explicitly identifying inaccuracies in AI and recognising their role in assessing the accuracy of AI outputs. One student explained:

"I have discovered that one must always be critical of the content that AI gives us because it can often give users inaccurate or outdated information; hence, I believe that one should also do one's own research on a topic instead of solely depending on AI" (S99).

This comment reflects the growing awareness that AI outputs require verification and triangulation rather than passive acceptance (Ziegler, Peisl, & Harte, 2021). Students further recognised that responsible use of AI demands human oversight to minimise errors and bias. The responses show that many participants were beginning to engage deliberately and reflectively with AI, a trait closely linked to higher levels of AI literacy (Walter, 2024). They did not simply label AI as "good" or "bad" but regarded it as a useful yet fallible knowledge system that requires monitoring, evaluation, and human oversight.

5.6. AI Pedagogical Imagination – Envisioning AI in Future Classrooms

Pedagogical imagination refers to the ability to envision meaningful teaching and learning practices that incorporate AI, beyond mere personal study use. It indicates whether students can envisage how AI might influence curriculum design, lesson planning, assessment practices, and classroom interaction. As Sun et al. (2024) argue, teacher education must provide opportunities for prospective teachers to critically examine AI's pedagogical implications. Without such preparation, AI is likely to remain a supplementary tool rather than an integral part of the teaching process. In line with previous studies (Adiguzel, Kaya, & Cansu, 2023; Grassini, 2023), most participants saw the value of AI and related technologies for their future teaching. They imagined AI as a resource for lesson planning, activity design, learner support, assessment, feedback, personalised learning and learner engagement. Several students associated AI with the creation of games, videos and images, suggesting they saw it as a creative resource that could make learning more accessible, enjoyable and inclusive.

Students viewed AI as a tool to improve lesson planning and curriculum alignment, seeing it as an essential part of professional planning practices. One student described AI as a resource for adapting to changing educational environments and creating innovative, inclusive lesson designs that support diverse learners and boost digital literacy (S32). Others expanded their vision to include assessment and feedback, highlighting AI's potential to support formative assessment, provide immediate feedback, and enable flexible learning environments. Language support was another important aspect of students' pedagogical imagination. Several participants imagined AI helping learners with English language development, especially in multilingual classrooms. This is particularly relevant in South Africa, where language can influence access to learning. One participant referred specifically to the use of AI tools to support learners who struggle with sentence structure and word choice (S31).

These responses show that participants were not only using AI as students but were beginning to imagine themselves as future teachers working with learners who will also use AI. However, most examples remained broad, which is understandable, given that the participants were first-year students. The responses also indicate the need for guided pedagogical design activities in teacher education programmes. The findings suggest that pedagogical imagination should be deliberately developed. Student teachers need opportunities to design, test and critique AI-supported lessons, assessments and learner activities. They also need to consider how AI can be used ethically and inclusively in multilingual, rural, low-resource and digitally uneven classroom context.

The themes identified in this study resonate with the wider international literature on AI literacy and AI in education, where knowledge, use, capacity to evaluate AI outputs and implications, ethical awareness, and critical engagement are repeatedly identified as dimensions of AI literacy (Long & Magerko, 2020; McGinty & Murray-Johnson, 2025; Ng et al., 2021). However, the contribution of the present study lies in showing how these dimensions are configured within a South African ODeL teacher education context shaped by uneven access, linguistic diversity, policy uncertainty and self-directed learning demands. These contextual conditions influence whether AI literacy can become meaningful for teacher AI readiness.

The preceding discussion shows that AI literacy and AI readiness are closely related but not identical. While participants' responses reflected internationally recognised dimensions of AI literacy, the findings also revealed that these dimensions are enacted unevenly and contextually. Knowledge and skills were enacted through access; confidence was shaped by institutional support and policy clarity; and ethical awareness often influenced whether students engaged with or avoided AI. These interconnections provided the basis for the proposed Teacher AI-Readiness Mapping Framework presented in the next section.

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6. A Framework for Mapping Teacher AI Readiness and Readiness Gaps

Building on the findings, this section proposes a framework to map teacher AI readiness and identify readiness gaps. The framework does not treat readiness as a fixed or measurable state that can be conclusively determined. Instead, readiness is understood as developmental, relational, multidimensional and contextually shaped. The framework provides a lens for examining where student teachers show emerging readiness, where uncertainty remains, and where teacher education programmes need to provide further support.

AI literacy may be understood as a necessary condition for AI readiness, but it is not sufficient in itself. The findings show that students may use AI tools while still lacking epistemological understanding, ethical clarity, confidence, critical judgement or pedagogical direction. Readiness is therefore not simply a matter of tool use or acceptance; it involves the ability to engage with AI in ways that are informed, ethical, confident, reflective and pedagogically meaningful.

The six themes developed through the analysis were conceptualised as interconnected dimensions for mapping teacher AI readiness, rather than as separate competencies or definitive indicators of readiness. The framework is shown in Figure 1 and summarised below.

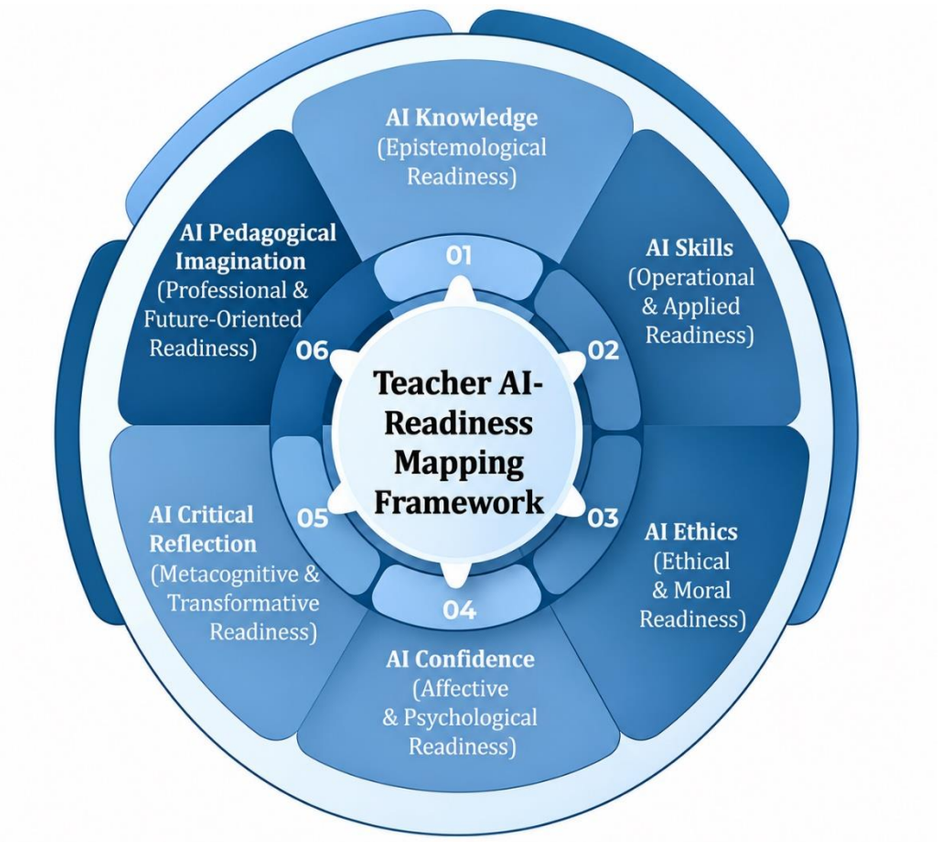


Figure 1. Teacher AI-readiness mapping framework.

6.1. AI Knowledge (Epistemological Readiness)

AI knowledge refers to students' understanding of what AI is, how it works, and how AI-generated knowledge should be interpreted. The findings showed that students were familiar with certain tools and functions but often did not clearly explain how AI systems produce outputs or how these outputs differ from conventional digital information. This dimension, therefore, helps identify gaps in epistemological readiness, including students' understanding of AI as a knowledge-producing system.

6.2. AI Skills (Operational and Applied Readiness)

AI skills refer to students' practical ability to use AI tools purposefully for learning, communication, problem-solving and emerging pedagogical tasks. Participants used AI for language support, summarisation, clarification, research assistance and task completion, but fewer demonstrated higher-order uses such as dialogic prompting, critical evaluation or pedagogical design. This dimension maps operational and applied readiness, showing where students can use AI functionally and where further development is needed for more advanced academic and professional purpose.

6.3. AI Ethics (Ethical and Moral Readiness)

AI ethics refers to students' awareness of academic integrity, authorship, bias, misinformation, dependency, privacy and possible harm. Ethical concerns were widespread in the findings, with some participants avoiding AI because of fear of plagiarism or uncertainty about institutional expectations. This dimension is important because ethical awareness can both support responsible use and constrain experimentation when policies or expectations are unclear. It helps identify where teacher education programmes need to provide clearer ethical guidance and structured opportunities for responsible AI engagement.

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6.4. AI Confidence (Affective and Psychological Readiness)

AI confidence refers to students' comfort, self-efficacy, trust and willingness to experiment with AI. The findings showed that confidence was uneven and shaped by access, prior experience, perceived usefulness, ethical clarity, institutional guidance and learning support. This dimension maps affective and psychological readiness by showing where students feel able to engage with AI and where anxiety, fear of misconduct, limited training or lack of support may prevent meaningful use.

6.5. AI Critical Reflection (Metacognitive and Transformative Readiness)

AI critical reflection refers to students' ability to question AI outputs, recognise limitations, verify information, identify bias and maintain human judgement. Many participants recognised that AI-generated content may be inaccurate, outdated or incomplete, and that users should not accept outputs uncritically. This dimension maps metacognitive readiness by identifying whether students can monitor their own engagement with AI and make informed decisions about when to use, question, or resist AI. It also points to transformative readiness, because critical reflection can shape future teaching, assessment and learner agency.

6.6. AI Pedagogical Imagination (Professional and Future-Oriented Readiness)

AI pedagogical imagination refers to students' capacity to envision meaningful and ethical uses of AI in future teaching. Participants imagined AI supporting lesson planning, activity design, assessment, feedback, learner engagement, inclusion and language support, although many examples remained broad and aspirational. This dimension maps professional and future-oriented readiness by identifying whether students are beginning to connect AI use with teacher identity, classroom practice and pedagogical judgement.

Together, these six dimensions form an empirically grounded framework for mapping teacher AI readiness and readiness gaps. The contribution of the framework lies in shifting the focus from whether student teachers are simply "ready" or "not ready" towards a more nuanced understanding of where readiness is emerging, constrained or underdeveloped. It can help teacher education institutions identify areas of strength and those requiring attention.

The framework also extends technology acceptance perspectives. While participants' engagement with AI was shaped by perceived usefulness, access, confidence, institutional support and policy clarity, their readiness involved more than just willingness or intention to use technology. They were also negotiating whether AI-generated knowledge could be trusted, whether AI use was ethically acceptable, how AI might affect their learning, and how it could be meaningfully integrated into future teaching. The framework, therefore, positions teacher AI readiness as the relational enactment of knowledge, skills, ethics, confidence, critical reflection and pedagogical imagination within specific educational and infrastructural contexts. The context here is the experiences of first-year preservice teachers at one South African ODeL university.

The framework should be understood as a reflective and diagnostic tool rather than a measurement instrument. It does not determine readiness in a definitive sense, nor does it imply that all six dimensions can be assessed through a single measure. Instead, it provides a structure for identifying readiness gaps and guiding curriculum development, professional learning, assessment redesign and institutional policy. For teacher education programmes, this means that AI readiness should be intentionally cultivated through explicit teaching, ethical dialogue, scaffolded practice, critical reflection, and opportunities to design and evaluate AI-supported pedagogies.

7. Conclusion and Implications

The purpose of this study was to explore what it means for pre-service teachers to be AI-ready. Guided by the overarching question, how can teachers' AI literacy be reconceptualised in the Global South to support a multidimensional understanding of teacher AI readiness? the study examined how pre-service teachers understand, use, evaluate, and envisage AI in their future professional roles. The findings show that AI readiness is not a fixed state that can be easily determined. Rather, it is developmental, uneven, multidimensional and shaped by contextual conditions. Participants demonstrated developing AI knowledge and skills, strong but sometimes uncertain ethical awareness, varying levels of confidence, emerging critical reflection and an early capacity to imagine AI in future teaching practice. Based on these findings, the study proposed a Teacher AI-Readiness Mapping Framework, offering teacher education institutions a way to examine where students show emerging readiness and where further support is required across six dimensions: AI knowledge, AI skills, AI ethics, AI confidence, AI critical reflection and AI pedagogical imagination.

The study has implications for teacher education programmes and institutions. Student teachers need explicit instruction in how AI systems generate and validate knowledge, clear guidance on ethical and acceptable AI use, opportunities to build confidence through practice, and structured engagement with AI-supported pedagogical design. Policy clarity, institutional support, and equitable digital access are therefore central to cultivating responsible, contextually responsive AI readiness.

The study is limited by its single institutional case and its focus on first-year pre-service teachers. The findings are not intended to represent all teacher education contexts in the Global South, but they offer a contextually grounded contribution to broader debates on AI literacy and teacher AI readiness. Future research could examine how readiness develops over time, include more advanced cohorts, and test or adapt the framework across diverse teacher education settings.

The central question is not simply whether future teachers are ready for AI, but what kinds of readiness teacher education programmes cultivate, for whom and in whose interests. AI in education will not arrive merely as a tool; it will arrive through teachers who are ethically grounded, critically reflective, professionally imaginative and sufficiently confident to shape AI use rather than be shaped by it.

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