Jher Vol. 33 No.1 September 2026, pp. 6 - 19

Artificial Intelligence and Instructional Practices of Technology Education Teachers in Nigerian Universities

[1]Ojo, Samson A., [1]Khoza, Samuel D.

[1]Department of Technology and Vocational Education
Tshwane University of Technology, Pretoria, South Africa
Corresponding Author: *KhozaSD@tut.ac.za*

Abstract

This study focused on ways Artificial Intelligence (AI) could enhance the instructional practices of Technology Education teachers in Nigerian universities. Specifically, it determined ways AI influence: instructional planning; classroom instructional delivery; facilitation of practical; laboratory and workshop-based instruction; and assessment, feedback, and monitoring of students' skill acquisition. It tested four null hypotheses. The Survey research design was adopted. The study was conducted in 13 federal universities in Nigeria offering Technology Education programmes. Population comprised of 456 Technology Education teachers (295 lecturers and 161 technologists). Data were collected using questionnaire and a semi-structured interview guide. Data were analysed using mean, standard deviation, and t-test, while qualitative data were summarized using thematic analysis. Findings reveal 11 ways AI could enhance instructional planning (Cluster $\overline{X}_g$= 3.61), classroom instructional delivery ($\overline{X}_g$ = 3.53), practical, laboratory and workshop-based instruction ($\overline{X}_g$ = 3.30), and assessment, feedback, and monitoring of students' skill acquisition ($\bar{x}$ = 3.72). Further, there are no significant differences between the mean ratings of lecturers and technologists across all instructional practice areas at 0.05 level of significance. Qualitative findings corroborated these results, indicating that AI could enhance lesson preparation, instructional delivery, practical demonstrations, assessment efficiency, and student monitoring.

Keywords: Artificial, Intelligence, Instructional, Practices, Technology, Education, Planning, Assessment

Introduction

Higher education worldwide is increasingly shaped by rapid technological advancements and the integration of intelligent systems into teaching and learning. Universities are expected to adopt technologies that enhance instructional effectiveness, learner engagement, and workforce relevance (Ojo et al, 2024). Among these innovations, Artificial Intelligence (AI) has gained considerable attention for its capacity to support adaptive instruction, streamline assessment, and generate data-driven insights that inform teaching decisions (Organisation for Economic Co-operation and Development [OECD], 2021; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2023). Consequently, instructional practices in universities are evolving, requiring educators to rethink how learning is planned, delivered, assessed, and aligned with contemporary skill demands.

AI in education refers to computational systems capable of analysing data, recognising patterns, and supporting decision-making to enhance teaching and learning (OECD, 2021). In instructional contexts, AI is applied through intelligent tutoring systems, virtual simulations, automated assessment, learning analytics, and adaptive content delivery. In this study, AI is operationalised as intelligent digital systems used to support lesson planning, instructional delivery, practical facilitation, and assessment processes. Contemporary scholarship suggests that AI functions not merely as a supplementary instructional aid but as an enabling technology that influences pedagogical planning, feedback, and learner engagement (Kim, 2024; Shiohira, 2021). This is particularly relevant in technology education, where teaching combines theoretical instruction with practical skill acquisition.

Technology Education in Nigerian universities is designed to develop technological, vocational, pedagogical, and entrepreneurial competencies required for sustainable workforce development, industrial productivity, and national development. Under the National Universities Commission (NUC) Core Curriculum and Minimum Academic Standards (CCMAS), the Bachelor of Technology Education (B.Tech. Ed.) programme prepares graduates for careers in teaching and industry through specialized training in Automobile Technology, Building Technology, Electrical and Electronics Technology, Metalwork Technology, and Woodwork Technology (National Universities Commission [NUC], 2023). The programme integrates theoretical knowledge with practical competence, problem-solving ability, technological adaptability, and digital innovation to equip graduates with the knowledge, skills, attitudes, and values required for effective participation in education and the world of work (Federal Republic of Nigeria, 2020; NUC, 2023). Consequently, instructional practices within technology education emphasize classroom instruction, laboratory and workshop experiences, project-based learning, competency-based teaching, and the integration of emerging technologies, including artificial intelligence, to enhance teaching, learning, and skills development.

Instructional practices encompass the strategies and activities technology education teachers employ in planning lessons, delivering instruction, facilitating practical sessions, and assessing student outcomes across theoretical and practical learning contexts (Anyigor et al, 2025; Ojo et al, 2025). Effective instructional practice requires both subject-matter expertise and the integration of technologies that enhance learner engagement and skill acquisition (Ali et al., 2024; Mou, 2021). In this regard, AI has the potential to strengthen instructional practices through virtual simulations, automated assessment, and personalised learning pathways tailored to students' varying needs. Conceptually, this study is anchored on a model that positions AI as an enabling instructional resource influencing four interrelated dimensions of instructional practices: instructional planning, classroom instructional delivery, practical and workshop-based facilitation, and assessment, feedback, and monitoring. The model assumes that AI supports lesson preparation, enhances classroom teaching, strengthens practical instruction through simulations and demonstrations, and improves assessment through automated feedback and performance monitoring. These dimensions represent the core instructional responsibilities of technology education teachers and provide a framework for examining how AI shapes teaching practices in Nigerian universities.

Technology education teachers in Nigerian universities comprise lecturers and technologists who are responsible for implementing the Technology Education curriculum through classroom instruction, laboratory activities, and workshop-based training. While lecturers primarily deliver theoretical, pedagogical, and professional instruction, technologists facilitate practical demonstrations, supervise laboratory and workshop activities, and provide technical support for skills acquisition (Ojo et al., 2024). Together, they play complementary roles in preparing competent graduates across the various Technology Education specializations. However, despite their pivotal role in developing a technologically skilled workforce, available evidence suggests that many technology education teachers continue to rely substantially on conventional instructional approaches, with limited integration of artificial intelligence and other intelligent technologies into teaching and learning (Adamu et al., 2020; Eze & Anierobi, 2023). Factors such as inadequate infrastructure, limited awareness of AI tools, insufficient professional training, and weak institutional support continue to constrain the effective integration of AI, particularly in laboratory- and workshop-based instructional settings (Brown et al., 2020; Mokoena & Seeletse, 2025).

Globally, AI is increasingly used in higher education to support instructional planning, adaptive teaching, practical simulations, and automated assessment, particularly in science, technology, engineering, and vocational disciplines (Attwell et al., 2020; Deckker & Sumanasekara, 2025; Shiohira, 2021). Studies show that AI improves lesson preparation, feedback quality, personalised learning, and student performance monitoring (Holmes et al., 2019; UNESCO, 2023; Zawacki-Richter et al., 2019). However, levels of utilisation vary across contexts and disciplines.

Recent evidence indicates that AI is gradually emerging in Nigerian universities, although utilisation remains uneven and limited. Lecturers and students increasingly use AI-supported tools such as generative AI platforms, automated feedback systems, plagiarism detection software, learning analytics, and digital content generation to support teaching, assessment, and research (NITDA, 2023; Okoye et al., 2020; UNESCO, 2023;). However, utilisation remains concentrated in general digital learning and administrative functions, with limited evidence of systematic integration into technology education, particularly practical and workshop-based instruction (Adamu et al., 2020; Eze & Anierobi, 2023; Ojo et al., 2024; Ojo et al, 2020).

Purpose of the Study

This study invesigated ways AI could influence instructional practices of technology education teachers in Nigerian universities. Specifically, it determined ways AI could influence the following instructional practice areas of technology education teachers:

1. instructional planning practices.
2. classroom instructional delivery practices.
3. facilitation of practical, laboratory, and workshop-based instruction.
4. assessment, feedback, and monitoring of students' skill acquisition.

Hypotheses (HOs)

The following null hypotheses were tested at 0.05 level of significance. There is no significant difference between the mean responses of technology education lecturers and technologists on ways AI could influence the following instructional practices in Nigerian universities:

1. instructional planning practices
2. classroom instructional delivery practices
3. facilitation of practical, laboratory, and workshop-based instruction
4. assessment, feedback, and monitoring of students' skill acquisition

Methodology

Research Design**:** The study employed a survey research design.

Area of the Study**:** The study was conducted in Nigeria. The country is made up of 36 states and the Federal Capital Territory (FCT), Abuja. The study covered federal universities accredited by National Universities Commission (NUC) to offer Technology Education programmes, including programmes operating under related nomenclatures such as Industrial Technical Education, Technology Education, Technology and Vocational Education, and Vocational and Technical Education. These universities are distributed across the six geopolitical zones of the country and provide a suitable context for examining the influence of AI on instructional practices because they operate within the NUC Core Curriculum and Minimum Academic Standards (CCMAS) (2023).

Population of the Study**:** The population comprised technology education teachers in federal universities in Nigeria. This included lecturers and technologists involved in teaching, practical instruction, laboratory/workshop supervision, research, and related academic duties. Based on departmental and institutional records obtained from the Heads of Department and official staff records of the participating universities, the accessible population consisted of 456 personnel, comprising 295 lecturers and 161 technologists. The population included male and female lecturers and technologists with varying academic qualifications, years of teaching experience, and specialization areas, namely Automobile Technology, Building Technology, Electrical and Electronics Technology, Metalwork Technology, and Woodwork Technology. These categories were considered suitable due to their direct involvement in instructional activities relevant to AI integration.

Sample for the Study**:** A total of 13 Federal universities accredited by the NUC to offer Technology Education and related programmes were purposively selected for the study. Proportionate sampling was then used to determine the number of respondents selected from each university based on its population of lecturers and technologists, while convenience sampling was used to select those who were available and willing to participate. A sample of 218 respondents (121 lecturers and 97 technologists) were selected from a population of 456.

Further 16 participants (10 lecturers and 6 technologists) from the 13 participating Federal universities for the interview phase of the study. The participants were selected based on their teaching experience, familiarity with AI-supported instructional practices, and willingness to participate.

***Instruments for Data Collection*:** Two instruments were used for data collection: a structured questionnaire and a semi-structured interview guide. The instruments were developed based on the specific purposes of the study and review of related literature. The questionnaire was comprised of two sections, section A focused on demographic information of the respondents, while section B focused on specific purposes. All items were rated on a five-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1). The instruments were validated by three university experts in technology education. To establish the reliability of the questionnaire, a pilot test was conducted among Technology Education teachers not included in the main study. The data obtained were analysed using Cronbach's Alpha, which yielded an overall reliability coefficient of 0.88, indicating high internal consistency.

***Method of Data Collection*:** Data was collected over a period of eight weeks using both physical and online approaches. A total of 218 copies of questionnaires, comprising 121 copies for lecturers and 97 copies for technologists, were administered. Out of the 128 copies of questionnaire administered, only 189 copies (105 from lecturers and 84 from technologists) were retrieved, representing 86.7 percent return rate.

For qualitative data, 16 respondents were interviewed using semi-structured interview guide. Data were collected using audio-recorder and note taking.

***Method of Data Analysis*:** Quantitative data were analysed using mean, standard deviation and t-test at 0.05 level of significance. Any item with a mean score of 2.50 and above was regarded as accepted, while any item with a mean score below 2.50 was regarded as rejected. The null hypothesis was rejected where the probability (p) value was less than 0.05 and retained where otherwise. Qualitative data were coded, categorised, and organised into themes aligned with the specific purposes of the study.

Results

Table 1: Mean Responses, Standard Deviations, and t-test Results on the Extent of Ways AI Could Enhance Instructional Planning Practices of Technology Education Teachers

S/N	Instructional Planning Practices:	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	$\bar{X}_g$	R	t-value	p-value	Dec.
	AI helps teachers to:									
1	organise lesson objectives	3.75	0.84	3.69	0.92	3.72	A	-0.82	0.414	NS
2	align objectives with course outcomes	3.67	0.88	3.63	0.94	3.65	A	-0.56	0.576	NS

Table 1 Continues

3	sequence instructional content	3.57	0.91	3.51	1.01	3.54	A	-0.73	0.467	NS
4	select instructional materials	3.64	0.86	3.58	0.93	3.61	A	-0.69	0.491	NS
5	address diverse learning needs	3.46	0.98	3.50	1.06	3.48	A	-0.44	0.662	NS
6	prepare lesson notes	3.73	0.81	3.67	0.89	3.70	A	-0.78	0.437	NS
7	access current instructional resources	3.86	0.75	3.80	0.83	3.83	A	-0.85	0.397	NS
8	reduce lesson preparation time	3.39	1.02	3.45	1.11	3.42	A	-0.52	0.605	NS
9	support data-driven planning	3.53	0.90	3.49	0.98	3.51	A	-0.49	0.626	NS
10	improve planning efficiency	3.65	0.86	3.61	0.94	3.63	A	-0.58	0.563	NS
11	improve lesson planning quality	3.70	0.83	3.66	0.91	3.68	A	-0.61	0.543	NS
	Cluster Mean	3.63	0.42	3.59	0.40	3.61	A	-0.38	0.704	NS

$\bar{X}_1$ = Mean of Lecturers; $\bar{X}_2$ = Mean of Technologists; SD_1 = Standard Deviation of Lecturers; SD_2 = Standard Deviation of Technologists; $\bar{X}_g$ = Grand Mean; R = Remark; A = Agree; NS = Not Significant, df = 216.

Table 1 shows that respondents agreed that AI could enhance instructional planning practices of Technology Education teachers ($\bar{X}_g$ = 3.61). The highest-rated areas were access to updated instructional resources ($\bar{X}_g$ = 3.83) and organisation of lesson objectives ($\bar{X}_g$ = 3.72). The cluster t-test revealed no significant difference between the mean ratings of lecturers and technologists ($t = -0.38$, $p = 0.704 > 0.05$, df = 216); therefore, the null hypothesis was retained.

Qualitative findings revealed that AI could:

- facilitate lesson planning and preparation.
- improve alignment of lesson objectives with course outcomes.
- increase access to current instructional resources.
- enhance organisation and sequencing of instructional content.
- improve efficiency in lesson preparation.

Table 2: Mean Responses, Standard Deviations, and t-test Results on the Extent of Ways AI Could Enhance Classroom Instructional Delivery Practices of Technology Education Teachers

S/N	Classroom Instructional Delivery	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	$\bar{X}_g$	R	t-value	p-value	Dec.
	AI helps teachers to:									
1	improve lesson presentation	3.62	0.88	3.58	0.96	3.60	A	-0.53	0.599	NS
2	enhance student engagement	3.46	0.97	3.52	1.05	3.49	A	-0.48	0.633	NS
3	support interactive teaching	3.58	0.91	3.52	0.99	3.55	A	-0.67	0.504	NS
4	support adaptive instruction	3.43	1.00	3.49	1.08	3.46	A	-0.44	0.661	NS

Table 2 Continues

5	integrate multimedia into teaching	3.74	0.82	3.68	0.90	3.71	A	-0.81	0.420	NS
6	monitor students' understanding	3.60	0.86	3.56	0.94	3.58	A	-0.51	0.611	NS
7	explain complex concepts	3.65	0.84	3.59	0.92	3.62	A	-0.74	0.460	NS
8	provide real-time feedback	3.38	1.01	3.44	1.09	3.41	A	-0.46	0.647	NS
9	promote learner-centred teaching	3.48	0.94	3.52	1.02	3.50	A	-0.39	0.698	NS
10	improve classroom interaction	3.41	0.98	3.47	1.06	3.44	A	-0.50	0.618	NS
11	support collaborative learning	3.44	0.96	3.50	1.04	3.47	A	-0.47	0.640	NS
12	improve teaching efficiency	3.60	0.87	3.54	0.95	3.57	A	-0.69	0.492	NS
13	improve instructional delivery quality	3.66	0.83	3.60	0.91	3.63	A	-0.77	0.442	NS
	Cluster Mean	3.52	0.38	3.56	0.41	3.53	A	-0.44	0.661	NS

$\overline{X}_1$ = Mean of Lecturers; $\overline{X}_2$= Mean of Technologists; SD_1 = Standard Deviation of Lecturers; SD_2 = Standard Deviation of Technologists; $\overline{X}_g$ = Grand Mean; R = Remark; A = Agree; NS = Not Significant, df = 216.

Table 2 indicates that respondents agreed that AI could enhance classroom instructional delivery practices of Technology Education teachers ($\overline{X}_g = 3.53$). The highest-rated areas were improving the use of multimedia in teaching ($\overline{X}_g$ = 3.71) and enhancing overall instructional delivery quality ($\overline{X}_g$ = 3.63). The cluster t-test showed no significant difference between the mean ratings of lecturers and technologists ($t = -0.44$, $p = 0.661 > 0.05$, df = 216); therefore, the null hypothesis was retained.

Qualitative findings revealed that AI could:

- improve lesson presentation.
- support multimedia-based instruction.
- simplify explanation of complex concepts.
- enhance student engagement.
- improve classroom interaction and instructional delivery.

Table 3: Mean Responses, Standard Deviations, and t-test Results on the Extent of Ways AI Could Enhance Practical, Laboratory, and Workshop-Based Instruction of Technology Education Teachers

S/N	Practical, Laboratory, and Workshop-Based Instruction:	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	$\overline{X}_g$	R	t-value	p-value	Dec.
	AI helps teachers to:									
1	support virtual simulations	3.25	1.02	3.31	1.08	3.28	A	-0.39	0.698	NS
2	improve practical demonstrations	3.32	0.95	3.38	1.01	3.35	A	-0.44	0.661	NS
3	improve workshop safety training	3.19	1.05	3.25	1.11	3.22	A	-0.41	0.683	NS
4	improve understanding of practical procedures	3.28	0.96	3.34	1.02	3.31	A	-0.42	0.676	NS

Table 3 Continues

5	monitor practical skill performance	3.15	1.07	3.21	1.13	3.18	A	-0.38	0.706	NS
6	support hands-on instruction	3.37	0.93	3.43	0.99	3.40	A	-0.45	0.654	NS
7	reinforce practical skills	3.33	0.94	3.39	1.00	3.36	A	-0.43	0.669	NS
8	improve laboratory instruction	3.30	0.98	3.36	1.04	3.33	A	-0.40	0.689	NS
	Cluster Mean	3.29	0.43	3.33	0.46	3.30	A	-0.51	0.612	NS

$\bar{X}_1$ = Mean of Lecturers; $\bar{X}_2$ = Mean of Technologists; SD_1 = Standard Deviation of Lecturers; SD_2 = Standard Deviation of Technologists; $\bar{X}_g$ = Grand Mean; R = Remark; A = Agree; NS = Not Significant, df = 216.

Table 3 shows that respondents agreed that AI could enhance practical, laboratory, and workshop-based instruction ($\bar{X}$ = 3.30). The highest-rated areas were complementing hands-on workshop instruction ($\bar{X}$ = 3.40), supporting practical skill reinforcement ($\bar{X}$ = 3.36), and enhancing demonstrations of technology processes ($\bar{X}$ = 3.35). The cluster t-test indicated no significant difference between the mean ratings of lecturers and technologists ($t = -0.51$, $p = 0.612 > 0.05$, df = 216); therefore, the null hypothesis was retained.

Qualitative findings revealed that AI could:

- support virtual simulations.
- improve practical demonstrations.
- reinforce practical skills.
- strengthen laboratory and workshop instruction.
- improve safety awareness during practical activities.

Table 4: Mean Responses, Standard Deviations, and t-test Results on the Extent of Ways AI Could Enhance Assessment, Feedback, and Monitoring Practices of Technology Education Teachers

S/N	Assessment, Feedback, and Monitoring:	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	$\bar{X}_g$	R	t-value	p-value	Dec.
	AI helps teachers to:									
1	automate students' assessment	3.72	0.80	3.78	0.86	3.75	A	-0.41	0.683	NS
2	provide timely feedback	3.79	0.76	3.85	0.82	3.82	A	-0.44	0.661	NS
3	improve assessment accuracy	3.65	0.85	3.71	0.91	3.68	A	-0.39	0.698	NS
4	monitor students' progress	3.68	0.81	3.74	0.87	3.71	A	-0.42	0.676	NS
5	improve performance record-keeping	3.76	0.78	3.82	0.84	3.79	A	-0.43	0.669	NS
6	support objective assessment	3.62	0.87	3.68	0.93	3.65	A	-0.37	0.712	NS
7	identify learning gaps	3.66	0.84	3.72	0.90	3.69	A	-0.40	0.689	NS
8	support formative assessment	3.60	0.88	3.66	0.94	3.63	A	-0.36	0.719	NS
9	improve feedback quality	3.71	0.82	3.77	0.88	3.74	A	-0.41	0.682	NS
10	improve assessment effectiveness	3.74	0.79	3.80	0.85	3.77	A	-0.43	0.668	NS
	Cluster Mean	3.71	0.35	3.74	0.38	3.72	A	-0.29	0.771	NS

$\bar{X}_1$ = *Mean of Lecturers;* $\bar{X}_2$ = *Mean of Technologists; SD*$_1$ = *Standard Deviation of Lecturers; SD*$_2$ = *Standard Deviation of Technologists;* $\bar{X}_g$ = *Grand Mean; R = Remark; A = Agree; NS = Not Significant, df = 216.*

Table 4 indicates that respondents agreed that AI could enhance assessment, feedback, and monitoring practices of Technology Education teachers ($\bar{X}_g = 3.72$). The highest-rated areas were improving the speed of feedback delivery ($\bar{X}_g = 3.82$), improving record keeping of students' performance ($\bar{X}_g = 3.79$), and enhancing overall assessment effectiveness ($\bar{X}_g = 3.77$). The cluster t-test revealed no significant difference between the mean ratings of lecturers and technologists ($t = -0.29$, $p = 0.771 > 0.05$, $df = 216$); therefore, the null hypothesis was retained.
Qualitative findings revealed that AI could:

- improve assessment efficiency.
- provide timely feedback.
- enhance monitoring of students' progress.
- improve record management.
- support objective and continuous assessment.

Discussion
The findings of this study demonstrate that Artificial Intelligence (AI) has considerable potential to enhance the instructional practices of Technology Education teachers in Nigerian universities, although the extent of enhancement varies across instructional domains. Respondents perceived greater potential for AI to enhance instructional planning and assessment, feedback, and monitoring than classroom instructional delivery and practical, laboratory, and workshop-based instruction. The absence of statistically significant differences between lecturers and technologists across all four domains indicates a shared perception of AI's usefulness despite their complementary instructional responsibilities. This consensus suggests that AI is increasingly viewed as an instructional resource capable of supporting both theoretical and practical aspects of Technology Education.

Regarding instructional planning, the findings revealed that AI could enhance lesson preparation through improved organisation of lesson objectives, alignment of instructional activities with course outcomes, access to current instructional resources, and greater planning efficiency. The qualitative findings further demonstrated that AI could simplify lesson preparation and improve access to relevant instructional materials. These findings suggest that AI can reduce teachers' routine planning workload while supporting more informed and organised instructional decision-making. This evidence corroborates OECD (2021) and Shiohira (2021), who argued that AI strengthens instructional planning through intelligent decision-support systems. It also extends recent evidence by Choi et al. (2024) and Ifenthaler et al. (2024), who reported that generative AI is transforming instructional design by supporting curriculum development and resource generation. Likewise, Alwakid et al. (2025) found that AI, when combined with teachers' professional competencies, significantly improves instructional planning and student learning outcomes, while Xiaoyu et al. (2025) identified lesson preparation and instructional content development as among the most common applications of generative AI in higher education. The retained null hypothesis further indicates that lecturers and technologists share similar perceptions regarding the extent to which AI could enhance instructional planning.

The study also found that AI could enhance classroom instructional delivery by improving lesson presentation, multimedia integration, explanation of complex concepts, and teaching efficiency. However, relatively lower ratings for adaptive instruction and classroom interaction indicate that AI-supported teaching is still evolving beyond content delivery towards more personalised learning. The qualitative findings similarly showed that AI could improve lesson presentation and students' understanding of technology-related concepts through multimedia resources. This finding reinforces UNESCO's (2023) position that AI enhances teaching effectiveness when integrated with sound pedagogical practices. It is also consistent with Mou (2021), who reported that AI-supported instructional technologies improve conceptual understanding when combined with learner-centred approaches. More recent systematic reviews by Almasri (2024), Weng et al. (2024), and Mustafa et al. (2024) further demonstrate that AI enhances student engagement, instructional effectiveness, and personalised learning, although successful implementation depends largely on teachers' digital competence and institutional support. The absence of significant differences between lecturers and technologists suggests a common understanding of AI's potential to improve classroom instruction.

With respect to practical, laboratory, and workshop-based instruction, respondents agreed that AI could enhance demonstrations, virtual simulations, laboratory activities, and practical skill reinforcement. Nevertheless, this domain recorded the lowest overall mean, indicating that AI integration into hands-on learning environments remains comparatively limited. The qualitative findings further attributed this situation to inadequate infrastructure and limited access to AI-enabled facilities. This finding supports Adamu et al. (2020) and Eze and Anierobi (2023), who identified inadequate technological infrastructure as a major barrier to technology integration in Nigerian Technology Education programmes. Similarly, Ifenthaler et al. (2024) and Liang et al. (2025) observed that although AI offers substantial opportunities for experiential and competency-based learning, its successful implementation depends on adequate infrastructure, institutional commitment, and teacher preparedness. Létourneau et al. (2025) further demonstrated that AI-driven intelligent tutoring systems improve practical learning by providing adaptive guidance and immediate feedback during skill acquisition. The comparatively lower ratings recorded in this study therefore appear to reflect contextual implementation challenges rather than limitations in AI itself. The retained null hypothesis equally indicates that lecturers and technologists hold similar perceptions regarding these constraints.

The findings further revealed that AI could enhance assessment, feedback, and monitoring to a greater extent than the other instructional domains. Respondents perceived AI as particularly useful for improving feedback delivery, assessment accuracy, record management, and continuous monitoring of students' learning progress. The qualitative findings also indicated that AI could improve assessment efficiency and strengthen monitoring of both academic achievement and practical performance. This finding supports OECD (2021), which highlighted the capacity of AI-driven assessment systems to improve assessment quality and learning analytics. It also reinforces the findings of Kim (2024), who reported that AI-supported assessment tools improve feedback quality and continuous assessment practices. Recent evidence from Liang et al. (2025), Mustafa et al. (2024), and Xiaoyu et al. (2025) similarly indicates that AI enhances automated assessment, timely feedback, and data-informed instructional decision-making while reducing teachers' assessment workload. The retained null hypothesis further suggests that lecturers and technologists share similar perceptions regarding the potential of AI to enhance assessment and monitoring practices.

Conclusion

This study concludes that Artificial Intelligence has considerable potential to enhance the instructional practices of Technology Education teachers in Nigerian universities. Its greatest potential lies in improving instructional planning and assessment, while its application in classroom delivery and practical, laboratory, and workshop-based instruction requires greater teacher competence and enabling institutional support. The effective integration of AI into Technology Education therefore depends not only on the availability of technological infrastructure but also on teachers' willingness to continuously develop their AI competencies and adopt innovative instructional approaches that improve teaching effectiveness and students' skill acquisition.

Recommendations

Based on the findings, the following recommendations were made:

1. Technology Education teachers should continuously develop their AI competencies to improve instructional planning and curriculum delivery.
2. Technology Education teachers should integrate appropriate AI tools into classroom instruction to enhance students' engagement and learning.
3. Technology Education teachers should adopt AI-supported applications, such as simulations and virtual demonstrations, to strengthen practical, laboratory, and workshop-based instruction.
4. Technology Education teachers should utilise AI-based assessment tools to improve feedback, monitor students' progress, and support skill acquisition.

References

Adamu, I., Kanbul, S., & Gambo, A. (2020). Technical and vocational education teachers' computer competencies using artificial intelligence. *Journal of Advanced Research in Education,* 5(3), 22–34. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3790259

Ali, T. M. A., Ahmed, A. A., & Alsharif, A. (2024). Improving the educational process in technical and vocational education using artificial intelligence. *Afro-Asian Journal of Scientific Research*, 3(2), 45–59. https://aajsr.com/index.php/aajsr/article/view/408

Almasri, F. (2024). Exploring the impact of artificial intelligence in teaching and learning of science: A systematic review of empirical research. *Research in Science Education,* 54, 977–997.

https://doi.org/10.1007/s11165-024-10176-3

Alwakid, W. N., Dahri, N. A., Humayun, M., & Alwakid, G. N. (2025). Exploring the Role of AI and Teacher Competencies on Instructional Planning and Student Performance in an Outcome-Based Education System. *Systems*, *13*(7), 517. https://doi.org/10.3390/systems13070517

Anyigor, C. P., Oguejiofor, C. N., Emeasoba, N. C., **Ojo, S. A.,** Odo, M. E., Enyi, N. C., Ekpa, A. S., Ogbu, D. K., Nwachukwu, C. M., & Nwatarali, C. N. (2025). Efficacy of Two Modes of Project-Based Teaching Methods on Students' Interest in Basic Science and Technology: Implications for Science Teachers, Educational and Business Managers. *Cuestiones de Fisioterapia, 54*(5), 5226–5235. https://doi.org/10.48047/CU

Attwell, G., Bekiaridis, G., Deitmer, L., Perini, M., & Roppertz, S. (2020). *Artificial intelligence in policies, processes and practices of vocational education and training*. Cedefop. https://www.cedefop.europa.eu/files/ai_vet_report.pdf

Bakare, J. A., Ariyo, S. O., & Ojo, S. A. (2021). Constraints and performance gap analysis (CPGA) of lecturers in utilizing smart boards for improving students' engagement, motivation and learning outcomes (SEMLOs). *International Journal of Research in Education and Science, 7*(3), 681–714. https://doi.org/10.46328/ijres.1765

Brown, M., McCormack, M., Reeves, J., Brook, D. C., Grajek, S., Alexander, B., . . . Weber, N. (2020). 2020 EDUCAUSE Horizon Report: Teaching and Learning Edition. *Bibliothèque Et Archives Nationales Du Québec (Québec Government),* 2–58. Retrieved from https://eduq.info/xmlui/handle/11515/38515

Choi, G. W., Kim, S. H., Lee, D., et al. (2024). Utilizing generative AI for instructional design: Exploring strengths, weaknesses, opportunities, and threats. *TechTrends, 68*, 832–844. https://doi.org/10.1007/s11528-024-00967-w

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

Deckker, D., & Sumanasekara, S. (2025). AI in vocational and technical education: Revolutionizing skill-based learning. *EPRA International Journal of Research and Development*, 10(1), 112–124. https://www.academia.edu/121672520

Eze, S. C., & Anierobi, E. I. (2023). Emerging technologies and instructional delivery in technical education programmes in Nigerian universities. *Journal of Technical Education and Training, 15*(2), 45–58.

Federal Republic of Nigeria. (2020). *National Policy on Education*. NERDC Press.

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. Boston, MA: Center for Curriculum Redesign.

Ifenthaler, D., Majumdar, R., Gorissen, P., Judge, M., Mishra, S., Raffaghelli, J., & Shimada, A. (2024). Artificial intelligence in education: Implications for policymakers, researchers, and practitioners. *Technology, Knowledge and Learning, 29*(4), 1693–1710. https://doi.org/10.1007/s10758-024-09747-0

Kim, J. (2024). Leading teachers' perspectives on teacher–AI collaboration in education. *Education and Information Technologies*, 29, 11983–12002. https://doi.org/10.1007/s10639-023-12109-5

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610. https://doi.org/10.1177/001316447003000308

Létourneau, A., Deslandes-Martineau, M., Charland, P., et al. (2025). A systematic review of AI-driven intelligent tutoring systems in K–12 education. *npj Science of Learning, 10*, 29. https://doi.org/10.1038/s41539-025-00320-7

Liang, J., Stephens, J. M., & Brown, G. T. L. (2025). A systematic review of the early impact of artificial intelligence on higher education curriculum, instruction, and assessment. *Frontiers in Education, 10*, 1522841. https://doi.org/10.3389/feduc.2025.1522841

Liu, X., & Zhong, B. (2024). A systematic review on how educators teach AI in K–12 education. *Educational Research Review, 45*, 100642. https://doi.org/10.1016/j.edurev.2024.100642

Mokoena, O. P., & Seeletse, S. M. (2025). AI in Rural Classrooms: Challenges and Perspectives from South African Educators *International Journal of Current Educational Studies*. https://doi.org/10.46328/ijces.199

Mou, J. (2021). Analysis on the human development path of vocational education in the era of artificial intelligence. *Proceedings of the International Conference on Advances in Artificial Intelligence*. https://dl.acm.org/doi/10.1145/3505711.3505730

Mustafa, M. Y., Tlili, A., & Lampropoulos, G. (2024). A systematic review of literature reviews on artificial intelligence in education (AIED): A roadmap to a future research agenda. *Smart Learning Environments, 11*, 59. https://doi.org/10.1186/s40561-024-00350-5

National Information Technology Development Agency (NITDA) (2023). *Draft National Artificial Intelligence Policy for Nigeria*. National Information Technology Development Agency.

National Universities Commission. (2023). *Core Curriculum and Minimum Academic Standards (CCMAS): Education*. National Universities Commission.

Nworgu, B. G. (2015). *Educational research: Basic issues and methodology* (3rd ed.). University Trust Publishers.

Ojo, S. A., Gbenga-Arotiba, H., Ojo, O. D., Ogbu, D. K., & Dalyop, G. B. (2023). Teacher's perception of potential of emerging technologies in enhancing technical college instruction: Evidence from two technical colleges in Nigeria. *Journal of CUDIMAC, 11*(1), 127–139.

Ojo, S. A., Ogbu, D. K., Ojo, O. D., Ezeugwu, O. J., Gbenga-Arotiba, H., Dalyop, G. B., Nwaosa, I. F., Bassey, N. N., Eze, N. U., & Egbulefu, L. C. (2020). Bridging gaps in crisis-resilient education: Students' perceptions of technology enhanced learning platforms in technical college education during disruptive periods. *Journal of Critical Reviews, 7*(19), 13422–13434. https://doi.org/10.53555/jcr.v7i19.13297

Ojo, S. A., Ojo, O. D., Ezeugwu, O. J., Ezeaku, M. N., Egbulefu, L. C. A., Shetima, A. A., & Chime, S. C. (2025). Bridging Basic Science Technology and English Language Education: Students' Perceptions on Learner-Centered Pedagogical Approaches. *Journal of Home Economics Research, 32*(2), 80–90. https://doi.org/10.66731/jher.v32i2.566

Ojo, S. A., Ujevbe, O. B., & Ogunjobi, O. P. (2024). Assessing the integration of ICT in instructional practices among TVET lecturers in Enugu State universities. *NAU Journal of Technology & Vocational Education, 9*(2), 93–104. https://journals.unizik.edu.ng/naujtved/article/view/5144

Okoye, K. R. E., Nwajiuba, C. A., & Igbojekwe, P. A. (2020). Digital technologies and educational transformation in Nigeria: Issues and prospects. *Education and Information Technologies, 25*(4), 2781–2801.

Organisation for Economic Co-operation and Development (OECD). (2021). *Artificial intelligence in education: Promises and implications for teaching and learning*. OECD Publishing.

Shiohira, K. (2021). *Understanding the impact of artificial intelligence on skills development*. UNESCO-UNEVOC. https://files.eric.ed.gov/fulltext/ED612439.pdf

United Nations Educational, Scientific and Cultural Organization (2023). *Guidance on generative AI in education and research*. UNESCO Publishing.

Weng, X., Ye, H., Dai, Y., & Ng, O. (2024). Integrating artificial intelligence and computational thinking in educational contexts: A systematic review of instructional design and student learning outcomes. *Journal of Educational Computing Research, 62*(6), 1420–1450. https://doi.org/10.1177/07356331241248686

Xiaoyu, W., Zainuddin, Z., & Hai Leng, C. (2025). Generative artificial intelligence in pedagogical practices: a systematic review of empirical studies (2022–2024). *Cogent Education, 12(1).* https://doi.org/10.1080/2331186X.2025.2485499

Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). Harper and Row.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education, 16*(39), 1–27.