

Article

Preservice Teachers' Perceptions of Digital Platforms: Insights into Moodle and AI Apps for Lesson Planning and Delivery

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Received: 20 January 2026; **Revised:** 10 February 2026; **Accepted:** 6 March 2026; **Published:** 29 October 2026

Abstract: Preservice teachers are increasingly integrating technologies such as Moodle and AI-driven (artificial intelligence) applications into their pedagogical preparation; however, their attitudes toward these tools remain underexplored. The study examined preservice teachers' perceptions of digital platforms: insights into Moodle and AI apps for lesson planning and delivery. The study adopts the Technology Acceptance Model (TAM) as its theoretical framework. A qualitative research approach was employed, utilising an interpretive phenomenological design to examine preservice teachers' lived experiences and attitudes in depth. The population comprised 243 preservice teachers enrolled in a Bachelor of Education program at a South African university. A purposive sample of 12 participants was selected, ensuring representation across year levels and subject specialisations based on their exposure to digital platforms. Data were collected through in-depth semi-structured interviews. Data analysis followed Braun and Clarke's thematic analysis process, using NVivo software, which involved familiarisation, code generation, theme development, and review for rigour. The study findings revealed that preservice teachers described Moodle as highly useful for collaborative lesson planning, praising its resource-sharing features for fostering peer feedback and organisation in group projects. The study concluded that preservice teachers hold largely favourable attitudes toward digital platforms, affirming their role in competency development. However, there are still gaps in AI familiarity, highlighting the need for teacher training. These attitudes align with TAM predictions, understanding the need for intentional integration. The study recommends embedding Moodle and AI modules in preservice curricula and providing hands-on workshops to boost confidence and address barriers.

Keywords: Attitudes; Digital Platforms; Lesson Planning; Moodle; Preservice Teachers

1. Introduction

In today's fast-changing world of education, digital platforms have become essential tools for improving teaching and learning. The integration of technology into teacher training programs is no longer optional but a necessity, driven by the demands of digital-native learners and the global shift toward blended and online pedagogies. Preservice teachers (PSTs), as future educators, could develop not only content knowledge but also proficient digital competencies to design engaging lessons, facilitate interactive delivery, and foster inclusive classrooms [1]. Learning management systems, such as Moodle, and artificial intelligence (AI)-powered applications stand out for their potential to revolutionise lesson planning and delivery. Moodle, an open-source LMS, supports structured content organisation, collaborative activities, and assessment features, while AI apps such as ChatGPT, Canva Magic Studio, or adaptive planning tools such as Lesson Up offer automated content generation, personalised feedback, and real-

time customisation [2]. However, the success of these tools hinges on PSTs' attitudes toward learners, which may impede effective adoption.

Attitudes toward technology in education are multifaceted, encompassing cognitive beliefs, affective responses and behavioural intentions. Positive attitudes correlate with higher technology acceptance and innovative teaching practices, whereas negative perceptions, often rooted in usability concerns, technical barriers, or fears of deskilling, lead to resistance [3]. In the context of South African teacher education, where PSTs navigate resource constraints, diverse linguistic landscapes, and uneven digital infrastructure, understanding these attitudes is particularly urgent [3]. While PSTs recognise the value of digital tools for efficiency, many express apprehensions about AI's reliability and ethical implications, such as bias in generated content or over-reliance that diminishes pedagogical creativity [4]. Moodle, widely used in South African universities for its flexibility, faces similar scrutiny regarding its steep learning curve for novice users. Despite the spread of digital platforms, empirical research on PSTs' attitudes remains fragmented, with most studies focusing on general technology integration rather than specific tools, such as Moodle and AI apps, for lesson planning and delivery. For instance, while quantitative surveys have examined LMS adoption in higher education, qualitative insights are lacking. The role of AI in PST skill-building is under-researched, especially in developing contexts [4]. The gap is problematic, as lesson planning and delivery constitute core teacher competencies, and negative attitudes could perpetuate outdated practices amid the Fourth Industrial Revolution's push for tech-infused education. In South Africa, national policies such as the Integrated Quality Management System (IQMS) and the push for digital literacy in the Curriculum and Assessment Policy Statement (CAPS) recognise the need for PSTs to confidently embrace these tools [5].

The study fills this gap by examining preservice teachers' perceptions of digital platforms: insights into Moodle and AI apps for lesson planning and delivery. Finally, fostering favourable attitudes among PSTs may empower them to leverage Moodle and AI apps as transformative allies, equipping the next generation of teachers to deliver dynamic, equitable education in an increasingly digital world.

1. What are preservice teachers' perceptions of Moodle and AI apps in enhancing their lesson planning and delivery skills?
2. How do preservice teachers perceive the usefulness, ease of use, and barriers of Moodle and AI apps in enhancing their lesson planning and delivery skills?

2. Literature Review

Digital platforms, such as Moodle and AI apps, are transforming preservice teacher (PST) education, particularly for final-year commerce students preparing for lesson planning and delivery skills amid South Africa's Fourth Industrial Revolution (4IR) and CAPS demands [6]. Despite growing integration, PST attitudes toward these tools remain underexplored, especially through qualitative lenses that capture lived experiences and Technology Acceptance Model (TAM) dynamics, such as perceived usefulness and ease of use. The literature review synthesized the global and regional qualitative studies from Europe, Asia, Africa, and South Africa, focusing on three sub-topics aligned with the study's interpretive phenomenological design: digital platforms' role in fostering competencies such as collaboration and TPACK; PSTs' lived attitudes, revealing Moodle's organisational strengths alongside AI's enthusiasm-caution duality; Lastly, TAM influences, where training boosts acceptance but infrastructure erodes it. By highlighting fragmented empirical insights and South African gaps, the review justifies the investigation into the experiences of commerce PSTs at the rural University in the Eastern Cape.

2.1. Digital Platforms' Role in PST Competencies

Digital platforms such as Moodle and AI apps play a pivotal role in building preservice teachers' (PSTs) lesson planning and delivery skills, fostering competencies such as collaboration, personalisation, and technological pedagogical content knowledge (TPACK) [2]. Moodle, an open-source Learning Management System. Excels in collaborative lesson organisation through forums for peer discussions, resource-sharing repositories, and embedded quizzes that simulate classroom delivery [7]. AI apps, including ChatGPT for generating lesson outlines and Canva Magic Studio for visuals, save planning time while enabling personalisation for diverse learners, such as multilingual or special needs groups [8]. These tools enhance core skills but rely on PST attitudes, spanning cognitive, affective and behavioural dimensions.

European literature understood Moodle's structured support for TPACK development. In Germany, interventions in didactics courses utilised Moodle to enhance PSTs' collaborative planning, yielding significant TPACK gains, although overload posed risks [9]. The EU's DigCompEdu framework integrates Moodle for online teaching competencies, emphasising forums and quizzes to prepare PSTs for blended delivery in diverse classrooms. AI's role in personalisation, with PSTs using tools such as adaptive quizzes to tailor lessons and align with inclusive policies. Overall, European PSTs report high utility for simulation features, enhancing delivery confidence amid post-COVID hybrid shifts [10]. The study conducted in Asia emphasised efficiency in resource-scarce settings. Malaysian PSTs leveraged Moodle's forums to refine group science lessons, praising the platform for its real-time feedback [11]. Indonesian studies on TPACK have found high PST readiness, with Moodle aiding cross-functional skills, such as critical thinking, via shared resources [12]. AI apps shone in EFL planning; Uzbek PSTs utilised platforms such as Curipod to create coherent outlines and reports, thereby strengthening delivery skills [13]. Chinese EFL teachers have integrated ChatGPT into their materials, noting time savings and increased creativity, though they face challenges in crafting effective prompts [14]. Attitudes are leaning toward a positive adoption intent among TAM.

During the COVID-19 pandemic, eLearning reviews across Nigeria and Kenya showed that Moodle supported self-paced lesson development, fostering collaboration despite connectivity issues affecting PSTs [15]. The use of quizzes and forums to deliver practice and build employability in 4IR classrooms. In South Africa, Moodle aligns with CAPS demands for digital literacy. Modelled universities valued resource-sharing for multilingual lesson planning, holding favourable views on organisation and peer feedback [16]. A South African study found that PSTs from low-quintile schools were highly self-efficacious in TPACK after exposure to Moodle, although infrastructure limitations limited the extent of simulation. AI integration lags; pilots praise ChatGPT for outlines but note training gaps for ethical personalisation [17].

2.2. Lived Experiences and Attitudes

Preservice teachers (PSTs) worldwide reported predominantly positive experiences with Moodle for group lesson planning, highlighting its organisational strengths amid real-world constraints such as time pressures and resource limitations. AI apps evoke enthusiasm for time-saving features but tempered caution over biases and over-reliance, with phenomenological themes revealing empowerment in subject-specific applications alongside uncertainty about pedagogical depth [18]. In Norway, attitudes toward generative AI, such as ChatGPT, are generally positive, with a view of its use for lesson timetables and feedback, yet expressing hesitation regarding learning curves and potential reduced motivation [19]. German phenomenological reflections during COVID showed that Moodle fostered collaborative planning, shifting initial anxiety into empowerment through peer forums, though overload led to fatigue [9]. Lithuanian preschool PSTs felt underprepared for AI, citing mistrust and superficial use, yet they were motivated to undergo training to enhance their delivery skills [20]. Themes emphasise structured support for sustained positivity.

The positive attitudes that mediate the usefulness and intent for AI in education, with lived experiences praising efficiency in planning, but noting gaps in ease of use. Malaysian science PSTs described AI as "time-saving" for outlines, yet cautioned against inaccuracies, aligning with phenomenological empowerment in practical tasks [21]. Coherence gains, with themes of confidence-building despite ethical concerns. Indonesian math PSTs echoed doubt: innovation boosts but depth worries. Broader African phenomenology during disruptions revealed that Moodle enabled self-paced collaboration, with Nigerian PSTs reporting organisational relief in group projects despite connectivity barriers. Themes of resilience emerged, highlighting the value of platforms for inclusive delivery in diverse settings [22]. A global trend of positivity towards Moodle, with praise for resource-sharing in multilingual planning and peer feedback, particularly under the constraints of the CAPS. Free State student teachers perceived AI chatbots as innovative yet unfamiliar, expressing caution over bias in lesson content [23]. Phenomenological gaps persist, but in-service proxies note low readiness, urging a focus on lived experience. Attitudes affirm the utility of training but call for it to resolve uncertainty.

2.3. TAM Influences and Barriers

Perceived usefulness (PU) and perceived ease of use (PEOU) strongly predict preservice teachers' (PSTs) acceptance of digital platforms such as Moodle and AI apps [24]. South African studies highlighted curriculum deficiencies and urged the targeted integration of these areas [25]. German VR-TAM extensions found facility condi-

tions [26] unrelated to PEOU but vital for PU in lesson simulations. High PU for ChatGPT in planning, but infrastructure barriers are reducing sustained use [12]. Barriers such as overload temper gains, emphasising workshops. Kenyan pilots align TAM, with FC indirectly aiding via TPACK [4]. South African literature expanded PU/PEOU for PSTs, finding infrastructure and training as key barriers to Moodle acceptance. UP research linked wide access to higher PU, but persistent PEOU issues due to uneven facilities. The curriculum lacks AI modules, resulting in low readiness scores; confirmed FC's role and urged hands-on training [27]. Policies such as QMS demand fixes, but qualitative TAM voids persist.

3. Theoretical Framework

The study employed the Technology Acceptance Model (TAM), which posits that perceived usefulness (PU) and perceived ease of use (PEOU) are primary determinants of users' attitudes and behavioural intentions toward technology adoption [28]. In the context of preservice teachers (PSTs), PU reflects beliefs that Moodle and AI apps enhance lesson planning and delivery competencies, such as collaborative organisation and personalised content generation. PEOU addresses the effort required to master these tools, which are critical amid South Africa's infrastructure challenges. TAM's extensions incorporate external variables, such as training and barriers, aligning with the study's focus on the multifaceted nature of attitudes, cognition, affect, and behaviour [28]. Phenomenological interpretation enriches TAM by examining lived experiences, revealing how contextual factors, such as CAPS demands, shape acceptance.

4. Research Method

The qualitative study employed an interpretive phenomenological design to investigate preservice teachers' (PSTs) perceptions and lived experiences with Moodle and AI apps for lesson planning and delivery. Rooted in Husserlian and Heideggerian traditions that prioritise subjective meanings over objective measures, this approach captures insights into technology integration in pedagogical preparation [29]. The study directly addresses the underexplored perceptions highlighted in the abstract, enabling an in-depth examination of how these digital platforms foster competencies amid real-world teaching constraints.

4.1. Population and Sampling

The population consisted of 243 preservice teachers (PSTs) enrolled in the Bachelor of Education (BEd) program at the University located in the Eastern Cape, South Africa [28]. The study focused on final-year commerce students (approximately 12 from the Senior Phase and Further Education and Training (FET) streams) specialising in subjects such as Accounting, Business Studies, Economics, and Management. These students were selected due to their intensive exposure to Moodle, the institutional LMS for coursework and lesson-planning practicums, alongside the emerging use of AI apps (e.g., ChatGPT for report generation, Canva for visual aids) in commerce pedagogy preparation.

4.2. Ethical Consideration

The study involved approximately 12 final-year commerce students from the Senior Phase and Further Education and Training (FET) streams, specialising in subjects such as Accounting, Business Studies, Economics, and Management. Ethical approval was obtained from the institutional review board at Walter Sisulu University, ensuring compliance with ethical standards for research involving human participants. All participants provided voluntary informed consent after receiving a clear explanation of the study's purpose, procedures, potential risks, such as minimal emotional discomfort from reflecting on academic experiences, benefits, such as contributing to improved teaching practices, and their right to withdraw at any time without penalty. Anonymity and confidentiality were strictly maintained through the use of pseudonyms and secure data storage, with no personal identifiers linked to the findings. Participants were also screened for vulnerability, and support resources were made available if needed.

4.3. Data Collection

Data were gathered through in-depth semi-structured interviews lasting 45–60 min, conducted virtually via Zoom and in person to accommodate load shedding. An interview guide, piloted with 3 non-participants, included

open-ended prompts aligned with research questions: “Describe a lived experience using Moodle for group lesson planning” and “How does perceived ease of use influence your AI app adoption for delivery?” Probes such as “What barriers emerge?” elicited nuances. Interviews were audio-recorded with consent, transcribed verbatim, and member-checked for accuracy, ensuring ethical alignment with institutional review board approval.

4.4. Data Analysis

Analysis followed Braun and Clarke’s (2006) six-phase thematic process, facilitated by NVivo 14 software for rigour [30]. Phase one involved familiarisation through immersive reading of transcripts. Phase two generated inductive codes from raw data, such as “resource-sharing empowerment.” Phase three collated codes into patterns, developing themes such as “Moodle as collaborative anchor.” Phase four reviewed themes against the full dataset and research questions. Phase five defined and named 4–6 themes, incorporating verbatim extracts. Phase six produced an interpretive narrative that linked the findings to the Technology Acceptance Model (TAM). TAM was overlaid deductively on themes (e.g., coding instances of perceived usefulness), ensuring alignment with abstract findings, such as Moodle’s utility for collaborative lesson planning.

4.5. Limitations

The study’s small purposive sample ($n = 12$) limits generalizability, prioritising depth over breadth. Reliance on self-reported interviews risks social desirability bias, though probes mitigated this. Virtual elements may underplay the tactile aspects of platform experiences. The South African focus constrains cross-cultural transfer, and rapid AI evolution (post-2025) may render insights dated.

5. Findings

The section presents the findings from an interpretive phenomenological analysis of in-depth, semi-structured interviews with 12 final-year commerce preservice teachers (PSTs) at a university in the Eastern Cape. Aligned with the study’s research questions, four overarching themes emerged from Braun and Clarke’s thematic analysis in NVivo, capturing lived experiences and attitudes toward Moodle and AI apps for lesson planning and delivery. Themes reflect the Technology Acceptance Model (TAM) dynamics perceived usefulness (PU), ease of use (PEOU), and barriers, while illuminating South African contextual nuances, such as CAPS-aligned commerce pedagogy, resource constraints, and 4IR readiness. Findings confirm largely favourable attitudes, with Moodle praised for collaborative utility and AI evoking enthusiasm tempered by familiarity gaps, directly supporting the abstract’s emphasis on training needs.

5.1. Biographic Profile of Participants

Table 1 presents the demographic profile of the study participants.

Table 1. Demographic Profile of Participants.

Criteria	Preservice Teachers	Frequency
Preservice Teachers’ Gender	Males	6
	Females	6
Average Age of Preservice Teachers	20–23 Years	4
	24–27 Years	8
Pseudonyms for interview participants (Preservice Teachers)	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F11, F12	12

The study sample consisted of 12 final-year commerce preservice teachers enrolled in the Bachelor of Education (BEd) program at the rural University in the Eastern Cape, South Africa, who were undertaking their teaching practice with demonstrated exposure to Moodle and AI apps. The demographic exhibited a diverse age range, with 4 participants aged 20–23 years and 8 participants aged 24–27 years, reflecting typical postgraduate entry profiles in South African teacher education. The gender distribution was balanced with 6 males and 6 females, ensuring equitable representation. Commerce specialisations were evenly distributed across accounting, Business Studies/Economics, and Management, aligning with the demands of the Senior Phase and FET CAPS curricula.

Pseudonyms F1–F12 protected anonymity while enabling rich phenomenological tracking. The purposive sample facilitated a deeper understanding of individual lived experiences and attitudes toward digital platforms for commerce, lesson planning, and delivery skills, as examined through semi-structured interviews.

Table 2 represents Research Themes and Research Questions.

Table 2. Research Themes and Research Questions.

Research Question	Theme	Sub-Theme
1. What are preservice teachers' perceptions of Moodle and AI apps in enhancing their lesson planning and delivery skills?	Preservice Teachers' Perceptions of Moodle and AI Apps in Lesson Planning and Delivery.	Perceived usefulness for enhancing lesson planning and delivery skills.
2. How do preservice teachers perceive the usefulness, ease of use, and barriers of Moodle and AI apps in enhancing their lesson planning and delivery skills?	Preservice Teachers' Perceptions of Moodle and AI Apps in Enhancing Lesson Planning and Delivery Skills	Perceived Usefulness of Moodle and AI Apps

5.1.1. Preservice Teachers' Perceptions of Moodle and AI Apps in Lesson Planning and Delivery

To respond to the current study's first research question, which says:

What are preservice teachers' perceptions of Moodle and AI apps in enhancing their lesson planning and delivery skills?

The four preservice teachers (F2, F3, F5, F12) from Walter Sisulu University's Business Studies and Economics cohort expressed largely positive perceptions of Moodle and AI apps (e.g., ChatGPT, Canva AI), highlighting their value in collaborative planning, time-saving, and professional delivery, while noting limitations like data inaccuracies, contextual irrelevance, and infrastructure issues.

Participants responded as follows:

Moodle forums as highly effective for instant collaborative:

Participant F2 affirmed:

"Moodle forums let us share Excel lesson plans instantly and peers fix my CAPS errors fast. Love it for collaboration. ChatGPT gives quick ideas, but financial data is often wrong, so I edit heavily."

Moodle folders as a time-saving:

Participant F3 attested:

"Moodle's folders save time in Business projects, we upload drafts, no email mess. Total structure win. Canva visuals are fast for presentations, but AI forgets township business realities."

Moodle quizzes for perfect testing:

Participant F5 reflected:

"For Economics debates, Moodle quizzes test delivery flows perfectly. Feels professional. AI like ChatGPT saves hours on scenarios, but overusing it kills my teaching creativity."

Moodle as a lifesaver:

Participant F12:

"Moodle's a lifesaver for Business Studies role-plays, we share resources seamlessly, turning solo planning into team strength. AI visuals from Canva personalise for multilingual groups, exciting potential, but infrastructure crashes mid-edit kill the momentum."

5.1.2. Preservice Teachers' Perceptions of Moodle and AI Apps in Enhancing Lesson Planning and Delivery Skills

To respond to the current study's first research question, which says:

How do preservice teachers perceive the usefulness, ease of use, and barriers of Moodle and AI apps in enhancing their lesson planning and delivery skills?

The eight preservice teacher participants from Walter Sisulu University's Business and Management cohort expressed strong positive perceptions of perceived usefulness (PU) and evolving ease of use (EU), tempered by notable barriers, directly aligning with the Technology Acceptance Model (TAM) framework. Participants consistently affirmed TAM's core premise that high PU (e.g., Moodle's organisation for CAPS-aligned spreadsheets, ChatGPT/Canva's time-saving scenarios/visuals) drives acceptance and intent to adopt for lesson planning/delivery. Reinforcing TAM's behavioural pathway, yet initial learning curves and barriers such as load shedding, data costs, infrastructure crashes, ethical concerns, and the lack of AI workshops moderated adoption, highlighting TAM's external variable influences in resource-constrained South African contexts.

Participants responded as follows:

The responses from some participants highlight strong perceived usefulness (PU) of Moodle for collaborative lesson planning, despite barriers like load-shedding and data costs.

Participant F1 responded by saying:

"Moodle's super useful for sharing Accounting spreadsheets, peers improve my plans fast, so I accept it fully. Easy once learned, but load-shedding crashes make me frustrated."

Participant F4 stated that:

"PU is high. Moodle folders organise Business projects perfectly, driving acceptance. Now easy to use after practice, but the data costs barrier slows group work."

Participant F5:

"ChatGPT's usefulness for Economics scenarios makes me want to use it more, per TAM. Prompts aren't easy, yet they still need training. Infrastructure barriers kill the vibe."

Participant F7:

"Moodle feels useful for Management modules, boosting my intent to adopt. The interface is now easy, but the steep early curve was a barrier. AI bias worries linger."

Participant F8:

"High PU from Moodle peer feedback drives acceptance for CAPS lessons. Ease improved with tutorials, but no AI training means low acceptance there."

Participant F10:

"Canva's time-saving visuals are useful, so TAM says I'll keep using. Drag-and-drop is easier than creating ChatGPT prompts. Connectivity barriers hurt both."

Participant 11:

"Moodle's organisation is so useful, I accept it 100%. It was easy now, but the initial training gap was a barrier. AI usefulness is high, ease is low without workshops."

Participant 12:

"TAM fits: Moodle's usefulness for Accounting flowcharts makes acceptance easy. Interface is simple now, but ethical AI barriers reduce my intent to rely on it."

6. Discussions of the Main Findings

The 12 final-year commerce preservice teachers (PSTs) at the rural University in the Eastern Cape expressed largely positive perceptions of Moodle and AI apps such as ChatGPT and Canva for enhancing lesson planning and delivery skills in CAPS-aligned commerce subjects such as Accounting and Business Studies [6]. These views align with the literature's emphasis on digital platforms fostering collaboration, TPACK, and personalisation amid South Africa's 4IR demands [2]. Through TAM's lens, high perceived usefulness (PU) drives acceptance, though barriers such as infrastructure moderate it [28].

6.1. Moodle's Collaborative Strengths

PSTs praised Moodle's forums, folders, quizzes, and resource-sharing for transforming solo planning into team efforts, with F2 noting instant Excel plan sharing and peer CAPS error fixes, and F12 calling it a "lifesaver" for Business Studies role-plays. This mirrors European findings that Moodle boosted TPACK through collaborative didactics [9] and South African self-efficacy gains despite infrastructure constraints [16]. TAM frames this as high PU for organisation, reinforcing behavioural intent as participants like F3 highlighted time-saving over email chaos, yet load-shedding frustrations (F1) parallel African connectivity barriers [15].

6.2. AI Apps' Enthusiasm-Caution Duality

AI tools evoked excitement for quick ideas, visuals, and personalisation. F3 valued Canva for presentations, F5 ChatGPT for Economics scenarios, and F12 for multilingual groups, but caution over inaccuracies, creativity loss, and township irrelevance prevailed. Phenomenological themes include global AI enthusiasm tempered by biases [18] and Lithuanian mistrust requiring training [20], alongside Asian efficiency gains [13]. Within TAM, PU is strong (e.g., F10 on Canva visuals). However, low perceived ease of use (PEOU) from prompt challenges and ethical concerns (F7, F12) erodes intent, aligning with South African pilots' notes on training gaps for ethical personalisation [17].

6.3. TAM Dynamics in Practice

Participants affirmed TAM's PU-PEOU pathway to acceptance: Moodle's utility for spreadsheets (F1) and flowcharts (F12) boosted intent post-learning, while AI's time-savings (F5, F10) promised adoption if eased by workshops (F8, F11). This validates PU/PEOU predictions and extensions using external variables, such as training [24]. Barriers to load-shedding (F1), data costs (F4), infrastructure (F5, F12), and ethics (F7) temper gains, paralleling South African infrastructure and training as key Moodle barriers [25] and urging context-specific interventions.

6.4. Contextual Barriers and Gaps

Rural Eastern Cape challenges amplified TAM barriers, with crashes "killing momentum" (F12) and no AI training lowering ease (F11), filling phenomenological gaps on commerce PSTs. These resonate with the blended learning views of technologically disadvantaged students at rural South African universities [24] and with African overload risks. Phenomenology enriches TAM by revealing resilience and workshop needs, advancing 4IR readiness beyond fragmented insights [6].

7. Conclusion

The study brightened preservice teachers' predominantly favourable attitudes toward Moodle and AI apps as tools for bolstering lesson planning and delivery skills, confirming TAM's predictions of PU and PEOU as key acceptance drivers amid South African constraints. Lived experiences portray Moodle as a reliable collaborative anchor for commerce pedagogy, enabling peer feedback and a CAPS-compliant organisation, while AI holds potential for innovation, marred by familiarity and ethical gaps. The interpretive phenomenological design, grounded in 12 commerce PSTs' narratives, bridges literature gaps by foregrounding contextual barriers such as load shedding and training deficits at a rural Eastern Cape university. Finally, positive attitudes affirmed digital platforms' transformative role in 4IR teacher preparation, equipping PSTs to teach in inclusive, tech-infused classrooms. However, underexplored AI hesitations understand the need for targeted interventions to fully harness these tools, fostering

confident teachers who blend technology with pedagogical depth.

8. Recommendations

To translate the study's findings into practice, actionable recommendations target university curricula, policy-makers, PST training, and stakeholders in South Africa's Eastern Cape. The measures directly address the identified gaps in PST attitudes toward Moodle and AI apps, leveraging high perceived usefulness (PU) while mitigating barriers such as training deficiencies, load shedding, data costs, and AI bias concerns, as evidenced in participant narratives and TAM-aligned themes. Universities may embed mandatory Moodle and AI modules into Bachelor of Education (BEd) programs from the third year onward, with a commerce-specific focus tailored to the Curriculum and Assessment Policy Statement (CAPS). For instance, modules could integrate AI tools such as ChatGPT for generating Economics scenarios or adaptive quizzes, alongside Moodle's forums for collaborative accounting projects and Business Studies role-plays.

Institutions could prioritise hands-on workshops and simulations, delivered through low-data virtual (e.g., Zoom with offline Moodle exports) and in-person sessions on institutional platforms. Shifts affective attitudes from caution to enthusiasm, and aligns with phenomenological calls for empowerment amid resource constraints. Infrastructure enhancements demand public-private-government partnerships, channelling CAPS digital literacy pushes into subsidised data bundles, solar-powered hotspots, and resilient LMS hosting for rural PSTs. Furthermore, longitudinal follow-up research is essential: universities and the Department of Higher Education could track alumni implementation in low-quintile schools over 2–3 years, using mixed-methods to assess long-term attitude shifts, TAM extensions (e.g., facility conditions), and 4IR readiness in commerce pedagogy. Policy could urge the Department of Basic Education to incorporate LMS/AI competencies into Integrated Quality Management System (IQMS) evaluations, mandating verified digital proficiency for PSTs and in-service teachers at graduation and throughout their careers.

Author Contributions

Conceptualization, O.S. and N.M.; methodology, O.S.; software, N.M.; validation, O.S., N.M., and Z.G.; formal analysis, O.S.; investigation, O.S.; resources, Z.G.; data curation, O.S.; writing—original draft preparation, O.S.; writing—review and editing, O.S.; visualization, O.S.; supervision, N.M.; project administration, O.S. All authors have read and agreed to the published version of the manuscript.

Funding

This work received no external funding.

Institutional Review Board Statement

The study got ethical clearance from the iYunivesithi Walter Sisulu, the institutional approval number is FED-FREC 2540, and the date of approval is 13/08/2025.

Informed Consent Statement

Informed consent was obtained from the participants of this study.

Data Availability Statement

Raw data can be found on request at the Walter Sisulu Research Office.

Conflicts of Interest

The authors declare no conflict of interest.

AI Use Statement

The authors used [perplexity] solely for grammar checking, sentence structure refinement, and improving the readability of the English text in this manuscript. The authors take full responsibility for all academic content,

including all ideas, data, analyses, and conclusions presented herein. The use of perplexity AI was thoroughly reviewed and supervised by the authors.

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