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Exploring Pre-Service Teachers' AI Pedagogical Judgement in Assessment Design: A Document Analysis of Technology-Integrated Tasks

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Abstract. The increasing integration of Artificial Intelligence (AI) in education has significant implications for assessment design and teacher preparation. This empirical study explores how Pre-Service Teachers (PSTs) engage with AI tools in the design of curriculum-aligned assessment tasks within a structured digital literacy module. Using qualitative document analysis of 63 assessment artefacts produced at a South African private higher education institution, the study examines how PSTs utilised AI-generated outputs, the extent of their critical and ethical reflection, and how their designs aligned with curriculum requirements. Thematic analysis, informed by the Technological Pedagogical Content Knowledge (TPACK) framework and the Substitution Augmentation Modification and Redefinition model, revealed three interrelated patterns: efficiency-oriented and creative use of AI, critical evaluation and adaptation of AI-generated content, and emerging ethical awareness regarding overreliance, bias, and contextual misalignment. While most PSTs used AI at substitution and augmentation levels, several PSTs demonstrated movement toward modification through interactive and digitally mediated assessments. Building on the findings, the study proposes the concept of AI Pedagogical Judgement to explain how PSTs negotiate generative efficiency, curriculum alignment practices, ethical reflexivity and professional agency when deciding whether to accept, adapt, or reject AI outputs. The study contributes to emerging scholarship on AI literacy in teacher education by showing that meaningful AI integration relies not only on access to technology, but on the quality of pedagogical judgement exercised in assessment design.

Keywords: Artificial Intelligence (AI); Pre-Service Teachers (PSTs'); assessment design; ethics; contextual understanding; AI Pedagogical Judgement

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1. Introduction

The rapid integration of AI in education is reshaping pedagogy and transforming how teachers design learning and assessment tasks (Holmes & Littlejohn, 2024; Luckin et al., 2022). Beyond technical competence, AI literacy aligns with wider learning goals related to digital citizenship and equips educators to respond to the demands of a fast-changing, data-informed environment (Tunjera & Chigona, 2025). AI originates within computer science and involves the development of programs that can problem-solve, respond to questions, generate plans, and simulate intelligent behaviour, with the aim of augmenting and extending human cognitive capabilities (Owan, et al., 2023).

AI refers to a rapidly advancing area of technology focused on designing computer systems capable of executing processes associated with human thought and decision-making (Rashid & Kausik, 2024). These tasks include understanding and generating natural language, identifying patterns, analysing data, making decisions, and adapting to new or unfamiliar situations (Owan, Abang, Idika, Etta, & Bassey, 2023). Common AI tools used in education are ChatGPT, Grammarly and Gemini. These tools can function as "objects to think with," thereby supporting critical thinking, creativity, problem-solving, and reflective learning.

As education systems increasingly adopt AI-powered tools, it becomes critical to prepare PSTs to engage with these technologies in thoughtful and ethical ways. While the integration of AI in education offers opportunities for efficiency and innovation, it also raises concerns around ethical use and over-reliance issues that must be addressed in teacher preparation programmes (Holmes & Littlejohn, 2024; Williamson & Eynon, 2020). Additionally, analysing how PSTs design assessments with AI allows for insights into their development regarding digital pedagogy and professional judgement.

Existing studies examine perceptions of AI readiness and the use of AI for lesson planning. However, less is known about how PSTs engage with AI when designing curriculum-aligned assessments that require pedagogical reasoning, ethical judgement, and contextual adaptation. This study explores how PSTs use AI tools in the design of curriculum-aligned assessment tasks within a teacher education programme, with particular attention to their creative use of AI, critical evaluation of AI-generated outputs, and ethical considerations shaping their pedagogical decision-making.

The study addresses the following research question:
How do PSTs engage with artificial intelligence (AI) tools in the design of curriculum-aligned assessments within a teacher education programme?

2. Literature Review

The growing implementation of AI in education is especially evident in assessment design and digital pedagogy (Cope, et al., 2020). AI tools can automate feedback and support formative assessment (Owan, Abang, Idika, Etta, & Bassey, 2023). However, this momentum is uneven across global contexts. In parts of

Africa and Southeast Asia, AI literacy remains exploratory, with engagement often limited to pilot initiatives or workshop-based activities due to limitations in infrastructure and capacity constraints (Tunjera et al., 2025). At the same time, teacher preparation programmes are frequently slow to respond to these developments, leaving PSTs underprepared for AI-augmented classrooms (Antonenko & Abramowitz, 2023).

Research indicates that PSTs' attitudes toward AI are influenced by their digital literacy, prior exposure, and opportunities for practice-based application (Joseph, et al., 2024). While AI can support assessment design by generating ideas or streamlining tasks, its use also requires educators to exercise critical judgment, specifically around ethical issues such as bias, data privacy, and student agency (Khlaif, et al., 2025).

Kaka & Kessner (2025) employed a mixed method approach, in which quantitative findings indicated that AI-generated lesson plans outperformed those produced by PSTs in terms of clarity, structured alignment, and inquiry integration. However, qualitative findings demonstrated that AI's strengths were largely confined to the technical elements of lesson planning, particularly procedural efficiency and clarity. These findings suggest that AI-supported lesson design may be both practical and beneficial for immediate classroom application.

In contrast, PST-generated lesson plans reflected greater pedagogical depth, creativity, and critical engagement. Although the study focused on lesson design, the findings highlight the potential of AI as a foundational resource to reduce teacher workload and addressing burnout, while recognising the irreplaceable role of PSTs' professional judgement, creativity, and pedagogical decision-making (Kaka & Kessner, 2025). Despite the growing interest of AI in education, there remains a lack of research that specifically explores how PSTs engage with AI in the context of curriculum-aligned assessment design. This study addresses that gap by examining how students creatively, critically, and ethically navigate AI as part of a structured design task.

2.1 Artificial Intelligence (AI) in Assessment and Digital Pedagogy

AI-enabled assessment tools in education offer several advantages, such as enhancing the precision and efficiency of assessment processes, delivering tailored feedback to learners, and supporting teachers in adjusting instructional strategies to address diverse learner needs (Owan, Abang, Idika, Etta, & Bassey, 2023). The growing use of AI to enhance pedagogical practices through personalised learning, automated assessment, and the streamlining of administrative tasks has increased the calls for the inclusion of AI literacy in teacher education (Tunjera & Chigona, 2025). Existing research proposes AI literacy curricula for primary education that focus on the importance of teachers developing competencies across the technological, pedagogical, and ethical aspects of AI.

AI-driven tools enhance educational measurement by supporting tests, assessment, and evaluation processes. These technologies provide educators with valuable information about student achievement, learning progress, and the overall impact of instructional practices (Sayed, et al., 2024). For instance, AI-based assessment systems can examine student responses to tasks and generate tailored feedback, enabling learners to better recognise their strengths and areas for improvement (Owan, et al., 2023). Traditional assessments function as end-point measures of learning, administered at the conclusion of instruction, such as chapter quizzes or examinations (Cope et al., 2020). These assessments capture learning outcomes through retrospective judgments of learners' ability to recall content.

In contrast, AI-enabled assessment is embedded within the learning process itself. Rather than producing standardised test results that compare learners against a uniform norm, AI-enabled approaches provide ongoing indicators of progress that support personalised and adaptive learning for both learners and teachers (Cope et al., 2020). Despite the benefits of AI for assessment design, PSTs perceive AI as a tool rather than a collaborator (Guan, Zhang, & Gu, 2025). This narrow framing influences PSTs practical approach towards assessment design and only utilises AI for routine tasks such as content generation or lesson planning, rather than for innovative assessment strategies that confirm AI's full potential (Rougeaux & Sharp, 2023).

2.2 Pre-service teachers' preparedness, attitudes, and professional judgement in AI

A lack of AI literacy places PSTs at risk of marginalisation within an increasingly digital educational landscape (Casal-Otero et al., 2023). A study conducted in Portugal and Spain involving 203 PSTs found that participants demonstrated limited readiness to integrate AI into their future teaching practices (Lucas, et al., 2025). PSTs lack a critical understanding of AI's capabilities and limitations, leading to the view that AI is just another technological aid rather than a transformative element in assessment practices (Guan, et al., 2025). Although AI literacy is acknowledged as essential in PSTs' education, its implementation remains restricted by a number of challenges. Key barriers include insufficient faculty expertise, limited resources, and the absence of standardized instructional frameworks (Tunjera & Chigona, 2025). In addition, many teacher educators have not received adequate training in AI, further impeding effective integration.

Limited AI literacy restricts PSTs' ability to harness the potential of AI in ways that are ethical and responsible. This requires a foundational understanding of issues such as data privacy, informed consent, and algorithmic transparency (Sun, et al., 2023). These are areas that continue to raise concern as AI tools become embedded in educational institutions. Consequently, fostering AI literacy in teacher education extends beyond the acquisition of technical competencies. AI literacy also involves cultivating ethical awareness, critical judgement, and responsible application in pedagogical contexts. For PSTs, this highlights the need to cultivate both a critical understanding of AI's possibilities and risks in addition to the professional digital competence necessary to embed AI responsibly within their future teaching practices and support learners' digital development.

2.3 Ethical, reflective and curriculum-aligned use of AI in Teacher Education

At present, the educational community remains divided regarding the use of AI in teacher education. While some educators embrace AI for its accessibility and efficiency, viewing it as a valuable pedagogical tool, others raise concerns about its potential implications for academic integrity and students' intellectual development (Sağın, et al., 2023).

A primary concern among educators is that students may use AI tools in ways that compromise academic integrity, including increased risks of plagiarism. Additionally, there are worries that overreliance on AI could impede students' intellectual growth, resulting in reduced subject knowledge and weakened critical thinking skills. In response to these concerns, some universities have implemented restrictions or outright bans on the use of AI tools in educational contexts (Sağın, et al., 2023). According to Guan, et al., (2025), PSTs stated that they need more understanding regarding AI fundamentals and ethics for AI's integration into education. Tunjera and Chigona (2025) assert, universities are offering specialised modules in AI ethics, data literacy, and instructional design to support the responsible integration of AI in teacher education.

The design of AI-supported lessons demonstrates the value of structured, practice-oriented approaches in developing PSTs' practical AI competencies (Ayyoub, et al., 2025). These developments reflect important progress toward ethical and reflective AI use. However, sustained impact requires continued curriculum refinement, targeted professional development for teacher educators, and closer alignment with established teacher competency standards. Such measures are essential to ensure that AI integration in teacher education remains pedagogically sound, ethically grounded, and scalable across diverse institutional contexts.

Studies across Asian and European contexts suggest that PSTs perceive AI as more than a supplementary educational tool. Rather than functioning solely as a facilitator of learning, AI is positioned as an alternative source of knowledge, feedback, and guidance, with some students referring to AI as "my teacher" (Guan, et al., 2025). This shift reflects AI's growing capacity to emulate certain instructional functions traditionally associated with teachers, including personalised support and adaptive feedback (Ou, et al., 2024). Such perceptions raise important questions for teacher education, especially regarding PSTs preparedness to exercise professional judgement in determining how AI should be integrated responsibly and pedagogically within learning and assessment contexts. PSTs' limited AI literacy and understanding of ethical considerations poses a challenge with the integration of AI into assessment design, raising concerns about the reliability, fairness and validity of AI-assisted assessments (Guan, et al., 2025).

Although existing research has examined AI-generated lesson planning and general attitudes towards AI integration, limited attention has been given to how PSTs engage with AI in the design of curriculum aligned assessment tasks. Assessment design requires not only technological familiarity, but also

pedagogical reasoning, curriculum interpretation, and ethical judgement. Frameworks such as TPACK and SAMR have been used to explain teachers' knowledge domains and levels of technology integration. However, these frameworks do not capture how teachers exercise professional judgement when working with generative AI, specifically when deciding to accept, adapt, reject, or ethically moderate AI-generated outputs. This theoretical limitation is significant in assessment design contexts, where curriculum alignment, fairness, and contextual responsiveness are central.

What remains underexplored is how PSTs negotiate AI-generated outputs of professional knowledge in assessment design. This study also addresses this gap by analysing how PSTs adapt and reflect on AI-generated assessment tasks within a structured assessment design activity in a teacher education course. Additionally, this study explores these decision-making processes and advances the concept of AI Pedagogical Judgement.

3. Methodology and research design

This qualitative study employed a document analysis approach to examine how second-year PSTs are engaged with AI in the design of assessment tasks. Qualitative document analysis is defined as systematic procedure for reviewing and interpreting textual data to obtain meaning, gain understanding, and develop knowledge (Bowen, 2009). A qualitative approach is well suited to the study as it enables an in-depth exploration of participants' pedagogical reasoning, evaluative judgments, and reflective accounts as captured in written artefacts, without researcher intervention during data generation. The documents were produced as part of a formally assessed learning activity and thus represent naturally occurring data situated within authentic coursework contexts.

Each submission included a structured task requiring PSTs to:

(1) design an AI-supported assessment activity using an AI tool (e.g., ChatGPT, Conker AI) to generate a curriculum-aligned assessment idea;
(2) critically evaluate the AI-generated output in terms of pedagogical value, practical feasibility, and ethical considerations; and
(3) reflect on their experience of using AI for assessment design in a short written narrative of approximately 200 words.

The research design was exploratory and interpretive in nature, focusing on how PSTs made sense of AI-generated assessment suggestions and how they articulated their professional judgments and reflective insights through written responses. By analysing these documents, the study sought to gain insight into PSTs' emerging understandings of AI as a pedagogical tool, their capacity for critical evaluation, and their reflective engagement with technology-integrated assessment practices.

3.1 Data Collection

This empirical study employed a secondary analysis of archived assessment submissions (Kelly, et al., 2024) generated by second year PSTs enrolled in a

digital literacy module at a South African private education institution. The dataset comprised 63 written submissions from a cohort of 88 students. Inclusion was based on the successful retrieval of archived assessments following an institutional system change. The remaining 25 submissions were unavailable for analysis due to incomplete responses, or non-submission from students.

The documents were generated as part of a formally assessed learning activity and were not created specifically for research purposes, thereby constituting naturally, occurring data. Each submission contained an AI-supported assessment design task, a critical evaluation of the AI-generated output, and a short written reflective narrative. All identifiable data were removed prior to analysis, and the documents were stored securely and organised for systematic qualitative examination.

3.2 Theoretical and conceptual framework

This study is informed by two complementary frameworks for understanding technology integration in education, the TPACK framework and the SAMR model. Together, these two frameworks provide a robust conceptual lens for examining how PSTs engage with AI in assessment design, enabling analysis of both the knowledge domains underpinning technology use and the extent to which technology transforms pedagogical practice.

For instance, the TPACK framework conceptualises effective technology integration as the dynamic intersection of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK) (Khoehler, et al., 2006). Rather than viewing these domains in isolation, TPACK emphasises the integrated forms of knowledge such as Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Pedagogical Content Knowledge (PCK) that teachers may draw upon when designing meaningful, curriculum-aligned learning experiences (Wang, et al., 2024).

In this study, TPACK provides a lens for interpreting how PSTs evaluated AI-generated assessment ideas, identified content misalignments, exercised pedagogical judgment, and adapted technological outputs to suit the learners' needs and other curriculum requirements. Evidence of integrated TPACK was particularly visible in students' reflective accounts that acknowledged both the affordances and limitations of AI, highlighting the continued necessity of inter alia human oversight, contextualisation, and ethical decision-making in assessment design.

Complementing TPACK, the SAMR model offers, for example, a framework for conceptualising the depth of technology integration by categorising technology use into four levels: substitution, augmentation, modification, and redefinition (Harkin, 2024). Whereas substitution and augmentation describe technology use that enhances or streamlines existing practices, modification and redefinition reflect more transformative uses that fundamentally reshape learning tasks (Boateng & Kalonde, 2024). Within this study, SAMR was used to interpret how PSTs positioned AI in relation to assessment design. The usage ranged from AI as

a replacement for manual assessment design to more interactive, responsive, and digitally mediated assessment practices. While TPACK and SAMR provide a lens for analyzing teacher knowledge and levels of technological transformation, they are not developed for generative AI contexts. As a result, they offer limited explanatory power regarding teachers' evaluation and ethical decision making when interacting with AI-generated outputs. This study uses these frameworks while remaining open to an extended conceptual contribution though AI pedagogical Judgement.

To address this limitation, the study is open to an emergent conceptual contribution, which is AI Pedagogical Judgement. This concept refers to the professional capacity of teachers to critically evaluate AI-generated outputs and make appropriate decisions that balance generative efficiency, curriculum alignment, ethical responsibility, and professional agency. Rather than replacing TPACK or SAMR, AI Pedagogical Judgement extends these frameworks by foregrounding the evaluative and ethical dimensions of AI-supported teaching practice. Together, TPACK, SAMR, and the emergent concept of AI Pedagogical Judgement provide a coherent foundation for analysing PSTs' written artefacts and understanding their developing digital pedagogical reasoning in relation to AI-supported assessment design.

3.3 Data analysis

The data consisted of secondary sources drawn from PSTs' technology-integrated assessment tasks completed as part of a second-year digital literacy education module. The artefacts included written reflections and assessment designs demonstrating PSTs' engagement with AI tools. All data were de-identified prior to analysis to ensure anonymity and protect participant confidentiality. A qualitative thematic analysis was conducted following the six-phase process outlined by Braun and Clarke (2006). First, the researcher engaged in familiarization with the data through repeated reading of the assessment artefacts to gain an overall sense of PSTs' reflections, language use, and expressed meanings related to AI-supported assessment design. Initial observations and analytic memos were recorded to capture early impressions and potential patterns.

Within the second phase, initial codes were generated inductively across the dataset, focusing on meaningful segments of text that reflected PSTs' experiences of using AI, their pedagogical reasoning, and ethical considerations. Coding was conducted systematically using an Excel spreadsheet to organize excerpts, codes, and emerging categories. This phase remained open and flexible, allowing multiple codes to be applied to the same data segment where appropriate. In the third phase, codes were examined for patterns and clustered into preliminary themes.

These themes reflected recurring ideas related to efficiency and creativity, pedagogical judgement, curriculum alignment, ethical awareness, and the perceived role of AI in assessment design. During this phase, the Technological Pedagogical Content Knowledge (TPACK) framework and the Substitution–

Augmentation–Modification–Redefinition (SAMR) model was used as sensitizing frameworks to support interpretive depth rather than as prescriptive coding schemes. In the fourth phase, themes were reviewed and refined by returning to the original data to ensure coherence within themes and clear distinctions between them. This iterative process involved collapsing overlapping themes and discarding those that lacked sufficient analytic depth. The researcher examined whether the themes accurately represented PSTs' meaning making and reflected the broader research focus on technology integration and reflective practice.

The fifth phase involved defining and naming themes, with particular attention paid to how PSTs articulated the relationship between AI use, pedagogical decision-making, and contextual constraints such as curriculum alignment and learner needs. At this stage, the TPACK framework supported analysis of how PSTs demonstrated technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), and their intersections, particularly in relation to adapting and moderating AI-generated assessment tasks. Similarly, the SAMR model was used to interpret the extent to which AI use reflected substitution, augmentation, modification, or redefinition of assessment practices, based on PSTs' reflective accounts. Finally, the sixth phase involved producing the analytic narrative, where themes were synthesized and illustrated through representative excerpts. The analysis emphasized interpretation rather than quantification, focusing on how PSTs conceptualized AI as a pedagogical tool, the limits they identified, and the ethical considerations they raised.

The criteria of credibility, dependability, confirmability, and transferability were considered throughout the research process. In qualitative inquiry, these criteria support the integrity of interpretation by demonstrating that findings are grounded, transparent, and meaningful within the study context (Lim, et al., 2025). Credibility was strengthened through engagement with the dataset of the assessment artefacts during the familiarization phase of thematic analysis (Braun & Clarke, 2006). This iterative engagement enabled close attention to participants' meanings, recurring patterns, and contextual meanings. Credibility was supported through systematic coding and the refinement of themes by continuously returning to the original data to ensure that interpretations reflected participants' written responses.

Dependability was addressed by a clear and systematic analytic process guided by Braun and Clarke's (2006) six-phase thematic analysis framework. The stages of familiarization, coding, theme development, review, definition, and write-up provided a transparent structure for analysis. Coding decisions, theme revisions, and analytic reflections were documented throughout the study to create a trail that supports the consistency of the research process. Confirmability was strengthened through ongoing reflexive engagement during analysis. Analytic memos were used to record emerging interpretations, decisions, and assumptions throughout the coding process. In addition, the TPACK and SAMR frameworks were used as sensitizing lenses rather than predetermined coding categories, ensuring that themes were derived from the data while still being interpreted through relevant theoretical perspectives. This process supported transparency

and reduced the risk of findings being shaped by researcher bias. Transferability was supported through the contextual description regarding the institutional setting, participant group, module context, and nature of the assessment task. By clearly outlining the South African teacher education context and the characteristics of the dataset, readers are better positioned to determine the relevance of the findings to comparable higher education or teacher preparation settings.

TPACK analysis of students' assessment reflections presents a coded analytical framework aligned to the TPACK framework and supported by the SAMR model to illustrate how PSTs' written reflections and assessment artefacts were interpreted during data analysis. Table 1: TPACK analysis of students' assessment reflections demonstrates how participants' comments were mapped across distinct intersecting domains of teacher knowledge, providing a structured lens for examining PSTs' engagement with AI- supported assessment design. Evidence of TK was reflected in students' awareness of AI affordances such as efficiency, creativity, and idea generation. PK was evident in reflections that acknowledged the need for scaffolding, moderation, and adaptation of AI-generated tasks to suit students' levels.

CK emerged where PSTs identified misalignment between AI outputs and curriculum requirements, particularly in relation to CAPS and grade-appropriate content. The intersecting domains of TPK, TCK, and PCK captured PSTs' ability to evaluate AI-generated content, select appropriate digital tools and adapt assessment tasks to meet pedagogical and curricular goals. Evidence of integrated TPACK was visible in reflections that highlighted a balanced approach toward AI use, recognizing its pedagogical value while emphasizing the necessity of teacher oversight, contextual sensitivity, and ethical judgment. Together, this framework supported a detailed interpretation of PSTs' reflective engagement with AI, enabling analysis of both the knowledge domains activated and the extent to which AI use enhanced or transformed assessment practice.

Table 1: TPACK analysis of students' assessment reflections

TPACK component	Analytical interpretation	Illustrative student quote
TK – Technological Knowledge	Awareness of AI capabilities (speed, creativity, idea generation).	"AI helped generate questions quickly."
PK – Pedagogical Knowledge	Understanding of assessment strategies, need for moderation, scaffolding.	"I had to refine the questions to suit learners' levels."
CK – Content Knowledge	Recognising when AI outputs misalign with CAPS or grade-level content.	"AI gave concepts that are actually Grade 9."
TPK – Technological Pedagogical Knowledge	Selecting appropriate tools (Kahoot, Google Forms) to enhance engagement.	"AI suggested interactive assessments to boost participation."
TCK – Technological Content Knowledge	Identifying inaccuracies in AI-generated content.	"AI misunderstood the CAPS content."
PCK – Pedagogical Content Knowledge	Reworking AI tasks to match learning outcomes and learner needs.	"I adapted the AI tasks to fit my assessment purpose."
TPACK (Integration)	Balanced awareness: AI is useful but requires human oversight, contextualisation, and ethical judgment.	"Teachers must still check alignment and avoid over-relying on AI."

Table 2: SAMR analysis of students' assessment reflection presents the SAMR-aligned coding framework used to interpret the depth of AI integration evident in PSTs' reflective accounts and assessment designs. It illustrates how PSTs' descriptions of AI use were categorized across the four SAMR levels: Substitution, Augmentation, Modification, and Redefinition, providing an interpretive lens for examining whether AI use primarily enhanced existing assessment practices or enabled more transformative approaches. First, evidence of Substitution was observed where PSTs described AI as a direct replacement for manual question writing, with minimal change to the assessment structure. Augmentation was evident in reflections that emphasized increased efficiency, clearer organization, or improved assessment structure through AI use.

At the Modification level, students articulated more substantial pedagogical change, describing how AI supported the design of interactive, customized, or learner-centred assessment activities. Redefinition was least observed but emerged in instances where PSTs envisioned digitally mediated assessments such as instant feedback or adaptive tasks that would not be feasible without technology. This SAMR-informed coding complemented the TPACK analysis by capturing the extent to which AI use altered the nature of assessment design, thereby strengthening the analytical depth of the study's interpretation of PSTs' technology integration practices.

Table 2: SAMR analysis of students' assessment reflection

SAMR level	Interpretation of AI use	Illustrative student quote
Substitution	AI replaces manual question writing.	"AI helped create questions instead of me writing them."
Augmentation	AI improves efficiency and structure of the assessment.	"AI saved time and made the rubric clearer."
Modification	AI transforms assessment design by suggesting interactive or customised activities.	"AI suggested quizzes and simulations that improved engagement."
Redefinition	Students begin imagining assessments that would not be possible without technology.	"AI helped me create a digital assessment with instant feedback."

Together, Braun and Clarke's thematic analysis process, supported by TPACK and SAMR, enabled a detailed understanding of PSTs' reflective engagement with AI for assessment design.

3.4 Ethical consideration

Ethical clearance for the use of secondary data was obtained from the Research Ethics Committee of the Independent Institute of Education (IIE) Emeris, a registered private higher education institution. The study made use of existing assessment artefacts produced by PSTs as part of a formal digital literacy module and originally submitted for academic purposes (formally assessed learning activities).

Informed consent from participants was not required for this phase of the study, as no direct interaction with participants occurred and the data were analyzed for

research purposes only. The secondary data was accessed in line with institutional ethical guidelines governing the reuse of student-generated academic work, and the analysis posed minimal risk to participants. To ensure confidentiality and anonymity, all identifying information was removed prior to analysis. Pseudonyms and coded identifiers were implemented throughout the data analysis and reporting process, and no references were made to individual students, or assessment outcomes. The data were analyzed at an interpretive level, focusing on patterns of engagement with technology integration rather than on individual performance or competence.

Data handling procedures adhered to ethical standards for qualitative research (Bezuidenhout, Davis, & du Plooy-Cilliers, 2021). All digital data were securely stored on password-protected devices accessible only to the researcher. The data were used solely for the purposes of this study and were not shared beyond the research context. In accordance with institutional policy, the data will be retained for the prescribed period and then securely deleted. The secondary analysis was conducted with sensitivity to the original context in which the data were produced, ensuring that findings were presented in a manner that respected the participants' academic contributions and avoided misrepresentation or deficit-oriented interpretations. Ethical principles of respect, integrity, and responsible data use guided all stages of the research process.

4. Findings

This study explored how PSTs engage with AI tools in the design of curriculum-aligned assessments. Analysis of 63 assessment artefacts revealed three interrelated themes that characterise PSTs' engagement with AI: (1) creative and efficiency-oriented use of AI for assessment design, (2) critical evaluation and adaptation of AI-generated outputs, and (3) ethical and contextual awareness in AI-supported assessment practices. These themes reflect varying levels of technological integration and professional judgement evident in PSTs' written artefacts and reflective narratives.

Within table 3: AI tools reported by PSTs for assessment design a total of 31 students explicitly mentioned the AI tool used to assist with assessment design. 32 PSTs referred to "AI" in general terms without specifying a platform, suggesting that AI was understood in terms of its functional role in assessment design rather than as a discrete technological tool.

Table 3: AI tools reported by PSTs for assessment design

Type of Artificial Intelligent (AI) Tool	Pre-service Teachers (PSTs)
ChatGPT	12 PSTs
Conker AI	8 PSTs
EduAide.ai	4 PSTs
Google Docs (AI-assisted use)	3 PSTs
Meta AI	1 PST
Gemini	1 PST
Kahoot (AI supported)	1 PST
Quizlet (AI supported)	1 PST

4.1 Theme 1: Creative Use and efficiency-orientated use of AI in Assessment Design

The findings indicate that most PSTs engaged with AI tools in ways that were both creative and efficiency-oriented, positioning AI as a generative partner in the assessment design process rather than as a substitute for pedagogical decision-making. PSTs predominantly used AI tools, such as ChatGPT and Conker AI, to support early-stage assessment design tasks, including generating question prompts, outlining assessment structures, drafting rubrics, and clarifying task instructions. PSTs demonstrated innovative applications of AI tools. The use of AI sparked design creativity, enabling PSTs to envision engaging, learner-centred assessments. These AI-generated outputs were not adopted uncritically; instead, PSTs described adapting, refining, and contextualising them before integrating the assessments into digital platforms such as Kahoot, Quizlet, and Google Forms.

This pattern of use suggests that PSTs leveraged AI to reduce the cognitive and time demands associated with initial assessment planning, allowing them to focus on pedagogical alignment and learner engagement. In this sense, AI functioned as a cognitive scaffold that supported ideas and organisation, rather than as an authoritative source of assessment content. Such engagement reflects Owan et al.'s (2023) description of AI tools operating as "objects to think with" in teaching and learning contexts, thereby supporting, inter alia, critical reflection, creativity, and problem-solving.

Across the dataset, PSTs frequently described AI as a means of reducing the time required to design assessments and overcome initial uncertainties about task structure. Reflections commonly emphasised AI's ability to generate multiple question types and provide a clear assessment framework. For example, one PST noted that AI "helped generate questions quickly and gave me ideas I would not have thought of on my own," while another reflected that AI "made it easier to structure the assessment and plan the rubric." From a TPACK perspective, these responses demonstrated evidence of Technological Knowledge (TK), particularly awareness of AI affordances such as speed, creativity, and idea generation. In terms of SAMR, most of these uses aligned with Substitution and Augmentation, where AI replaced or streamlined manual assessment design processes without altering the nature of the task.

4.2 Theme 2: Critical Engagement with AI's Pedagogical and Contextual Limitations

While PSTs valued AI for efficiency and creativity, many also demonstrated critical engagement with AI-generated content. A substantial portion of students identified limitations related to curriculum alignment, contextual relevance, and pedagogical appropriateness. These concerns were most evident in reflections where PSTs described the need to revise or moderate AI-generated tasks before classroom use. Several PSTs noted that AI-generated content did not align with the Curriculum and Assessment Policy Statement (CAPS), particularly in terms of grade level, subject specificity, or content accuracy. Typical reflections included comments such as "AI gave concepts that are actually Grade 9, not the grade I am teaching" and "the questions were too advanced and had to be simplified." Others highlighted that AI suggestions were often generic and required contextualisation

for South African classrooms. These reflections highlight that AI literacy involves more than simply using AI tools; it demands the critical ability to assess the pedagogical suitability, curriculum alignment, and contextual relevance of AI-generated outputs. As Holmes, et al., (2023) contend, teachers require a foundational understanding of simplified AI algorithmic decision-making processes to recognise potential inaccuracies or embedded biases and to promote equitable, contextually responsive learning experiences (Holmes, et al., 2023; Kohnke & Zou, 2026).

These evaluative responses reflected Content Knowledge (CK) and Pedagogical Knowledge (PK), as PSTs drew on curriculum knowledge and learner considerations to assess the suitability of AI outputs. Evidence of Pedagogical Content Knowledge (PCK) and Technological Content Knowledge (TCK) emerged where students described reworking AI-generated tasks to meet learning outcomes, learner needs, and assessment purposes. PSTs reported that AI strengthened their technological and pedagogical decision-making (TPACK), and they emphasised the need for teacher oversight to ensure contextual alignment with CAPS, learner needs, and classroom realities.

At the level of SAMR, the reflections demonstrated movement across the SAMR model, with most PSTs using AI remaining within the substitution and augmentation stage. This reflects shallow AI literacy skills, and conceptual limitation regarding reliance on AI for low-level procedural tasks, bypassing the opportunity to implement higher-order, AI-enhanced assessment tasks that could redefine student evaluation (Rougeaux & Sharp, 2023). A smaller group demonstrated modification-level integration, reflecting movement beyond simple Substitution. For example, students reported adapting AI-generated ideas into interactive quizzes, scaffolded digital tasks, and assessments that incorporated immediate feedback, indicating more substantive pedagogical change with transformation through interactive, AI-enhanced assessment tools.

4.3 Theme 3: Ethical and Responsible AI Use

A further theme evident across the dataset was PSTs' awareness of ethical and contextual considerations associated with AI use in assessment design. Many PSTs explicitly identified concerns related to ethical use, overreliance on AI, data privacy, digital inequality, plagiarism and AI's limitations in understanding learners' emotional, cultural, or contextual needs. Several PSTs referenced the importance of teacher oversight, emphasising that AI should support rather than replace professional judgement. Reflections frequently cautioned against uncritical use of AI-generated assessments, with students noting that "teachers still need to check the content and make sure it is fair and appropriate" and that "AI cannot understand the classroom context or learners' backgrounds."

Some students raised concerns about unequal access to technology and the feasibility of implementing AI-designed assessments in under-resourced classrooms. References to data protection and learner privacy, including mentions of POPIA, further demonstrated ethical sensitivity regarding learner data protection and responsible AI use in educational settings. These reflections

indicated evidence of integrated TPACK, where PSTs articulated a balanced understanding of AI's pedagogical value alongside its limitations. Rather than positioning AI as an authoritative source, students framed it as a supportive tool requiring human mediation, contextual judgement, and ethical accountability.

These findings indicate that PSTs can engage with AI tools both creatively and critically when provided with structured, reflective learning tasks. The data revealed that PSTs view AI as a supportive co-designer of assessments, valuing its efficiency, creativity, and ability to generate diverse question types. While PSTs reported that AI strengthened their TPACK, they emphasised the need for teacher oversight to ensure contextual alignment with CAPS, learner needs, and classroom realities.

The reflections also demonstrated movement across the SAMR model, with most students using AI for substitution and augmentation, and a smaller group describing modification-level transformation through interactive, AI-enhanced assessment tools. However, concerns relating to ethical use, digital inequity, plagiarism, and accuracy highlighted a critical awareness of AI's limitations. Collectively, the students' reflections illustrate a balanced stance where AI is beneficial for assessment design, but its responsible integration requires pedagogical judgement, contextual sensitivity, and ethical accountability.

5. Discussion of findings

The findings suggest that PSTs are beginning to position AI not as a productivity tool, but as a pedagogical co-designer that supports ideas and structural planning in assessment development. While many PSTs demonstrated efficiency-oriented use aligned with substitution and augmentation levels of the SAMR model, fewer demonstrated transformative integration. This suggests that although AI literacy is emerging, it may still be situated within enhancement approaches rather than transforming assessment practices.

From a TPACK perspective, the data reveals uneven integration across knowledge domains. While TK was evident in recognizing AI's advantages for speed and idea generation, deeper insights such as TPACK were less consistently demonstrated. Where PSTs adapted AI outputs to align with CAPS requirements and learner needs, integrated knowledge domains became more visible. This suggests that structured reflective tasks provide PSTs with opportunities to develop confidence in their professional judgement rather than relying on AI outputs.

Importantly, the findings also reveal a tension between AI as cognitive scaffold and AI as epistemic authority. While PSTs valued AI for idea generation, many expressed discomfort with its contextual limitations and inaccuracies. This ambivalence reflects broader debates within the literature regarding AI's role in education, including concerns about overreliance, and lack of professional autonomy. The fact that PSTs emphasized teacher oversight suggests that professional identity formation remains anchored in human judgement rather than technological solutions.

Ethical awareness emerged as a dimension of engagement. References to data privacy, and contextual feasibility indicate that PSTs are not engaging with AI naively. Instead, they demonstrate developing forms of critical AI literacy. However, such awareness was expressed at a reflective level rather than operationalised into concrete design modifications. This suggests that while ethical consciousness is developing, its translation into pedagogical design practice requires further scaffolding within teacher education programmes. A conceptual construct has emerged from the findings which are referred to as an AI Pedagogical Judgement.

This study proposes the concept of AI Pedagogical Judgement. Where existing frameworks such as TPACK and SAMR remain useful, but they do not explain the decision-making processes involved when teachers interact with generative AI. AI Pedagogical Judgement refers to the professional capacity to evaluate AI-generated outputs and make appropriate decisions that balance efficiency, curriculum alignment, learner needs, and ethical responsibility. Four interrelated dimensions appear:

1. Generative efficiency is using AI for idea generation, structure, speed, and workload reduction.
2. Curriculum moderation, checking for alignment with standards, grade level, learning outcomes and learner readiness.
3. Ethical reflexivity, concerned with fairness, bias, privacy, access and risks of overreliance.
4. Professional agency, focused on exercising teacher authority to adapt, reject, redesign, and contextualise AI outputs.

These dimensions position AI as a mediated tool whose educational value depends on the quality of teacher judgement rather than reliance on the technology itself. The findings suggest that AI integration in teacher education is not simply a matter of tool adoption but involves complex negotiations between technological affordances, curriculum constraints, pedagogical reasoning, and professional identity formation. Structured, reflective AI-based tasks appear to provide a productive space for cultivating this negotiation process.

These findings contribute to understanding AI usage in teacher education by showing that successful integration is not primarily a technical issue, but a pedagogical and professional one. PSTs require opportunities to learn how to question, adapt, and ethically mediate AI-generated content within authentic teaching tasks. This shifts the focus of teacher preparation from learning to use AI tools toward developing the judgement required to use them responsibly and contextually. In this regard, AI Pedagogical Judgement offers a useful conceptual lens for such limitations.

This study is subject to several limitations. First, the dataset was drawn from a single private higher education institution, which may limit the generalizability of findings to other institutional contexts. Second, the analysis relied on secondary assessment artefacts produced within a graded coursework context. As such, students' reflections may indicate performance awareness shaped by assessment

expectations rather than fully authentic beliefs or practices. Third, the reflective narratives were limited to approximately 200 words, which may have constrained the depth of insight into students' pedagogical reasoning. Finally, the study examined intended assessment designs rather than classroom practice. Future research should consider longitudinal and practice-based investigations to explore how AI engagement evolves as PSTs transition into professional teaching contexts.

6. Conclusion

This study explored how PSTs engage with AI tools in the design of curriculum-aligned assessments within a teacher education programme. In response to the research question, the findings show that PSTs engaged with AI in three interrelated ways, as a tool for creative and efficient assessment planning, as a resource requiring critical evaluation and adaptation, and as a technology that raises ethical and contextual considerations.

First, PSTs used AI to generate questions, structure assessment tasks, develop rubrics, and support early-stage planning. This indicated that participants recognised the practical value of AI for improving efficiency, reducing workload, and stimulating new ideas during assessment design. Second, PSTs demonstrated critical engagement by identifying inaccuracies, curriculum misalignment, inappropriate grade-level content, and the need to modify AI-generated outputs for learner needs.

These findings suggest that effective AI integration depends not on automatic acceptance of generated content, but on pedagogical reasoning, curriculum interpretation, and professional judgement. Third, the findings revealed growing ethical awareness. PSTs raised concerns relating to overreliance on AI, plagiarism, privacy, fairness, and unequal access to digital resources. This indicates that AI literacy in teacher education should extend beyond technical competence to include ethical and contextual decision-making.

A key conclusion of the study is that meaningful AI integration is not determined by tool adoption alone, but by the quality of judgement exercised when evaluating, adapting, and mediating AI-generated outputs. The study advances the concept of AI Pedagogical Judgement as a useful lens for understanding how future teachers balance efficiency, curriculum alignment, ethical responsibility, and professional agency in AI-supported assessment design. The study concludes that AI can enhance teacher preparation when embedded within structured reflective tasks that develop critical thinking, moderation skills, and responsible professional decision-making.

7. Recommendations

Future research should explore longitudinal changes in PSTs' AI use in assessment design over time and investigate how these capabilities translate into actual classroom practice. Additionally, teacher education programmes must move beyond technical training and develop students' capacity to evaluate, critique and responsibly use AI in teaching and assessment. Furthermore,

modules should include assessment activities where PSTs generate, adapt, and justify AI-supported teaching resources to strengthen pedagogical judgement. Students should be taught how to check AI-generated outputs against curriculum standards, learner readiness, and contextual classroom realities. As AI becomes increasingly embedded in education systems, the role of teacher educators in modelling critical and ethical AI integration will be valuable. Further studies should investigate how PSTs' AI Pedagogical Judgement develops over time and how these capabilities translate into real classroom practice during teaching placements and early career teaching.

8. Conflict of Interest

The author declares there are no conflicting interests. The study was conducted in accordance with institutional ethical guidelines, and the analysis was carried out independently for research purposes.

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