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Leveraging AI for Self-Reflection in Teacher Training: Insights from Jamaican Trainee Teachers

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Abstract: ***This study investigates how Jamaican trainee teachers utilize artificial intelligence (AI) tools for self-reflection during teacher training. Drawing on both quantitative and qualitative data from 30 trainee teachers and 15 educators across six institutions, the research identifies the benefits, challenges, and perceived impacts of AI integration on professional development. Findings reveal that most trainees used tools like ChatGPT and Grammarly to enhance lesson planning, assess classroom strategies, and refine content delivery. While AI-supported reflection promoted efficiency and instructional clarity, concerns arose around over-reliance, inconsistent output, and contextual misalignment with local curricula. The study concludes that AI has promising potential in teacher training, provided structured support and balanced human oversight are maintained.***

Keywords: trainee teachers, artificial intelligence, self-reflection, teacher education, lesson planning

1. Introduction

Self-reflection is an essential component of professional development in education, particularly during teacher training. According to Fontane [1], it allows teachers to deeply explore events to learn from their experiences so that they can undertake a change in behaviour or perception. This continuous process not only enhances teaching quality but also fosters personal growth and professional competence among educators. The time-tested approach of traditional teaching involving face-to-face classroom interactions and learning through the utilisation of textbooks and educators' guided critical thinking exercises is quickly becoming obsolete. For trainee teachers who are still trying to improve their classroom presence, student engagement strategies, and lesson planning, this tool can be beneficial in the analysis by providing more objective views of recorded lessons, highlighting patterns in students' development, and recognizing moments of low interactions by students.

This study aimed to explore how Jamaican trainee teachers use AI tools to enhance self-reflection and improve their teaching practices during practicum experiences. Particularly, it examined how the use of this technology impacts the advancement of their teaching methods. Through its exploration we aimed to gain insights not only on the practical uptake of AI in local teacher education but also the implications for preserving impactful, technology-integrated amid resource constraints and professional development.

Problem Statement

Currently in Jamaica, there are limited research on how AI supports self-reflection among trainee teachers making the need to explore AI's effectiveness in enhancing teaching practices through self-analysis relevant to our context.

Research Questions

1) What are the key challenges associated with integrating AI-driven mentorship and professional development tools in teacher training?
2) What are the key opportunities associated with integrating AI-driven mentorship and professional development tools in teacher training?
3) How do trainee and in-service teachers perceive the role of AI in enhancing professional development and mentorship in teacher training programmes?

Significance of the Study

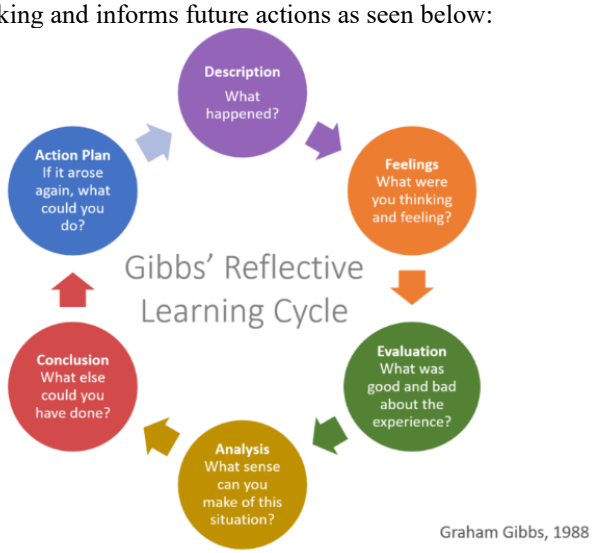
The significance of the study is to build on the contribution to teacher education research in Jamaica to explore the practical implications for curriculum development and AI-based mentorship programmes, while demonstrating the potential to enhance self-directed learning and teaching effectiveness. This study addresses a gap in research on AI-

supported reflective practices within teacher training, particularly in developing contexts. Its findings offer critical insights for curriculum reform, equity in digital learning, and policy-making around AI literacy in education.

2. Literature Review

In this section, we explored the significance of self-reflection in teacher training, its theoretical foundations, its impact on teaching practices, and its contribution to effective professional development. Much of today's popular discussions are centred on artificial intelligence (AI) and how it has impacted the way we live our lives and interact with technology, and has also revolutionized the education field. Artificial intelligence, according to Britannica [2], is seen as activities traditionally performed by human intelligence that are now being performed by digital computers or computer-controlled robots due to their capability to. Putting it simply, Karsenti [3] mentioned that it is a subdivision of computer science that fabricates "intelligent" machines that react and work similarly to the brain of a human. Today, the development of AI is rapidly growing and is trending in almost every area of people's lives [4]. As part of the process, according to Kingsbridge Teacher Training – North West [5], trainee teachers are expected to plan and deliver well-structured lessons, considering the needs of their students. As trainee teachers, it is important to take a step back to self-reflect as it can be helpful to bring habitual patterns from the subconscious level to the more conscious plane [6].

When teachers engage in self-reflection, they understand themselves, their methods, and, in essence, their students, making reflection an important component of improving the quality of teaching. According to Gardner Murray [7], D. Gardner quoted Endo in his article entitled 'Teacher Trainees' Autonomous Development Through Reflection' described 'reflection' as a process that supports deep learning and meaningful understanding. Gibbs reflective cycle is a theoretical model that offers a structural framework for experiential learning [8] and is said to consist of a six-stage process of reflection that improves decision making and informs future actions as seen below:



According to Coursebox [9] each step of the cycle builds on the previous one

- **Description** – What happened?
- **Feelings** – What were you thinking and feeling?
- **Evaluation** – What was good or bad about the experience?
- **Analysis** – Why did things happen the way they did?
- **Conclusion** – What could you have done differently?
- **Action Plan** – How will you approach this kind of situation next time?

The Gibbs Reflective Cycle has multiple uses for e-learning can assist educators to construct better and more learner-aligned course materials [9].

2.1 The Key Challenges Associated with Integrating AI-driven Mentorship and Professional Development Tools in Teacher Training

The integration of AI in education creates significant issues that probe its ethical implications, fairness, and reliability. AI systems, such as ChatGPT, can produce biased or inaccurate information, compromising their credibility as an educational tool, threatening issues such as plagiarism, lack of originality, and cybersecurity vulnerabilities, deepening the complexity of AI's role in supporting hands-on learning. As indicated by Garcia *et al* [10] and Samuels *et al* [11], there are many barriers affecting the integration of AI tools in Education. They continued to elaborate that not only do these barricades disturb educators, but policymakers as well, where issues with digital literacy, anxieties about data privacy, algorithm bias, and the need to guarantee equitable access to AI-enhanced learning are experienced. Additionally, significant concerns relating to the Integration of AI systems, such as ChatGPT can undermine their credibility since they can produce inaccurate or biased information [12].

Despite its benefits, the question of its reliability, ethical implications, and fairness is raised and posing significant concerns about its integration in education. Matters such as plagiarism, cybersecurity, lack of originality, and vulnerabilities complicate its role in encouraging authentic learning. These tools can produce inaccurate information, weakening their trustworthiness as an educational tool [12], [13]. The utilisation of AI for assignments also calls into question academic ethics, as the distinction between AI-generated work and the work of humans remains difficult [14], [15]. These issues reflect a growing tension between AI's efficiencies and core educational values like critical thinking, creativity, and ethical responsibility.

2.2 The Key Opportunities Associated with Integrating AI-driven Mentorship and Professional Development Tools in Teacher Training

One of the key drivers in educational innovation is the application of AI technology in education. Integrating these tools within teacher-education programmes not only builds their fluency in AI itself—covering issues like bias, transparency, and data privacy, but also develops the skills of instructors in teaching methodologies such as lesson plans, crafting syllabi and developing curricula [16]. This combined force prepares educators to both guide their students in responsible and leverage AI effectively [17]. Not only does it

deliver a one-on-one mentor feedback on a scale, but it also offers direction to educator's pace of learning, strengths and weaknesses that not only serve as a personalized boost engagement, but also ensures that no matter the size of the cohort, every teacher receives targeted support. This was also supported by Samuels *et al* [11]. According to Roshan *et al* [18], AI tools can analyze uploaded lesson recordings or classroom data to identify patterns—such as teacher talk time, question diversity, or student engagement cues—providing actionable insights. This data-driven reflection accelerates professional growth by pinpointing exactly where pedagogical adjustments are needed. Along with virtual student agents, Generative AI frameworks can also stimulate realistic classroom scenarios, rehearse complex lessons or manage challenging behaviors in an environment that is risk free. This practice helps to refine instrumental techniques before entering live classrooms. Not only does AI offer real-time analytics for reflective teaching by highlighting specific aspects requiring pedagogical changes [18], it also according to Kelley *et al* [17], cultivate AI literacy and ethical practices leveraging AI successfully and mentoring their students in practicing responsibility in its utilization. In the case of Jamaica, educators are no different, they generally acknowledge the potential benefits of technology, enriching students learning and teaching methodologies that which includes support tools customizing professional development.

2.3 The Perception of the role of AI in enhancing professional development and mentorship in teacher training programmes by trainee and in-service teachers

Recent studies indicate that teachers' perceptions of AI play a crucial role that impact the implementation and effectiveness of AI-based professional development (PD) and mentorship. This too was also supported by Bagai & Maine [19]. According to Holmes *et a*l. [20], teachers generally recognize the potential of AI to personalize learning, provide timely feedback, and support continuous growth. However, they also express concerns regarding the reliability of AI systems, data privacy, and the need for adequate training to use these technologies effectively. Jamaican educators are in agreement with this as well.

A study by Holmes, *et a*l. [20] titled *"Artificial Intelligence in Education: Promises and Implications for Teaching and Learning"* (available on Google Scholar) reveals that both trainee and in-service teachers see AI as a promising tool to supplement traditional PD and mentorship approaches. Teachers reported that AI systems could offer tailored feedback on teaching practices, identify areas for improvement, and facilitate remote mentorship — particularly valuable in resource-constrained settings. Nonetheless, the study also emphasizes that successful integration depends heavily on teachers' perceptions of AI's utility and their confidence in its use. Jamaican teachers believe that AI-based mentorship can help overcome current challenges and disparities been in-service and pre-service educators, more so in the rural areas where limited access to mentors is inaccessible [21]. They continued to state teachers viewed the fact as promising that AI systems could offer personalized feedback and facilitate remote coaching. While dedicated Jamaican studies remain forthcoming, converging evidence from ESL practicum research [22] and video-dialogue experiments [23] indicates that AI can serve as an effective, scalable reflection coach. For Jamaican trainee teachers—navigating large cohorts, diverse student needs, and limited supervisory resources—AI-powered self-reflection tools offer a promising avenue to enhance pedagogical skills, foster deeper metacognition, and ultimately improve classroom outcomes.

Future research should pilot context-adapted platforms in Jamaican colleges to measure impacts on teaching competencies and student achievement.

3. Methodology

3.1 Research Design

The research study employed a survey design leveraging quantitative and qualitative data collection and analysis, which align with Creswell and Plano Clark [24] highlight of the multimethod approaches to facilitate a rich understanding of the research problem. This approach enabled the researchers to triangulate the data, allowing for an extensive comprehensive of how AI tools were used by the trainee teachers in Jamaica for self-reflection during the teaching practicum. This design offered the opportunity to explore the multifaceted relationship among the trainee teachers' perceptions, challenges, and use of the AI tools in their teacher training experiences. The study used questionnaires to collect qualitative and quantitative data from trainee teachers, while qualitative data was collected through focus group discussions with the trainee teachers and interviews with the educators (teacher-educators and cooperating teachers).

3.2 The Participants

The study involved Jamaican trainee teachers who were enrolled in teacher training programmes across Jamaica in 2023. The participants of the study were thirty (30) trainee teachers and fifteen (15) educators (cooperating teachers and teacher-educators) across 6 tertiary institutions located in 6 parishes. The trainee teachers were selected using the snowball sampling method where a few were initially referred to participate in the online questionnaire and were asked to share with their peers across teacher training institutions. This sampling method allowed the study to involve a diverse group of trainee teachers. Trainee teachers were also engaged in focus group discussions through the employment of convenient sampling because of their availability and willingness to participate in the study which facilitated an in-depth discussion of how trainee teachers utilized AI tools to self-reflect and improve their teaching practice. The number of trainee teachers ensured there were enough responses that vary, allowing for nuanced and rich experiential insights through thematic coding. The educators, on the other hand, were deliberately selected using the purposive sampling method because they were already engaged in the practicum process as overseers and/or supervisors. The purposive sampling enabled direct insight collection from educators as they mentored and observed trainee teachers during the teaching practicum. Overall, the

sample facilitated geography and contextual diversity and representativeness of the participants across the three counties in Jamaica of varied educational environments.

3.3 Data Collection and Data Analysis

The study collected qualitative and quantitative data from the questionnaire which was shared online amongst trainee teachers. The questionnaire consisted of closed-ended and open-ended questions that focused on the trainee teachers' familiarity with AI tools, their perceived benefits, and challenges. The trainee teachers were also engaged in a focus group discussions that followed a semi-structured format, which facilitated further insights into their experiences and perceptions. The educators on the other hand were interviewed and shared what they observed of the trainee teachers who used AI tools for professional development and self-reflection to give insights into the challenges and concerns and made recommendations about AI's adoption in teacher education. The quantitative data in this study were analysed using descriptive statistics such as percentages, frequency distribution, and central tendencies to identify statistical patterns and trends in trainee teachers' perceptions and their levels of agreement regarding the usefulness of AI tools for self-reflection. While the qualitative data were analysed using coding and thematic analysis where themes, patterns, and nuances were identified in trainee teachers' responses. This analysis focused on trainee teachers' reflective thinking based on their planning and execution of classroom lessons, identifying any instructional improvements and challenges encountered. This analysis format according to Creswell and Plano Clark [24] allow for the combination of measurable insights and context-specific perspectives, which fortify the conclusion of the study ensuring reliability and validity of the study. This was ensured through the careful consideration of data saturation which was monitored during the data analysis. Moreover, the study ensured that informed consent from all participants, while emphasizing confidentiality, anonymity, and data security in handling the trainee teachers' data collected.

4. Results

4.1 Results Based on Research Question 1

How do Jamaican trainee teachers utilize AI for self-reflection during their practicum?

This research question explored how AI tools have been used for self-reflection and professional development by Jamaican trainee teachers. The study focused on revealing the different aspects of the trainee teachers' teaching practices that have been enhanced following the integration of AI tools. The findings for this question provide valuable insights into how trainee teachers leveraged AI tools to support their reflective practices and encourage their professional development.

Figure 1 shows the age range in years of the trainee teachers who participated in this study, emphasizing a diverse group with differing experiences related to life and teaching. The data revealed that the majority (56.7%) of the participants were in the age range 17-25 years; followed by the age range 26-35 years with only 30% of the participants in the study. The research included 53.33% of trainee teachers who studied mathematics education, the remaining studied early childhood, science, and English. Additionally, 10% of the participants fell in the age range 36-45 years and only 3.33% were over 45 years, indicating that there is less representation of older individuals in the teacher training programmes in Jamaica. The data illustrated that there is a younger demographic interest in mathematics education, which is often considered to be a challenging area of education though rewarding. This suggests that the recruitment efforts of the teacher training institutions seem to be geared toward younger trainees to specialize in mathematics. This is particularly true because there are scholarship offerings for students in their first or second year of study desirous of becoming mathematics teachers to help alleviate the burden associated with financial struggles to complete tertiary education [25]. This reflects that there is a pressing demand for mathematics educators in Jamaican schools.

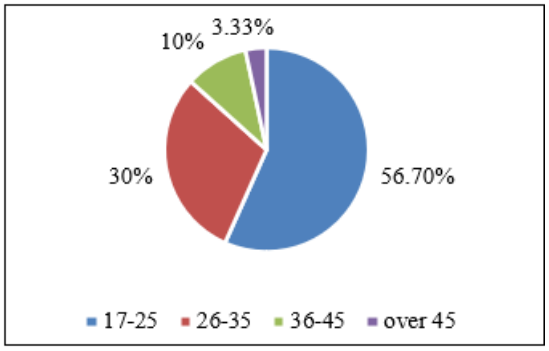


Figure 1: Age range of trainee teachers

Moreover, besides the demographics and trainee teachers' specialisations, the data uncovered that a significant portion (70%) of the trainee teachers leveraged AI tools for self-reflection activities while completing their teaching practicum (see Figure 2). This emphasizes an increasing shift towards integrating technology into teacher education. Upon further investigation, the trainee teachers reported that utilising AI tools has helped them refine lesson plans, evaluate their teaching techniques, and facilitate professional development. In addition, these trainee teachers expressed that they have the privilege of becoming equipped to meet

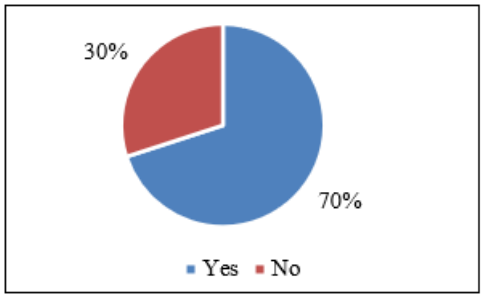


Figure 2: Trainee teachers' response to their use of AI tools for self-reflection activities on practicum

the changing needs [and/or requirements] of the teaching profession. This suggests the need for trainee teachers to develop a technological adaptive mind-set especially since their students have already adopted using technology tools.

The data in Figure 3 illustrated that most of the Jamaican trainee teachers integrated AI tools for self-reflection during

their teaching practicum. The most widely used AI tool among the trainee teachers (70%) was ChatGPT to assist mainly with their lesson planning. The trainee teachers reported that when they needed to get creative, they used ChatGPT to help develop ideas that facilitated instructional delivery, simplify complex teaching tasks, and aid in researching classroom management approaches (strategies). These teachers also pointed out that this tool helped them not only enhance their lesson development process but were able to identify innovative instructional tasks for their students particularly based on the students' experiences and involvement with technological tools. Additionally, the teachers expressed that leveraging this tool has equipped them to better navigate classroom challenges by being able to break down and clarify concepts for their students and improve their overall teaching practice experience. Grammarly (46.7%) and Quillbot (40%) were also commonly used AI tools by the trainee teachers to facilitate the refinement of written content including students' notes and lesson plans. The trainee teachers shared that Grammarly helped to enhance their communication in the English language based on grammatical accuracy and ensuring clarity. Quillbot, on the other hand, was found to also improve the trainee teachers' writing style where they can better paraphrase to help polish their instructional materials. Both of these writing tools have helped to contribute to trainee teachers' self-improvement by providing support in their presentation of content in a more effective manner.

The data revealed that some trainee teachers also explored less widely used AI tools such as OpenAI, Eduaide.AI, MagicSchool, and Copilot Education. The findings shared that 16.7% of the trainee teachers used OpenAI to facilitate general AI-based support, 13.3% explained that Eduaide.AI assisted with developing educational tasks based on suitable features for the students considering their experiences, particularly with the technology. MagicSchool, however, was mainly used by 3.3% of the trainee teachers to help with science activities, while 6.7% of trainee teachers used Copilot Education to help with ongoing professional growth. Nevertheless, it is noteworthy to mention that 9.9% of the trainee teachers expressed that they did not use any AI tools during their teaching practice. The findings in Table 1 illustrated that for lesson planning, 63.30% of the trainee teachers used AI tools to explore various differentiated instructional approaches to prepare materials and activities to meet the diverse student learning needs. These trainee teachers expressed that they leveraged the AI tools to craft lesson plans that provide support for students across different learning levels that consider adaptability and inclusivity. Most of the trainee teachers mentioned that writing lessons plan according to the 5E Lesson Plan Model (Engage, Explore, Explain, Elaborate, and Evaluate) initially was found to be unclear and difficult to write detailed instructions they need to give and tasks for students suited to each E in the 5E model. The trainee teachers pointed out that these tools were found to be beneficial to some extent to help clarify aspects of the 5E Lesson Plan Model particularly in determining the pace of each segment of the lesson to aid in support students' learning outcomes. Another key area in which AI tools were found to have played a significant role is student engagement where 43.3% of the trainee teachers expressed that they leverage these tools to facilitate engagement activities, interactive quizzes and AI-powered simulations to maintain student interest and reinforce concepts.

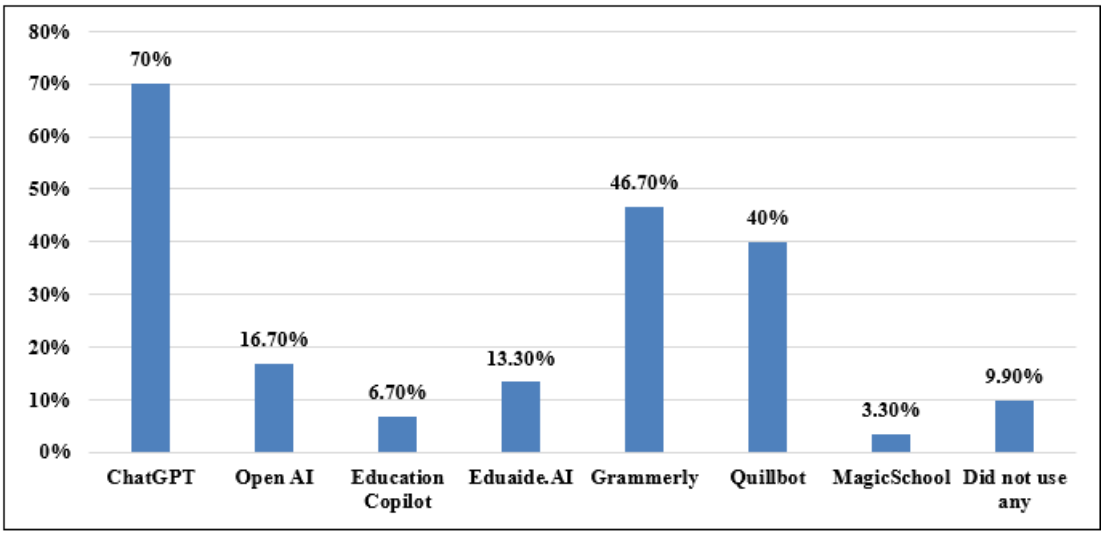


Figure 3: AI tools used for self-reflection

This suggests that trainee teachers were better able to have a dynamic classroom environment where students remain engaged and actively participate. Ten percent (10%) of the participants stated that they used Quizzizz and Quillionz for classroom assessment to facilitate automated grading, allowing teachers to focus on instructional strategies which are areas in which they need more development while minimising the work needed to prepare assessment tasks manually. These trainee teachers expressed that these Ai-driven analytics allowed them to assess student responses and make adjustments of their instructional strategies, activities in real-time; this helps to focus on student performance and their understanding to adapt (and/or adjust) their teaching approach. This type of grading tools facilitates objective and consistent evaluations of students work.

Table 1: Ways AI was used for Self-Reflection

Ways AI was used for Self-Reflection	Indicators	Percentage of Respondents
Lesson Planning	Differentiated instruction materials; lesson plan writing	63.30%
Student Engagement	Simulations, interactive quizzes; get students interested	43.30%
Classroom Management	Maintaining students' engagement; minimal disruptions; proactive behaviour management	13.30%
Assessment practices	Automated grading tools and rubrics	10%
Reflective Teaching Approach	Lesson effectiveness, knowledge of content, classroom interactions, and student performance trends	93.70%

The data uncovered that 93.7% of the trainee teachers believed that AI tools were found to be beneficial in reflecting on their lesson effectiveness, their content knowledge, the students' content knowledge, and the classroom interactions. This helps them to become empowered as they continuously review and refine their teaching practices and enhance their understanding of their professional growth journey.

Table 2 showed that the trainee teachers had varying levels of perceptions about their familiarity with Artificial Intelligence (AI) technologies. The data revealed that 26.7% of the trainee teachers expressed that they were "slightly familiar" with AI technologies, while 30% equally said that they were "moderately familiar" and "very familiar". Additionally, 13.3%, a smaller group expressed that they were "extremely familiar" with the AI tools. This indicated that they have some experience with the AI tools. Moreover, Table 2 indicate the mean score of perceived familiarity to be 3.3 indicating that on average each trainee teacher believed that he/she was "moderately familiar" with AI technologies, while the modal and median scores of 3 and 4 indicate that most trainee teachers identified themselves as being in the "moderately familiar" to "very familiar" range. The mean, mode, and median suggest that some trainee teachers had a considerable amount of exposure to AI tools, while other remained less experienced. Furthermore, the trainee teachers added more context to their responses when asked about their knowledge of AI technologies emphasizing that ChatGPT is the most frequent tool employed for self-reflection.

Table 2: Percentage of participants which focus on perceived familiarity with the different Artificial Intelligence (AI) technologies

Question	Not Familiar At All (1)	Slightly Familiar (2)	Moderately Familiar (3)	Very Familiar (4)	Extremely Familiar (5)
Knowledge of AI technologies	0 (0%)	8 (26.7%)	9 (30%)	9 (30%)	4 (13.3%)

*mean score of perceived familiarity = 3.3; modal score of perceived familiarity = 3, 4; median score of perceived familiarity = 3

They shared that ChatGPT provided answers to subject-specific questions, and generated lesson plans. ChatGPT was considered both a problem-solving and content-generator tool that facilitated instructional planning and teaching practices. For example, one trainee teacher expressed that AI tools facilitated simulations which helped with science teaching; and another said they benefited from creative teaching ideas. Other trainee teachers stated that they have familiarity with a wide range of AI tools comprising OpenAI and Quillibot which they leveraged for clarity on instructional materials prepared for lessons. The trainee teachers' responses indicate that the AI tools were used for specific purposes such as improving their writing and lesson planning and facilitating subject-specific engagement.

4.2 Results Based on Research Question 2

What are the perceived benefits of using AI as a reflective tool in teacher training?

This research question explored trainee teachers' perceived benefits of AI tools impacting their self-reflective activities during the teaching practicum. This question focused on the influences of the tools on trainee teachers' lesson planning, assessment practices, and instructional improvement as they self-reflect.

Figure 4 illustrated that 80% of the trainee teachers believed that AI tools positively affected their ability to self-reflect on their teaching experiences. Based on an in-depth analysis of their comments most of the trainee teachers expressed that AI tools helped them to better self-reflect by simplifying their writing and facilitating insights into common errors-related concepts. For example, one trainee teacher emphasized that AI tools helped with improving his/her writing skills as well as their understanding of content as an English Teacher. The AI tools especially helped him/her to not only identify mistakes made while writing that they may have overlooked but also be able to improve on them. This suggests that AI tools are the key component for facilitating reflective teaching since they not only enhance trainee teachers' comprehension of the technical aspects of lesson planning but encourage greater self-awareness.

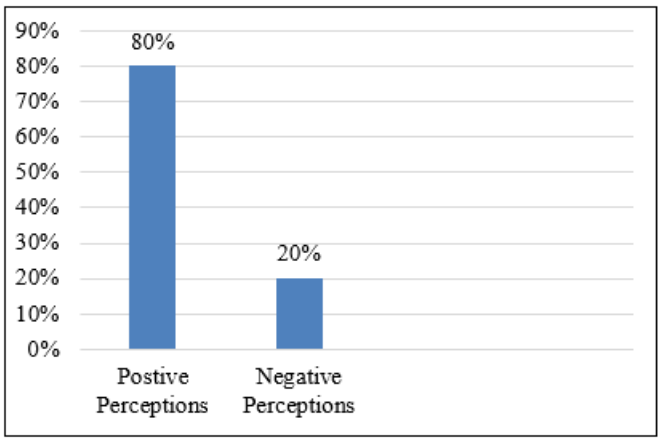


Figure 4: Trainee teachers' perceptions of AI's impact on their self-reflective activities

Figure 5 revealed trainee teachers perceived the benefits of using AI tools for self-reflection during teacher training. Most of the trainee teachers (63.3%) reported that AI tools improved their ability to plan lessons (see Figure 5 and Table 3). They explained that AI helped to provide a smooth run of the planning process producing lesson outlines that are structured, such that the lesson objectives and activities are well-aligned.

Additionally, by extension, the trainee teachers can better identify strategies for instructional differentiation. This ensured efficiency which facilitated trainee teachers with the opportunity to allocate more time to clarify students' tasks based on classroom activities and focus on tailoring lessons to allow for various student needs [abilities and preferences]. Another key benefit emphasized is AI's ability to assist in driving flexibility and adaptability of lesson planning by providing creative teaching approaches that could better engage students. These creative approaches can encourage innovative thinking while allowing for fast adjustments of lesson plans when needed. This allowed trainee teachers to become better equipped with designing varied classroom experiences and engagement. Furthermore, 43.3% of trainee teachers experienced improved content delivery because the AI tools broke down complex concepts into smaller pieces for students which they could better digest which made it easier for the students to comprehend challenging topics. This simplification indicates that trainee teachers benefit from becoming more effective communicators of difficult ideas to drive students' comprehension. This ultimately empowers trainee teachers to cultivate meaningful connections between theoretical content and real-life applications that enhance students' overall learning outcomes.

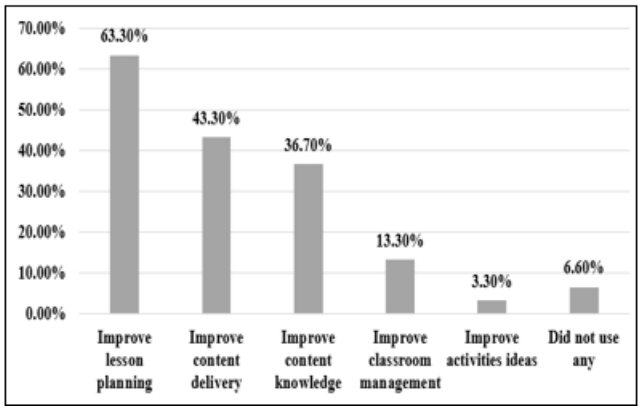


Figure 5: Perceived benefits of AI tools on self-reflection during teacher training

Trainee teachers have emphasized that AI tools have allowed them to find a variety of instructional strategies as well as lesson materials that can cater to the students' varying learning styles. For instance, one trainee teacher explained how he/she prepared a detailed 5E lesson plan for a mathematics class using AI tools. This trainee teacher explained that the tools were used to generate examples, real-world problems, and specific learning objectives.

On the other hand, some pointed out that not all of these tools, such as Eduaide.AI, are appropriate to account for diverse learning styles or even provide feasible materials given the school's resources. Nevertheless, most of the trainee teachers commented on their experience in thinking "outside the box" since employing AI tools to support differentiated instructions, which has helped with improving both lesson clarity and engagement. The findings uncovered that trainee teachers were able to effectively use AI tools to enhance student engagement through leveraging simulations, gamified learning activities, and adaptive learning platforms. Some trainee teachers shared that students appreciated visualizing key concepts when engaged with visual representations and interactive questions that encourage active participation in lessons. One of the trainee teachers accounted that when AI simulations were used students seemed to have a better comprehension of scientific concepts since they could visualize real-world scenarios. This aligns with previous findings as countered by other trainee teachers where there is a between the theory and practice driving classroom participation and improved comprehension of concepts. Approximately, 13.3% of the trainee teachers noted that they benefitted from improved classroom management. They expressed that they incorporated tailored engagement strategies and structured lesson activities that they found via research using AI tools to facilitate classroom management. Some of the trainee teachers reported that when they started their practicum, the students seemed disruptive and displayed behavioural issues but once they found these activities and strategies to assist with minimizing disruptions and maintaining control of students' behaviours. They went on to say that they were able to also identify patterns of students' behaviours so they could pre-emptively put measures in place to ensure effective classroom management strategies. For example, trainee teachers who use automated grading tools and rubrics are likely to benefit from reduced time spent on administrative tasks to better manage classroom dynamics and engage students. Moreover, AI tools played a key role in reinforcing trainee teachers' reflective teaching practices. The findings uncovered that approximately 93.7% of the trainee teachers agreed that they benefitted from enlightening perspectives on how to make lessons effective and improve classroom interactions and student performance trends using AI tools. These trainee teachers appreciated that the AI tools provided them with objective evaluations of teaching practices to help them recognize where they need to slow down their content delivery, consider using more visual aids, and better measure students' responses to their lessons. This type of feedback was indicated to be beneficial in making adjustments to their instructional strategies which the trainee teachers believe may help with providing more meaningful and effective teaching strategies.

Table 3: Trainee teachers perceived benefits of AI in self-reflection

Benefits of AI tools in self-reflection	Indicators	Percentages of Participants
Enhanced Lesson Clarity & Structure	Refine lesson plans such as lesson objectives for alignment with activities	63.30%
Objective Feedback	Non-biased evaluations of teaching practices; slow down delivery; use more visual aids	26.67%
Efficiency in Reflection	Reducing time spent on manual review; pinpoint specific improvements	53.33%

A small portion of trainee teachers (36.7%) have also reported that they have seen improvement in their content knowledge since engaging with AI tools, especially where they are now much better able to break down complex concepts. This is based on AI's ability to generate examples contextualising concepts considering students' backgrounds and learning experiences. This has helped trainee teachers prepare lessons that provide students with stepwise explanations based on their experiences of using AI tools. Trainee teachers expressed that they feel more confident in their subject matter which has helped with effective content delivery and can better respond with great clarity to students' inquiries. The trainee teachers (10%) have also noted that they have benefitted from immediate feedback and automated grading by using tools such as Quizziz and Qullionz, where they can assess students' responses in real time. Trainee teachers commented that they can better track the progress of their students' and modify their instructional processes where necessary; as well as reducing the time needed to complete administrative tasks. The idea of time management is a key benefit coupled with trainee teachers being more efficient in their teaching practice. This was accounted for by 53.3% of the trainee teachers who expressed that they can better pinpoint areas for improvement more quickly since AI tools facilitated a reduction in the time they spent on manual lesson planning and reviewing content to create notes. One trainee teacher stated that they have experienced an improvement in their overall quality of instruction since they have time to fine-tune their classroom activities after using the AI tools to plan lessons. Additionally, some of the trainee teachers reported that their stress levels of reduced with lesson planning since their exposure to AI tools which has helped them to become more thoughtful and better able to design teaching strategies for classroom delivery.

Figure 6 shows trainee teachers' perceptions of using AI tools to influence self-reflective activities that could address diverse students' needs. The majority of the trainee teachers (73.3%) believed that AI tools assisted effectively in this regard, while 26.7% did not (see Figure 6). Upon further investigation, the findings uncovered that many trainee teachers were now exposed to innovative ideas and multiple strategies that promote differentiated instruction, and well effective in addressing students' varied learning needs. For instance, one trainee teacher noted that AI "provide[d] a variety of ideas to incorporate differentiated instructions and activities", emphasizing that AI has the capability to serve a broad range of learners.

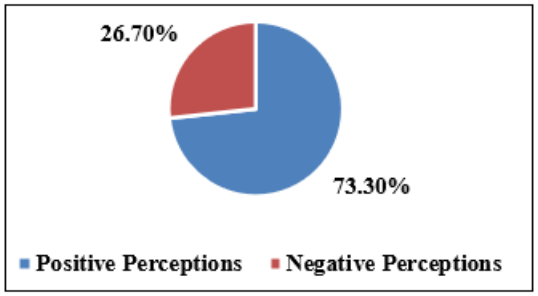


Figure 6: Trainee teachers' perceptions of how self-reflective activities using AI tools impact addressing diverse students' needs

Moreover, tailoring teaching strategies has been indicated to be the most noted benefit by trainee teachers in using AI tools. Several of these trainee teachers expressed that these tailored teaching strategies have provided an eye-opener that affords insights into students' different preferences and learning styles. They went on to share that by identifying students' interests, they can better align lessons that may be more receptive to students learning concepts. One trainee teacher said, "Students have different learning styles. So, AI can give teachers insight on how to cater to specific students", emphasizing the effectiveness of AI tools to focus on individual needs by understanding each perspective 'at a prompt'. This functionality stimulated teachers to become better lesson designers that is more engaging students in a meaningful way, despite their learning preferences.

4.3 Results Based on Research Question 3

What are the perceived challenges trainee teachers have in using AI tools for self-reflection during teacher training?

The findings revealed that trainee teachers have experienced a new set of possibilities in self-reflecting on their teaching practices through the employment of AI tools. This involved trainee teachers being able to assess their teaching methods where they can identify their weaknesses that indicate areas for growth, to allow them to clarify and improve their instructional strategies. Moreover, an examination of the AI tools' effectiveness is dependent mostly on trainee teachers' perceptions of the tools and the benefits they derive from using them. This research question explored the perceived challenges that trainee teachers experienced while engaging with the AI tools for teacher training, especially as self-reflection tools. Through the examination of these challenges, the findings revealed insights into the key barriers found in integrating AI tools into their self-reflective practices that can inform strategies needed to enhance teacher preparedness and professional growth.

One of the key challenges identified in this study is that the trainee teachers (36.7%) received output from AI tools that have either been inconsistent or inaccurate. Table 4 and Figure 7 have shown the frequency of these occurrences, where some trainee teachers pointed out that they experienced errors in the generated AI responses. One case was reported by a trainee teacher who researched information on binary operations but instead received information on binary equations. Another reported, "I asked an AI tool for clarity on a particular topic, and part of it was

Table 4: Trainee teachers perceived challenges in using AI tools for self-reflection

Perceived Challenges	Indicators	Percentage of Participants
Digital Literacy Gaps	Limited familiarity with AI tools, unsure of their applications in teaching	10%
Output received not suited	Inaccurate or inconsistent	36.7%
Bias in AI Feedback	Overgeneralization; at times fail to address diverse educational challenges	13.33%
Over-reliance on AI over personal capabilities	Overlying on AI tools; stunting critical thinking skills; not a replacement for	10%

	foundational processes	
Reliance on AI over human mentorship	Not a replacement for human teachers	10%

incorrect, so I had to source the information from a science textbook". This emphasized the need for trainee teachers to verify AI-generated content manually to establish accuracy and that the information received aligns with classroom requirements. Trainee teachers have indicated that this at times caused frustration or additional work to cross-reference the information, therefore potentially diminishing the perceived benefits in using AI for reflective practices.

Another key issue revealed from the findings of the study is digital literacy gaps, with 10% of the trainee teachers expressing that they have limited familiarity with AI tools and the unpredictability of their nature to facilitate practical applications in teaching. Some trainee teachers, upon further investigations, stated that they did not use AI tools while others mentioned that they were unsure of how to leverage these tools for their teaching practice. One of the trainee teachers reported, "I did not use AI tools to generate questions", which emphasized the disparity in comprehension and application. This highlights the need for targeted training in AI literacy to bridge the knowledge gap experienced among trainee teachers. In the absence of proper familiarity, trainee teachers (educators) could find it difficult to implement AI tools for both effective self-reflection and instructional improvements. Trainee teachers (13.33%) have also mentioned that bias in AI feedback is another barrier, where they expressed concerns about contextual irrelevance and overgeneralization. One trainee teacher stated, "All educational AIs provide the same ideas for a lesson… it seems to cater for 1st world countries more with the ideas it gives". This viewpoint mirrors the obstacles in using AI to obtain suggestions that can contextual teaching practices aligned with Jamaican classrooms, such as the varying students' needs [challenges addressing these needs adequately] and limited resources available. It is imperative for AI tools to address these obstacles [bias] to consider culturally responsive and adaptable experiences, particularly for developing countries that have varied educational settings such as the Jamaican educational system.

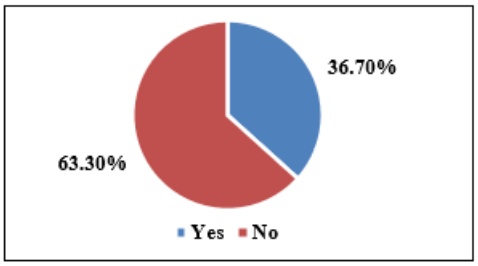


Figure 7: Trainee teachers' perceptions of inconsistencies or incorrect answers observed while using the AI tools

Furthermore, 10% of the trainee teachers expressed concerns of over-reliance on AI at the expense of personal critical thinking capabilities. One of the trainee teachers explained, "Students rely on it for various tasks and are not thinking critically". A few of the trainee teachers expressed their fear of becoming overly reliant on the AI tools that could hinder their higher-order thinking skills over time along with their students. These trainee teachers stated that while the AI tools are relevant to teacher training, it is pertinent to use the tools to support their teaching practices and not replace the foundational learning processes which are crucial for higher-order thinking and problem-solving. It is therefore essential for trainee teachers to effectively reflect on their teaching methods along with students' outcomes without developing dependency on AI tools. This will not only maintain a balance but also drive crucial approaches to ensure problem-solving among teachers and students. Additionally, 10% of the trainee teachers also stated that they do not desire to become reliant on AI for human mentorship during teacher training. While AI tools generate valuable suggestions for teachers, the nuanced feedback by human mentors cannot be replaced. One trainee expressed, "Even though I use AI to write my lesson plans, I go through them and there are no mistakes. As it relates to the questions, I would work them out myself". This indicates there is a need to refine AI-generated content to facilitate mentorship while establishing relevant, real-world classroom scenarios. This further emphasized what human mentors can facilitate such as emotional support and advice AI tools cannot replicate, so that trainee teachers can be well-rounded. Additionally, AI should be seen as a tool to replace human teachers but rather aid their teaching experiences. Finally, some trainee teachers expressed scepticism based on the persistent limitations of using certain AI tools. Some trainee teachers (10%) noted that AI tools at times lacked situational consistency with the Jamaican curriculum reflecting the need for manual adjustments. This is particularly evident in assessing students' creativity and critical thinking which are the subjective aspects of students' performance. Moreover, these trainee teachers have also shared that they sometimes experienced limited internet access and had challenges navigating the AI platforms. This suggests that it is essential for infrastructural and contextual barriers to be addressed to ensure the effective integration of AI tools for self-reflection in teacher training programmes.

4.4 Further Discussions and Implications

Jamaican trainee teachers have reported that they have leveraged AI tools for self-reflection and improving their teaching practices. The findings uncovered the main ways that AI tools have been used by trainee teachers are to facilitate content review, lesson planning, and classroom management strategies. Most of the trainee teachers expressed that they used AI tools to generate new ideas that are both creative and engaging which cater to addressing the diverse needs of the learners, urging them to explore further instructional strategies. One of the trainee teachers stated, "It helps to identify ways in which I could allow the classroom to become more student-centered".

However, 10% of the trainee teachers emphasized the need for AI tools to be supported by input for the optimal effectiveness of their lessons. Another trainee teacher countered, "It is a good tool, but [the] discussion is necessary for students' growth [and development]", reinforcing the need for AI insights to complement critical dialogue between teachers and students, and teachers' ability to make manual adjustments of their instructional strategies. Furthermore, the findings uncovered that trainee teachers have noticed various benefits from using AI tools for self-reflection. Thirty

percent (30%) of the trainee teachers established that AI tools were "effective", while another 30% found them to be "very effective" (see Table 5). Table 5 illustrated on a 4-point scale, a mean score of 2.6 reflecting that on average each trainee teacher considers AI tools to be effective but the modal score of 2 signalling that most students are unsure of its effectiveness. Additionally, trainee teachers resoundingly shared that AI tools streamline lesson planning, freeing time for content delivery. One trainee teacher explained, "It saves time for you to be able to do other things". Furthermore, the findings reported that 73.33% of the trainee teachers would recommend AI tools to be used in teacher training for self-reflection and enhancement of teaching practices (see Figure 8). However, some of them

Table 5: Percentage of participants' perceptions of the overall effective of integrating AI tools for self-reflection in teacher training

Question	Ineffective (1)	Neutral (2)	Effective (3)	Very Effective (4)
Overall effectiveness of AI tools for self-reflection in enhancing teaching and learning experiences	0 (0%)	12 (40%)	9 (30%)	9 (30%)

*mean score of perceived overall effectiveness of AI tools = 2.6; modal score of perceived overall effectiveness of AI tools = 2

highlighted the need to maintain human oversight and not rely heavily on AI tools. One trainee teacher mentioned, "New teachers don't need to reinvent the wheel for lesson planning, but we need to focus on classroom management activities".

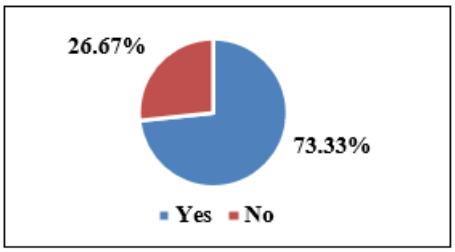


Figure 8: Trainee teachers' perceptions in recommending AI tools for self-reflection in teacher training practicum

Notwithstanding the benefits, the trainee teachers experienced several challenges. Trainee teachers have shared their concern about the need to contextually align AI's suggestions with Jamaican classrooms [11]. One of the trainee teachers expressed, "It doesn't always give you what you are looking for, especially for engaging ideas in the 1st of the 5E's". Another trainee teacher pointed out, "I had to do my own adjustment since AI did not cater to my diverse [classroom]". This emphasized that AI tools need to be modified to facilitate specific educational environments to offer more pertinent recommendations. On the other hand, some trainee teachers (36.7%) expressed that there were inconsistencies with AI's output. For instance, one trainee teacher explained, "For certain equations, it gives wrong answers", and another countered, "Sometimes the AI tools give incorrect answers for a mathematics question". A significant issue highlighted by several trainee teachers was the possibility of over-reliance on AI which they explained could impede problem-solving and critical thinking skills. One trainee teacher mentioned, "After a while, we become too dependent on the tool", indicating that the development of trainee teachers' essential teaching and learning skills can be hindered due to excessive reliance on AI tools. Another trainee teacher warned, "People might become dependent and not think it necessary to put in their own work". Therefore, it is important to minimize these risks especially to balance how AI tools are leveraged where it is not perceived to be a substitute for pedagogical expertise but rather supplement it [11]. Moreover, trainee teachers' decision to integrate AI tools into their teacher experiences correlates with their technological background and experiences. The findings revealed that the younger trainee teachers were found to be more tech-savvy than the others and have been more receptive in leveraging AI tools through experiments with AI tools for lesson planning and obtaining feedback. These trainee teachers have reported that they have experienced increased confidence in their teaching abilities since leveraging AI tools. Conversely, more experienced trainee teachers seemed to be more sceptical about adopting AI tools for self-reflection and often cited concerns about AI tools being fully able to deal with the nuances of classroom dynamics. For example, one trainee teacher elaborated, "The human mind is more versatile… you can generate more ideas that are student-friendly". The findings that 73.33% of trainee teachers recommended that AI tools can be integrated into teacher training programmes to enhance teaching practices in the future, to facilitate improvements in these programmes.

Based on the findings of the study, the following implications are noted:

- **Integration of AI tools into Teacher Preparation Programmes:** The findings revealed that trainee teachers have found the use of AI tools beneficial in their teacher training. This suggests that teacher training institutions can integrate AI tools into the teacher training curriculum, particularly during the practicum, enabling trainees to conduct daily personal lesson evaluations in terms of preparations, and by extension, enhance their ability to self-reflect. Additionally, if trainee teachers are engaged in self-assessment modules provided by AI tools, they can better gauge their strengths and weaknesses. Moreover, these self-assessment tools can complement traditional mentorship.
- **Personalised Learning for Trainee Teachers:** AI tools can individualise learning but can be particularly effective to trainee teachers. Teachers are able to use these tools to personalise their feedback, particularly for teaching practicum, which can help them refine their teaching practices and strategies by assessing their unique strengths and weaknesses.
- **Bridging the Digital Literacy Gap:** In this digital age, where the education system has become more dynamic, there is a need for teacher training programmes to target the inclusion of AI literacy training. Trainee teachers can be engaged in professional development sessions to bridge the gap by addressing the disparities in their proficiency in AI tools to encourage equitable access.

This will allow trainees to become more aware of how to refine the suggestions provided by AI tools and better interpret them. Moreover, the findings suggest that AI developers should consider improving the contextual relevance of the generated suggestions or recommendations suited to developing countries' curricula, particularly in Jamaica. As teacher training institutions leverage both human and technological resources, trainee teachers can become better equipped with the necessary skills needed for diverse classroom settings and can be confident to thrive in them.

- **Enhancing Teaching Effectiveness through AI Feedback:** The findings suggest that teachers can leverage AI tools to help identify areas of improvement due to the challenges in the classroom settings such as student engagement, communication, and classroom management. These teachers are able to diligently work on each area to ensure teaching effectiveness.
- **Reducing Reliance on Traditional Evaluation Methods:** The findings suggest that AI tools can assist with lesson observations which can capture real-time and data-driven feedback. This can help to ensure lesson observations where areas might have been overlooked are done manually.
- **Potential for Over-Reliance on AI:** It is important to adopt a balanced approach in using AI tools for teacher development so that trainee teachers do not become reliant on the tool. As such policies need to guide the usage of AI tools that encourage higher-order thinking and problem-solving skills as AI tools are adopted.
- **Equity and Access Considerations:** Education policymakers need to level the playing field so that all trainee teachers can have access to AI tools, particularly those in resource-limited and rural areas.

5. Conclusion

The study explored the usage of AI tools by Jamaican trainee teachers to complete self-reflection activities and improve their teaching practices. The study focused on the ways that AI tools were leveraged for self-reflection, identifying trainee teachers perceived challenges and benefits, and what recommendations can be considered for AI integration in teacher trainee training programmes. The findings revealed that trainee teachers have a growing appreciation for using AI tools to improve their teaching practices. Additionally, trainee teachers have indicated that they experienced challenges with adopting AI tools which was conveyed through varying levels of acceptance considering their experiences and how comfortable they are with using the technology. It was uncovered that 30% of the trainee teachers found AI tools to be effective, while another 30% believed that they were very effective in cultivating creative lesson planning, encouraging student-centred learning approaches, and enhancing differentiated instruction. Most of the trainee teachers emphasized that they were able to save time, generate lesson ideas, and improve fluency in writing lesson plans and verbal communication by leveraging AI tools. On the other hand, some trainee teachers reported that they found inconsistencies or incorrect answers at times while using the AI tools, which necessitated human input and adjustments. The findings also uncovered that 73.3% of the trainee teachers highly endorsed adopting AI tools for teacher self-reflection, particularly with its ability to reduce workload associated with lesson planning, increase student engagement by incorporating fun activities, and enhance classroom management. Conversely, 10% of the trainee teachers shared concerns about over-reliance on AI and expressed a need to make the instructions clearer. In conclusion, the findings demonstrated that AI tools have the potential to significantly support trainee teachers' teaching practices and self-reflection abilities. It is also important for a balance to exist between AI feedback and human judgement coupled with the ability to adapt. However, it is important that structured training and resources are provided particularly since teaching training programmes evolve to consider equitable access and optimize the use of AI tools.

6. Recommendations

The study recommends that teacher training institutions facilitate the use of AI tools for trainee teachers to continuously enhance their teaching practices in a timely, manner where they can leverage data-informed feedback. Also, AI tools and resources can be adapted to complement human judgment for reflective teaching, which should be used in a structured manner and support equitable access.

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