International Journal of Education Humanities and Social Science

ISSN: 2582-0745
Vol. 9, No. 05; 2026

UTILIZATION OF ARTIFICIAL INTELLIGENCE TOOLS TO FACILITATE TEACHING AND LEARNING IN TEACHER TRAINING COLLEGES IN NORTHERN ZONE, TANZANIA

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https://doi.org/10.54922/IJEHSS.2026.1446

Received: 27 August 2026/Published: 7 Oct 2026

ABSTRACT

This study examined the utilization of artificial intelligence tools to facilitate teaching and learning in teacher training colleges in Tanzania's Northern Zone. The study was anchored to the Diffusion of Innovations Theory and employed a convergent mixed-methods design. The target population consisted of 2,329 participants, including 7 colleges, 7 college principals, 7 IT experts, 272 tutors, and 2,043 teacher trainees. A sample of 272 respondents was drawn, comprising 6 principals and 6 IT experts selected through purposive sampling, as well as 55 tutors and 205 teacher trainees selected through proportionate stratified sampling. Data were collected through an online questionnaire for tutors and teacher trainees, interview guides for principals and IT experts, and an observation checklist. To ensure validity, three experts from MWECAU were consulted: two from Educational Planning and Administration and one from Information Technology. A pilot test was conducted at one teacher training college and was not included in the actual study. The reliability of the quantitative Likert-scale items was assessed using Cronbach's Alpha, yielding a coefficient of 0.786, indicating acceptable internal consistency. The trustworthiness of the qualitative data collection instrument was ensured through triangulation and peer debriefing. Quantitative data were analyzed using descriptive and inferential statistics with the assistance of SPSS version 27, while Qualitative data were thematically analyzed. The study observed ethical principles of informed consent, confidentiality, anonymity, and voluntary participation throughout. Findings revealed that although AI tools are accessible, their use is mainly based on individual initiative and personal preference, with no formal institutional integration or standardized guidance. This suggests that AI adoption remains informal and uncoordinated despite growing usage in academic activities. Based on the findings, the study concludes that AI tools have not yet been fully integrated into teaching and learning processes, due to the lack of clear direction and institutional guidance. The study recommends clearly specifying approved artificial intelligence tools and developing explicit, practical, and implementation-oriented policies and guidelines. In addition, teacher training colleges should establish structured systems for training tutors and teacher trainees on the ethical, pedagogical, and effective use of artificial intelligence tools in teaching and learning.

Keywords: Artificial Intelligence Tools, Teacher Training Colleges, Teaching and Learning, Utilization of AI Tools.

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1. INTRODUCTION

Artificial Intelligence (AI) has become an important technological innovation in all sectors, including education, offering new opportunities to enhance teaching and learning processes. AI refers to computer systems capable of performing tasks that normally require human intelligence, including learning, reasoning, problem-solving and decision-making. The UN emphasizes the importance of responsible and inclusive governance to harness AI's benefits while mitigating associated risks. In line with this, the UN General Assembly adopted its first resolution on AI, urging member states to ensure that AI systems are developed safely, securely and reliably, respecting human rights and international law (United Nations, 2024). The context of education, Artificial Intelligence (AI) contributes to Sustainable Development Goal 4 (SDG 4), particularly Target 4.3, by strengthening teacher education through enhancing instructional delivery, assessment, content creation, feedback provision, and personalized learning experiences. The utilization of AI tools supports the preparation of qualified teachers by improving their pedagogical practices, digital competencies, and capacity to deliver inclusive, equitable, and quality education. The growing adoption of AI technologies has transformed how teachers prepare lessons, interact with learners, and evaluate students' progress (UNESCO, 2025).

Educational institutions have integrated various AI-powered tools to enhance teaching effectiveness and learning outcomes. Tools such as ChatGPT, Grammarly, Turnitin, Gradescope, Quizizz AI, Microsoft Copilot, and Google Gemini are increasingly used to support lesson planning, academic writing, assessment, feedback, and personalized learning. These technologies allow educators to automate routine tasks and enable learners to access learning support beyond traditional classroom settings (Holmes et al., 2022). Consequently, AI tools are becoming a vital part of modern educational practices by playing a crucial role in enabling remote learning, automating assessments, and personalizing instruction. Platforms such as Zoom and adaptive systems like Carnegie Learning maintained educational continuity (Zawacki-Richter et al., 2019).

Artificial Intelligence (AI) originated in the 1950s, following pioneering work by researchers such as Alan Turing and John McCarthy, who introduced the concept of machines capable of performing tasks that normally require human intelligence. Although AI experienced several decades of gradual development, its widespread adoption accelerated significantly during 2022–2023 with the emergence of powerful generative AI technologies such as ChatGPT and other large language models, which made AI applications more accessible to educators, students, and institutions worldwide (UNESCO, 2023). The African Union recognizes AI as a strategic technology capable of enhancing educational access, efficiency, and learner engagement. Several African countries have started integrating AI-powered educational tools to support instructional activities, facilitate content delivery, and improve learning experiences (African Union, 2024). Despite the growing integration of AI in education, disparities in the utilization of AI tools across institutions continue to present a critical challenge. In line with this development, Mauritius has been one of the leading African countries in AI adoption. It introduced its National AI Strategy in 2018 and continues to refine its approach based on UNESCO's Readiness Assessment Methodology (UNESCO, 2025). Various AI tools are already being applied to support teaching and learning, particularly through personalized learning systems and automated academic tasks such as grading and feedback generation (Tupsee et al., 2024). These AI tools help teachers reduce workload and allow more time for direct engagement with students, thereby improving instructional effectiveness. Nevertheless, the concern remains about the AI tools that have to be integrated and utilized in different educational institutions, including teacher training colleges.

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Tanzania has undergone a gradual transition from the adoption of Information and Communication Technologies (ICT) to the integration of Artificial Intelligence (AI) in education. This transition has been supported by national initiatives, including the ICT Policy 2024, the formulation of National Digital Education Guidelines for Schools and Teacher Colleges 2025 and the National Guideline for Artificial Intelligence in Education 2025, which encourage educational institutions to adopt emerging technologies to improve teaching and learning processes (URT, 2025). These initiatives demonstrate the government's commitment to promoting digital transformation in education and creating an enabling environment for the use of AI in educational settings. In support of these efforts, Mwakapina (2024) highlighted the growing role of AI in enhancing educational processes and supporting innovative approaches to teaching and learning.

Within the Northern Zone of Tanzania, AI is increasingly gaining attention in educational institutions, including teacher training colleges. Stuart (2023) reported that AI applications have the potential to improve educational practices through enhanced learning experiences and instructional support. Similarly, Sarakikya and Kitula (2024) observed that teacher training colleges in the Northern Zone are operating within an environment where AI integration is becoming an important consideration in educational development. Despite the increasing adoption of artificial intelligence in education and the growing emphasis on digital transformation, limited empirical evidence exists regarding the AI tools utilized to facilitate teaching and learning in Teacher Training Colleges in the Northern Zone of Tanzania.

2. STATEMENT OF THE PROBLEM

Limited use of Artificial Intelligence (AI) tools in teaching and learning underscores the need to strengthen the utilization of AI tools, particularly in teacher training colleges. Teachers' colleges, as key institutions responsible for preparing future educators, are expected to expose teacher trainees to AI tools that can support teaching and learning in their future professional practice. Studies by Ponera and Madila (2024) highlight that AI tools have the potential to enhance teaching practices and improve learning outcomes. AI tools can improve academic efficiency and support learning processes (Stuart, 2023), while Sarakikya and Kitula (2024) further emphasize AI as a transformative pedagogical tool that can strengthen instructional delivery when effectively utilized. Despite these recognized benefits, the use of AI in teaching and learning remains limited across many educational institutions, particularly in teacher training colleges. This limited use restricts opportunities for tutors and teacher trainees to fully benefit from AI-supported teaching and learning practices. Furthermore, there is limited understanding of the AI tools currently utilized to facilitate teaching and learning within teacher training colleges. Therefore, this study examined the AI tools utilized to facilitate teaching and learning in teacher training colleges in the Northern Zone of Tanzania.

3. RESEARCH QUESTION

This study is expected to answer the following question:
What AI tools are utilized to facilitate teaching and learning in teacher training colleges in the Northern Zone of Tanzania?

4. SIGNIFICANCE OF THE STUDY

This study provides an understanding of the current state of artificial intelligence tools integration in teacher training colleges in Tanzania's Northern Zone, particularly in relation to its

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availability and use in teaching and learning processes. The study is significant in showing the gap between the availability of AI tools and their structured integration into teaching and learning, thereby informing the need for stronger coordination between policy direction and institutional implementation. It also provides useful insights for improving planning and support systems for technology integration in education. Furthermore, the findings are valuable to educational policymakers involved in digital and artificial intelligence technologies, Diffusion Innovation Theory, curriculum development, and institutional leadership, in guiding evidence-based decisions aimed at strengthening digital transformation in teacher education. Overall, the study contributes to improving the understanding of how emerging technologies can be more integrated into teaching and learning processes.

5. THEORETICAL FRAMEWORK

This study is informed by the Diffusion of Innovations Theory developed by Everett M. Rogers (2003), which offers an understanding of how new technologies, including artificial intelligence, are adopted and integrated within social systems such as educational institutions. The theory explains innovation adoption as a process through which new ideas or technologies are communicated over time among members of a social system. It categorizes adopters into five groups: innovators, early adopters, early majority, late majority, and laggards, and emphasizes that adoption is influenced by key characteristics of the innovation, namely relative advantage, compatibility, complexity, trialability, and observability. Rogers further argues that diffusion occurs through communication channels within a social system and follows a predictable adoption curve, where change agents can facilitate or accelerate the adoption process (Rogers, 2023).

The theory is valuable in explaining differences in the uptake of innovations across individuals and groups. It enables the identification of varying levels of preparedness among stakeholders such as principals, tutors, and teacher trainees. Additionally, it highlights the importance of social networks and communication processes in influencing adoption decisions, which is particularly relevant in educational settings where peer interaction and leadership play a key role. By focusing on perceived attributes of innovation, the theory also helps to explain both the facilitating factors and barriers that affect the integration of new technologies in education (Zondo & Ndoro, 2023). However, the theory has a linear and uniform adoption process, which may not fully reflect the complexity of innovation uptake in real educational contexts. In particular, it tends to overlook structural and contextual constraints such as policy gaps, limited funding and inadequate infrastructure, which can significantly hinder adoption regardless of individual willingness. These limitations are especially relevant in low-resource educational environments where systemic challenges strongly influence implementation outcomes.

6. REVIEW OF EMPIRICAL STUDIES

AI tools are transforming education by delivering adaptive learning, streamlining administrative functions, and fostering engagement through intelligent systems, thereby optimizing instructional practices and enhancing learner performance and institutional efficiency. This section consists of the analytical review that synthesizes the empirical studies reviewed that are related to this study. Themes that emerge from research questions are used in reviewing and arranging this section. The review is organized according to the theme emerging from the research question. In reviewing these studies, the knowledge gap, contextual gap, methodological gap, and empirical gap were identified that justify the need for the present study.

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Niu et al. (2022) Conducted a qualitative investigation into the perceptions of both teachers and students regarding the use of an AI-assisted educational platform designed to support teaching and learning within Chinese educational institutions. The study involved a total of 130 participants, comprising 98 students and 32 teachers across nine colleges in China. Data were collected through interviews and questionnaires, serving as the sole instruments for data gathering. Thematic analysis was employed to interpret the responses from participants. The findings indicated that the AI-enhanced SLP platform was perceived as an effective tool that facilitated students' learning and supported teachers in their instructional roles. Additionally, the study informed the current study in terms of the theoretical approach used and the target population that was used in the data collection procedures. However, the research was limited in specifying or suggesting which AI tools were most effective in the context of teaching and learning. Furthermore, the methodology did not provide a clear sampling technique used to select participants, which raised questions about the credibility and generalizability of the research findings. In response to these limitations, the present study aimed to identify specific AI tools that might be applied in educational settings and adopted purposive and stratified random sampling techniques to ensure a more rigorous and transparent participant selection process.

Arvin et al. (2023) explored teachers' experiences with AI-based educational tools through a qualitative research design in Iran. Data were collected via semi-structured interviews conducted with 20 educators representing a range of educational levels and subject areas. Participants were selected through purposive sampling to ensure a broad spectrum of perspectives and experiences. The collected data were analyzed thematically. The study identified several critical challenges impeding the effective integration of artificial intelligence in education, including technical difficulties, limited access to necessary resources, and inadequate teacher preparedness, highlighting the urgent need for targeted professional development. While the study contributed valuable insights into educators' perceptions and competencies regarding AI tool usage, it presented both methodological and practical limitations. Notably, the study fell short in addressing the issue of the utilization of AI tools within educational institutions. In response to this gap, the present research examined the utilization of AI tools that support teaching and learning within teacher training colleges in the Northern Zone of Tanzania.

Mutanga et al., (2024) investigated the Lecturers' Perceptions on the Integration of Artificial Intelligence Tools into Teaching Practice in South Africa. The study employed a qualitative research design. The sample of 25 participants was included in the study and the primary data collection method for this study was semi-structured interviews. The analysis of the interview data was carried out using thematic analysis. The findings reveal that the advent of AI was met with mixed feelings among lecturers. Some lecturers embraced AI technologies and developed mechanisms for utilizing them in the classroom, while others resisted the change. This research is significant, as it can inform best practices and guide future implementation strategies of technologies in education. Moreover, the study acknowledged that the use of artificial intelligence in the process of teaching and learning enhances quality education. Despite the findings, the sampling technique used to select the participants was not openly identified, which compromises the authenticity of the findings. Additionally, the reliance on interviews as the sole data collection instrument compromised the triangulation of findings. Thus, the current study used purposive sampling and proportionate stratified sampling in selecting the respondents. For triangulation of data, the study employed an online questionnaire, an interview guide, and an observation guide to explore artificial intelligence tools used in teaching activities.

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Matere (2024) conducted a study on the effectiveness of Artificial Intelligence (AI) tools in teaching and learning in education, Kenya, utilizing a mixed-methods approach under a descriptive survey design. The study sampled 387 participants, comprising faculty, students, and administrative staff. Data collection involved structured questionnaires and interview guides. Quantitative data were analyzed using both descriptive and inferential statistics, while qualitative responses were analyzed thematically. The findings revealed limited accessibility and integration of AI tools in institutional teaching and learning processes. This implies that substantial investment in digital infrastructure is crucial for enhancing AI adoption and its pedagogical effectiveness. While the study offered valuable insights in instrument that was used in the data collection, it was limited to addressing the competency of tutors in utilizing AI tools and failed short in clearly outlining the sampling techniques employed. The present study intended to bridge this gap by investigating tutors' abilities in using AI tools in teaching and learning. Also, it adopted purposive and stratified random sampling techniques to ensure a transparent selection of respondents.

Sarakikya and Kitula, (2024) examined the Application of Artificial Intelligence Platforms and their influence on the Education of Students in Arusha City, Tanzania. The study employed a mixed-methods approach under a convergent design. Purposive sampling, simple random sampling and stratified sampling techniques were used to sample 96 administrators, lecturers and students. Data collection instruments included questionnaires and interview guides. Descriptive analysis was used for quantitative data, whereby frequencies, percentages and mean scores were generated to aid the interpretation of data and the qualitative data were analyzed thematically. Findings indicated a high level of AI integration in educational practices, positive attitudes towards AI from both students and lecturers, and effective strategies such as face-to-face presentations and plagiarism detection software to combat AI-assisted plagiarism. This study informed the current study on continuous professional development for lecturers and student workshops to foster responsible AI use. Despite the valuable insight from the reviewed study, inadequate information was identified in the tools that could be employed and were suitable in education. The current study investigated the AI tools that were mostly used in teacher training colleges in the northern zone of Tanzania.

7. DEMONSTRATION OF RESEARCH GAP

A review of empirical studies demonstrated growing scholarly interest in the integration of artificial intelligence tools in education and their influence on teaching and learning processes. Despite their valuable contributions, several gaps remained evident. Regarding the knowledge gap,studies such as Niu et al. (2022) and Sarakikya and Kitula (2024) examined general perceptions, effectiveness, and institutional use of AI in education, but provided limited evidence on the specific AI tools used in teacher training colleges and how such tools vary in terms of availability and usage intensity across different stakeholders. With respect to the methodological gap, studies such as Arvin et al. (2023) and Mutanga et al. (2024) relied mainly on qualitative approaches and interview-based data collection, which limited methodological triangulation, while others such as Matere (2024) used structured surveys without adequately integrating qualitative insights to deepen understanding of IA tools used in teaching and learning. Concerning the contextual gap, most studies were conducted in countries such as China, Iran, Kenya, and South Africa, where educational systems, technological infrastructure, and policy environments differ significantly from those in Tanzania, particularly in teacher training colleges. Therefore, this study

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sought to address these gaps by examining the utilization of artificial intelligence tools that facilitate teaching and learning in teacher training colleges in Tanzania's Northern Zone,

8. METHODOLOGY

The study employed a convergent design within a mixed-methods approach, which enabled the concurrent collection and analysis of quantitative and qualitative data to obtain a comprehensive understanding (Creswell & Creswell, 2023). The target population consisted of 2,329 individuals, including 7 colleges, 7college principals, 7 IT experts, 272 tutors, and 2,043 teacher trainees. A sample of 272 respondents was obtained: 6 principals, 6 IT experts, 55 tutors, and 205 teacher trainees from 6 colleges. The criterion purposive sampling technique was used to select colleges, principals, and IT experts due to their strategic role in providing institutional information. Tutors and teacher trainees were selected using proportionate stratified sampling to ensure that participants from each college were represented according to their target population. Data were collected using online questionnaires administered to tutors and teacher trainees and interview guides for principals and IT experts and an observation guide. To ensure the validity of data collection instruments, the instruments were given to 2 research experts in educational planning and administration from MWECAU and 1 IT expert from MWECAU. Their recommendations were incorporated to improve the clarity, relevance, and adequacy of the instruments in addressing the study purpose.

A pilot test was conducted in one teacher training college that was selected randomly as 10% of the sample (Anupama et al., 2023). One college used was not included in the actual study, but possessed characteristics similar to other colleges. The reliability of the data Likert scale item was ensured through Cronbach's alpha for the Likert-scale items, with a Cronbach's alpha coefficient of 0.786, indicating acceptable internal consistency. The trustworthiness of the qualitative instrument was ensured through credibility and dependability by employing triangulation, member checking, and peer debriefing techniques. The quantitative data were analyzed through descriptive and inferential statistical techniques with the assistance of SPSS version 27. Descriptive statistical techniques, including frequencies, percentages, and percentage cases, and inferential statistical techniques, including chi-square for independent samples through crosstabulation, were employed to summarize and present the findings. The qualitative data obtained from interviews were subjected to thematic analysis in accordance with the six procedures, including: organizing and preparing data, reading through all data, beginning coding the data, generating descriptions and themes, representing findings in a narrative, and interpreting the meaning of data proposed by Creswell and Creswell (2023). Direct quotations from participants were incorporated to substantiate and provide deeper insights into the findings. Ethical considerations were observed throughout the study, including obtaining research clearance and permits, securing informed consent, ensuring voluntary participation, and maintaining the confidentiality and anonymity of respondents. The collected information was used solely for academic purposes.

9. FINDINGS AND DISCUSSION

The study examined the AI tools utilized by tutors and teacher trainees in teaching and learning activities. A dichotomous scale was used, where 1 = Yes and 0 = No, to determine whether specific AI tools were used. According to Creswell and Guetterman (2025), dichotomous scales are appropriate for generating clear and precise data when the objective is to determine whether a particular phenomenon exists, since respondents could select multiple AI tools, the data were

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analyzed as multiple responses using frequencies (F) and percentages of cases (%), which appropriately reflect the prevalence of each AI tool among participants (Taherdoost, 2022). Percentage interpretations followed Taherdoost (2022): 1–20% = extreme minority, 21–40% = minority, 41–60% = majority, 61–80% = high majority, and 81–100% = very high majority. The data are presented in Table 1

Table 1 Responses of Teacher Trainees and Tutors on the AI Tools that are used to Facilitate Teaching and Learning in the Teacher Training Colleges (n=55, n=205)

AI Tools	Respondent	Responses		Percent of Cases
		F	%	
Chatbot	T	16	12.3%	29.1%
	Tt	95	20.1%	46.8%
Quillbot	T	0	0%	0%
	Tt	0	0%	0%
Chatgpt	T	51	39.2%	92.7%
	Tt	202	42.8%	99.5%
Gradescope	T	0	0%	0%
	Tt	0	0%	0%
Quiz	T	14	10.8%	25.5%
	Tt	90	19.1%	34.3%
Turnitin	T	0	0%	0%
	Tt	0	0%	0%
Uncheck	T	1	0.8%	1.8%
	Tt	4	0.8%	2.0%
Grammarly	T	17	21.1%	47.9%
	Tt	94	20.2%	46.7%
Canva	T	7	5.4%	12.7%
	Tt	28	5.9%	13.8%
Otter ai	T	1	0.8%	1.8%
	Tt	19	4.0%	9.4%
Microsoft copilot	T	0	0%	0%
	Tt	0	0%	0%
Moodle	T	23	17.7%	41%
	Tt	4	0.8%	2.0%
Total	T	130	100.0%	236.4%
	Tt	472	100.0%	232.5%

Key: T- Tutors, Tt- Teacher trainees, F- Frequency, %- Percent
Source: Field data 2026

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Data in Table 1 show that ChatGPT is the most used AI tool among both tutors and teacher trainees, with 92.7% and 99.5% of cases, respectively, representing a very high majority. This indicates that ChatGPT has achieved near-universal use within teacher training colleges and plays a central role in supporting teaching and learning activities. Its dominance can largely be attributed to its free accessibility, ease of use, and widespread popularity, making it the most familiar and convenient tool for lesson preparation, content generation, and assignment completion. Grammarly is used by 47.9% of tutors and 46.7% of teacher trainees, representing a majority of cases in both groups. This suggests that Grammarly has become an important academic writing support tool within teacher training colleges. While its usage levels are fairly similar across the two groups, tutors seem to demonstrate slightly higher awareness and utilization than teacher trainees. This pattern indicates that tutors rely more heavily on Grammarly to improve the quality, clarity, and grammatical correctness of teaching materials and professional documents. In contrast, teacher trainees mainly use it to enhance their academic writing skills and assignment submissions.

Chatbot is utilized by 29.1% of tutors and 46.8% of teacher trainees. According to the percentage scale, this represents a minority among tutors and a majority among teacher trainees. This suggests thaChatbots aret chatbot technologies are more familiar to and more frequently utilized by teacher trainees than tutors. The comparatively higher utilization among teacher trainees reflects their greater inclination toward interactive digital learning environments where immediate feedback and on-demand academic support are available. As a result, chatbots appear to play a more significant role in supporting learning activities among teacher trainees than in assisting tutors with instructional tasks. Moodle is utilized by 41.0% of tutors, representing a majority, whereas only 2.0% of teacher trainees reported using the platform, reflecting an extreme minority. These indicate that Moodle is considerably more familiar to and utilized by tutors than teacher trainees. The higher level of utilization among tutors may be associated with their responsibility for course management, distribution of learning resources, assessment administration, and monitoring of student progress. In contrast, the very low level of utilization among teacher trainees may indicate limited engagement with the platform or inadequate exposure to its educational functions despite its use by tutors in facilitating teaching and learning processes.

These percentage cases imply that institutions are progressing toward AI integration; however, the findings reveal that this widespread use reflects informal and individual integration rather than structured institutional integration. In this sense, these AI tools are embedded in teaching and learning practices, but not within formal teaching frameworks. These findings were in line with what was shared by the principal from College Two (P_2) during the face-to-face interview about the use of AI tools, who said;

> Currently, we do not have any AI tools officially adopted by the college. However, students use their own tools individually… tutors also use them individually, but there is no officially recommended tool for use within the college. There are many AI tools available, but the one most commonly mentioned by students is ChatGPT, which they use for projects and completing tasks, and mostly use the tools because they are free to access (P_2, face-to-face interview, 13th February 2026)

Also, the IT expert added this

> Regarding AI tools, we do not have paid AI systems. Instead, we use free AI tools such as ChatGPT and others and the tools that are used here are just used by individuals and

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> not customized by the college. There are many available. Teacher trainees and tutors use them to search for materials and for other academic purposes (IT_1, face-to-face interview, 12th February 2026).

This implies that the utilization of AI tools in colleges occurs informally and is primarily dependent on individual users rather than institutional initiatives. The prominence of ChatGPT among teacher trainees suggests that it has become the most accessible and preferred AI tool for academic tasks and project-related work. This implies that the availability of cost-free AI applications has enabled users to access technological support even in the absence of institutional investment in AI resources.

Similarly, the IT_2 expert confirmed the dominance and familiarity of the tool by noting that;

> There are many tools used in the college but the most preferred AI tool here at the college is ChatGPT… this tool is not only used but is most familiar to both tutors and teacher trainees. The tools are available and accessible to all because they use them through their devices, like smartphones, and the tools that are mostly used are freely accessible (IT_2, face-to-face interview, 13th February).

Furthermore, the frequency of use provides additional insight into how AI tools are being utilized within the learning process. The principal stated that *"students frequently use AI tools, especially when they are given assignments… it is clear that they are actively using them"* (P_3, face-to-face interview, 19th February 2026). Additionally, the principal (P_4) emphasized that:

> Tools like Grammarly are used occasionally to check sentence structure and correctness, and other tools are used to assist in their assignments and when preparing the lessons. Nowadays, most of the teacher trainees are using AI tools instead of books. teacher trainees and tutors use these tools out of their own initiative, as there is no officially recommended tool for use within the college (P_4, face to face interview, 25th February 2026).

These imply that AI tools are widely used in teaching and learning activities, mainly to support academic tasks and improve efficiency in students' work. However, their use is largely driven by individual initiative rather than any structured institutional guidance. This means that while AI tools are actively employed in academic practices, there are no formal guidelines or standardized procedures within the college to regulate or direct their use and the selection of tools. As a result, their utilization depends on personal choices and preferences rather than an established institutional framework.

Also, IT expert 6 added that

> When we talk about tools, we are referring to applications such as ChatGPT, Grammarly, and others, which are available and used…and the college has acquired none of them. Tools like Grammarly are used to check the correctness of a sentence, and only a few people use this tool (IT_6, face-to-face interview, 2nd March 2026).

This indicates that artificial intelligence tools are utilized to facilitate teaching and learning in teacher training colleges. Nevertheless, their utilization is primarily driven by individual initiative rather than institutional acquisition, formal adoption or organizational support. This implies that tutors and teacher trainees independently incorporate AI applications into their

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teaching and learning practices according to their perceived academic needs and the accessibility of these technologies, reflecting a user-driven rather than institutionally coordinated pattern of AI utilization.

During the observation, the researcher found that digital learning tools and platforms were available within the college environment and were used to support teaching and learning activities. Moodle was observed to be available and in use within the college for academic purposes such as sharing learning materials, submitting assignments, and facilitating communication between tutors and teacher trainees. Also, ChatGPT was found to be available and actively used within the college environment. Evidence of its utilization was observed through access on digital devices used by tutors and teacher trainees for academic purposes such as searching for information, generating learning materials, explaining concepts, and supporting assignment preparation. The tool appeared to be readily accessible through internet-connected devices, indicating its practical integration into teaching and learning activities. However, the researcher observed that the use was based on individual initiative and preference. Grammarly was found to be available in college; however, its utilization was limited. Evidence of use was observed among a few tutors who utilized the tool for grammar correction and to improve the quality of academic documents. Although Grammarly was accessible to teacher trainees, there was little evidence of its use among them, as many appeared to lack adequate knowledge and skills on how to utilize the tool effectively for academic purposes. Consequently, its utilization remained low and was largely confined to a small number of tutors. The figures 1 below show teacher trainees and tutors utilizing AI tools in different teaching and learning activities



Teacher trainees using ChatGPT in their discussions; tutors using Grammarly in note preparation

Figure 1 confirms the utilization of AI tools in facilitating teaching and learning; a cross-tabulation and Chi-square test were conducted to determine whether there was a statistically significant association between tutors and teacher trainees regarding the utilization of AI tools in

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teaching and learning. While the qualitative findings provided contextual evidence on how AI tools were utilized within teacher training colleges, the quantitative analysis offered statistical evidence to establish whether the observed association between the two groups was significant.

Table 2: Cross-tabulation of Respondent Category and AI Tools Utilization (n = 260)

AI Tool	Response	Tutors		Teacher Trainees		Total
		F	%	F	%	
Chatbot	No	39	70.9	110	53.7	149
	Yes	16	29.1	95	46.3	111
ChatGPT	No	4	7.3	3	1.5	7
	Yes	51	92.7	202	98.5	253
Quizizz	No	41	74.5	115	56.1	156
	Yes	14	25.5	90	43.9	104
Grammarly	No	38	69.1	171	83.4	209
	Yes	17	30.9	34	16.6	51
Canva	No	48	87.3	177	86.3	225
	Yes	7	12.7	28	13.7	35
Otter AI	No	54	98.2	186	90.7	240
	Yes	1	1.8	19	9.3	20
Uncheck	No	54	98.2	201	98.0	255
	Yes	1	1.8	4	2.0	5
Moodle	No	32	58.2	205	100.0	237
	Yes	23	41.8	0	0.0	23

Source: field data (2026)

Responses from tutors and teacher trainees regarding the utilization of AI tools in teaching and learning indicate that the use of AI tools varied between the two respondent categories.
A high majority of teacher trainees (98.5%) and tutors (92.7%) reported utilizing ChatGPT, making it the most commonly utilized AI tool among both respondent groups. However, teacher trainees reported a slightly higher utilization than tutors. Regarding the Chatbot, nearly half (46.3%) of teacher trainees reported utilizing the tool, compared to 29.1% of tutors, suggesting that teacher trainees more commonly used the Chatbot. Similarly, 43.9% of teacher trainees reported utilizing Quizizz, compared to 25.5% of tutors, indicating a higher utilization among teacher trainees. In contrast, Grammarly was more commonly utilized by tutors, where 30.9% reported using the tool compared to only 16.6% of teacher trainees.

The data reveal that the utilization of Canva was low among both respondent categories, with 13.7% of teacher trainees and 12.7% of tutors reporting that they utilized the tool. Likewise, Otter AI was utilized by only 9.3% of teacher trainees and 1.8% of tutors, while Uncheck recorded the lowest utilization among both groups, accounting for only 2.0% of teacher trainees and 1.8% of tutors. Regarding Moodle, 41.8% of tutors reported utilizing the platform, whereas none (0.0%) of the teacher trainees reported utilizing it. These findings suggest that there were observable differences in the utilization of several AI tools between tutors and teacher trainees.

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Furthermore, the study tested the independent sample Chi Square to determine whether there was a statistically significant association between respondent category (tutors and teacher trainees) and the utilization of Artificial Intelligence (AI) tools; both Pearson's Chi-square test of independence and Fisher's Exact Test were employed. Pearson's Chi-square test was applied where the assumptions of expected cell frequencies were met, while Fisher's Exact Test was used when there were small expected cell counts. The level of statistical significance was set at $\alpha = 0.05$.

Table 3: Chi-Square Test of Association between Respondent Category and AI Tool Utilization

AI Tool	Statistical Test	χ^2	df	p-value
Chatbot	Pearson Chi-square	5.275	1	0.022
ChatGPT	Fisher's Exact Test	—	—	0.038
Quizizz	Pearson Chi-square	6.149	1	0.013
Grammarly	Pearson Chi-square	5.643	1	0.018
Canva	Pearson Chi-square	0.032	1	0.857
Otter AI	Fisher's Exact Test	—	—	0.086
Uncheck	Fisher's Exact Test	—	—	1.000
Moodle	Fisher's Exact Test	—	—	0.000

Source: filed data (2026)

a. 4 cells have expected counts less than 5. The minimum expected count is 4.23.

b. Computed only for a 2x2 table

The results revealed statistically significant associations between respondent category and the utilization of Chatbot, ChatGPT, Quizizz, Grammarly, and Moodle. Specifically, the utilization of Chatbot differed significantly between tutors and teacher trainees, χ^2 (1, n = 260) = 5.28, p = .022, indicating that the proportion of respondents using Chatbot varied significantly across the two groups. Similarly, ChatGPT demonstrated a statistically significant association based on Fisher's Exact Test (p = .038), suggesting that tutors and teacher trainees differed significantly in their utilization of ChatGPT. Likewise, the use of Quizizz was significantly associated with respondent category, χ^2 (1, n = 260) = 6.15, p = .013. This indicates that the utilization of Quizizz was not uniform between tutors and teacher trainees. A statistically significant association was also observed for Grammarly, χ^2 (1, n = 260) = 5.64, p = .018, implying that the two respondent groups differed in their use of Grammarly. Furthermore, Fisher's Exact Test indicated a highly significant association between respondent category and the utilization of Moodle ($p < .001$), suggesting that the use of Moodle differed substantially between tutors and teacher trainees.

Conversely, no statistically significant association was found between respondent category and the utilization of Canva, χ^2 (1, N = 260) = 0.03, p = .857. This suggests that tutors and teacher trainees utilized Canva at comparable rates. Similarly, Fisher's Exact Test indicated no significant association for Otter AI (p = .086), implying that the observed association in utilization between the two groups was not statistically significant. Likewise, no significant association was found for Uncheck (p = 1.000), indicating that tutors and teacher trainees exhibited similar utilization patterns for this AI tool. This indicates that the respondent category significantly influenced the utilization of several AI tools, particularly Chatbot, ChatGPT, Quizizz, Grammarly, and Moodle,

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whereas no significant association was observed in the utilization of Canva, Otter AI, and Uncheck.

The above information suggests that artificial intelligence tools have become increasingly integrated and utilized in teaching and learning activities in teacher training colleges. ChatGPT appears to be the dominant AI tool among both tutors and teacher trainees, whereas the utilization of other AI tools varies according to users' academic roles and responsibilities. While AI tools are actively utilized to support academic tasks such as lesson preparation, assignment completion, and content development, their use appears to be driven more by individual initiative and situational academic demands than by structured institutional integration. This pattern implies that AI has become embedded in daily academic practices, yet without formal guidelines or coordinated implementation frameworks to standardize its use. Such a situation suggests that the colleges are experiencing a transition phase where technological integration is occurring at the user level but has not fully matured into institutional practice. This interpretation is consistent with Rogers' Diffusion of Innovation Theory, which emphasizes that successful adoption of innovations depends not only on awareness and trial but also on institutional support and reinforcement, which appear limited in this context. In comparison with previous studies, the findings partially align with Niu et al. (2022), who emphasize that AI tools enhance learning by improving access to information and supporting academic tasks. The present study confirms this functional role of AI, particularly in facilitating assignment completion and instructional preparation. However, the information contradicts that of Mutanga et al. (2024), who reported a higher level of structured AI integration and institutional readiness among institutions, whereas your study finds that AI use is largely informal, individually driven, and not institutionally coordinated. Overall, this information suggests a gap between widespread individual adoption of AI tools and the absence of institutionalized frameworks to guide their effective and standardized use in teaching and learning.

The findings indicate that artificial intelligence tools are utilized in teacher training colleges, as evidenced by the availability and actual use of various AI tools by both tutors and teacher trainees to support teaching and learning activities. The widespread use of tools such as ChatGPT, Grammarly, Chatbots, Quizizz, and Moodle demonstrates that AI has already become an integral part of academic practices within colleges. However, the utilization of AI tools in the teacher training colleges varies considerably. Quantitative findings show that AI tools are commonly used by both tutors and teacher trainees, although the level of utilization varies across tools, reflecting differences in familiarity and academic roles. Qualitative findings reveal that AI use is mainly triggered by academic tasks, especially assignments and teaching preparation, suggesting that these tools are used as immediate problem-solving resources rather than continuous learning support systems. Despite this observable utilization, the use of AI tools is driven by individual initiative, personal preferences, and immediate academic needs rather than institutional coordination. Consequently, tutors and teacher trainees independently select and utilize freely accessible AI applications without institutional policies, standardized guidelines, or institutional support. This suggests that although AI tools utilization already exists within teacher training colleges, it has not yet evolved into formal institutional integration. Instead, the current pattern reflects user-driven utilization rather than a coordinated institutional approach, indicating that the colleges have begun embracing AI in practice but have not established the necessary structures, strategies, and mechanisms to support its systematic and sustainable integration into teaching and learning activities.

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10. CONCLUSION

Based on the findings, the study concluded that artificial intelligence tools are utilized in teaching and learning activities by both tutors and teacher trainees in teacher training colleges. ChatGPT emerged as the most widely utilized AI tool among both tutors and teacher trainees, while Chatbot and Quizizz were more commonly utilized by teacher trainees. Grammarly and Moodle were predominantly utilized by tutors, reflecting their instructional and course management responsibilities. Nevertheless, the utilization of available AI tools in teacher training colleges is driven by individual initiative rather than institutional support, indicating limited institutional coordination in the integration of AI into teaching and learning processes. Despite the government's directive promoting the adoption and integration of artificial intelligence in education, teacher training colleges have not yet incorporated AI tools into their teaching and learning processes. This may be due to the short timeframe since the directives were issued and the lack of clear, specific institutional frameworks to guide the adoption and integration of AI tools into educational practices. As a result, AI tools have not yet been fully incorporated into teaching and learning in teacher training colleges.

11. RECOMMENDATION

Based on the conclusion, the study recommends that the integration of AI tools in teacher training colleges should be strengthened through coordinated efforts between the Ministry of Education, Science and Technology and institutional administrations. The Ministry of Education, Science and Technology should operationalize and establish clear criteria and procedures for the evaluation, approval, and adoption of AI tools in teaching and learning processes, enabling teacher training colleges to select appropriate AI tools based on pedagogical relevance, ethical considerations, data protection, accessibility, and institutional needs. In addition, policies and guidelines governing the use of AI in education should be made more explicit, practical and implementation-oriented, particularly in defining how AI tools should be applied in teaching and learning. Moreover, Teacher training colleges should develop structured systems for educating both tutors and teacher trainees on the importance, ethical use and pedagogical application of AI tools in teaching and learning. This will ensure that AI use moves beyond individual initiative and becomes part of an organized and supportive institutional teaching and learning system.

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