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Leveraging Artificial Intelligence to Redesign TVET Assessment Systems for Enhancing Creativity and Innovation in Technical Education

Joyce Ogheneruona Onatere-Ubrurhe [1]
Department of Technology Education, Alvan Ikoku Federal University of Education, Owerri, Nigeria.
joyce.onatere-ubrurhe@alvanikoku.edu.ng

Ogheneochuko Ubrurhe [2]
Department of Information Systems and Technology, Southern Delta University, Ozoro, Nigeria

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Abstract: *This study explores the integration of Artificial Intelligence (AI) into Technical Vocational Education and Training (TVET) assessment systems in Nigeria, focusing on how AI can enhance creativity, innovation, and problem-solving among students. Traditional assessment methods in Nigerian TVET institutions have been found to inadequately evaluate 21st-century competencies, particularly in areas such as innovation and creative thinking. The research employed a descriptive survey design using a structured questionnaire administered to 285 respondents, including educators, students, and ICT personnel. Findings revealed moderate effectiveness of current assessments in capturing technical skills and a significant gap in evaluating creativity and innovation. While 57.9% of respondents were aware of AI in education, confidence in using AI tools remained moderate. Key AI technologies such as adaptive testing, learning analytics, and automated grading were widely recognized and positively perceived. However, challenges such as poor infrastructure, limited training, high implementation costs, and resistance to change were identified as major barriers. Despite these, respondents highlighted several opportunities AI offers, including real-time feedback, personalized learning, and improved assessment accuracy. Respondents also emphasized the need for targeted support such as training, digital infrastructure, policy frameworks, funding, and collaboration with tech providers. The study concludes that AI integration in TVET assessment holds substantial potential to modernize educational practices and better prepare students for the demands of an innovation-driven workforce, provided that strategic implementation and capacity-building measures are in place.*

Keywords: artificial intelligence, TVET assessment, creativity, innovation, personalized learning, Nigeria.

INTRODUCTION

Technical Vocational Education and Training (TVET) is pivotal for equipping individuals with practical skills and competencies necessary for national development, economic diversification, and poverty reduction. In Nigeria, TVET has been recognized as a strategic sector to foster economic growth and address the challenges of youth unemployment and skills mismatch (Korter, 2023). However, the existing TVET assessment systems in Nigeria often rely heavily on traditional, standardized testing methods, which inadequately measure students' creativity, problem-solving skills, and capacity for innovation (Edidiong et al., 2024).

Globally, Artificial Intelligence (AI) has emerged as a transformative force in education, offering novel ways to improve teaching, learning, and assessment processes. AI technologies, including machine learning, natural language processing, and adaptive testing systems, are increasingly being used to personalize learning experiences and provide dynamic, real-time feedback tailored to individual students' needs (Hao, et al., 2024). Unlike traditional assessments that often emphasize memorization and standard responses, AI-enabled assessment frameworks can analyze complex patterns in students' performance, enabling educators to capture critical thinking, creativity, and problem-solving abilities more effectively. These intelligent systems can adapt the difficulty of questions based on learners' responses, identify misconceptions early, and suggest targeted interventions, thereby fostering deeper engagement and continuous improvement (Iqbal, 2023).

Moreover, AI-powered assessment tools are capable of evaluating open-ended and project-based tasks, which are vital for measuring creativity and innovation key competencies required for success in the 21st-century workforce (Iqbal, 2023). Such technologies can process large volumes of data, including written text, multimedia submissions, and interactive simulations, to provide a more holistic evaluation of students' capabilities beyond conventional exams. The integration of AI into educational assessment also supports scalable and cost-effective evaluation solutions, addressing resource limitations common in many developing countries. Recent studies underscore the importance of leveraging AI to enhance educational outcomes in developing countries, where resource constraints and outdated assessment approaches hinder quality training (Hassan et al., 2022, Aderigbe, et al., 2023).

In the Nigerian context, the potential of AI in education is gaining recognition, especially as the country seeks to align its educational outcomes with global standards and market demands (Aderigbe, et al., 2023). However, current TVET assessment frameworks in Nigeria remain largely manual and inflexible, often failing to reflect the dynamic nature of technical skills and creative problem-solving required in modern industries (Edidiong et al., 2024). This disconnect contributes to a workforce that may possess technical know-how but lacks the innovative capacity to drive sustainable economic growth. Leveraging AI to redesign assessment systems offers an opportunity to bridge this gap by fostering an environment where creativity and innovation are systematically nurtured and evaluated.

The main aim of this study is to examine how Artificial Intelligence (AI) technologies can be leveraged to redesign assessment systems in Technical Vocational Education and Training (TVET) in Nigeria, with a

focus on enhancing creativity and innovation among students. While the specific objectives are to; (1) Assess the effectiveness of current assessment methods in evaluating technical skills, creativity, and innovation within Nigerian TVET institutions. (2) Determine the level of awareness and confidence of TVET stakeholders (educators, students, and ICT personnel) in the use of AI applications for educational assessment. (3) Identify the key AI technologies (e.g., adaptive testing, learning analytics, automated grading) known or used in TVET assessment practices. (4) Examine stakeholders' perceptions of the benefits and opportunities associated with integrating AI into TVET assessment systems. (5) Identify the major challenges and barriers to adopting AI-based assessments in Nigerian TVET institutions. (6) Explore the types of support and features required for successful implementation of AI-driven assessment tools aimed at fostering creativity, innovation, and personalized learning.

LITERATURE REVIEW

Overview of Technical Vocational Education and Training (TVET) in Nigeria

Technical Vocational Education and Training (TVET) in Nigeria plays a critical role in equipping youths with the skills required for industrial development and economic diversification (Udoudo & Ikeji, 2023). The Nigerian government has placed increased emphasis on TVET as part of its national development agenda, aiming to address youth unemployment and promote self-reliance through skill acquisition (Akpan, 2023). Despite policy initiatives, the sector faces challenges related to inadequate funding, poor infrastructure, and weak linkages with industry, which limit the effectiveness of TVET in meeting labor market demands. Recent reforms have sought to modernize TVET curricula and improve competency-based education; however, these reforms have yet to fully address the need for innovative teaching and assessment approaches that foster creativity (Onatere-Ubrurhe & Ubrurhe, 2024).

Current Assessment Systems in Nigerian TVET Institutions

Assessment practices within Nigerian TVET institutions are predominantly traditional, emphasizing written examinations, practical demonstrations, and standardized tests. These conventional methods often focus on the recall of technical knowledge and manual skills, neglecting critical competencies such as creativity, innovation, and problem-solving. The lack of continuous and formative assessment mechanisms reduces the opportunity for timely feedback and adjustment in learning processes. Additionally, there is limited integration of technology in assessment, which constrains the ability to personalize evaluation and adapt to individual learner needs. This static assessment framework impedes the capacity to produce graduates equipped for the complexities of modern industries (Edidiong et al., 2024; Yusop et al., 2024).

Challenges in TVET Assessment Practices

Several challenges impede the effectiveness of TVET assessment in Nigeria. Firstly, there is a deficiency of qualified personnel skilled in modern assessment techniques and technologies, leading to inconsistent and unreliable evaluation outcomes. Secondly, infrastructural limitations, such as inadequate digital tools and poor internet connectivity, hamper the adoption of innovative assessment models. Furthermore, cultural attitudes and resistance to change among educators and administrators pose significant barriers to reforming

assessment systems. These challenges contribute to an assessment regime that fails to adequately measure creativity and innovation, undermining the development of a competitive technical workforce (Edidiong et al., 2024; Yusop et al., 2024).

Artificial Intelligence in Education: Concepts and Applications

Artificial Intelligence (AI) in education refers to the use of algorithms and intelligent systems to support and enhance teaching, learning, and assessment processes. AI applications include personalized learning environments, automated grading systems, and adaptive testing platforms that adjust in real-time based on student performance. The integration of AI can facilitate continuous formative assessment, provide instant feedback, and analyze large datasets to identify learning patterns and gaps (Holmes et al., 2023). AI technologies also support the evaluation of complex skills such as creativity and critical thinking through tools that assess open-ended tasks and project work. (Mahamuni et al., 2024; Ilieva, 2025). This makes AI a powerful tool for transforming educational assessment from static, one-size-fits-all models to dynamic, learner-centered systems.

Machine Learning and Adaptive Testing Techniques

Machine learning, a subset of AI, enables systems to learn from data and improve performance without explicit programming (Kumar & Sharma, 2023). In educational assessment, machine learning algorithms can analyze student responses to predict performance trends and customize testing difficulty accordingly (Nair et al., 2023). Adaptive testing utilizes this capability to deliver personalized assessments that match the learner's proficiency level, thus providing more accurate measures of competence (Rathi, et al., 2024; Minn, 2022). Studies have demonstrated that adaptive testing enhances learner engagement, reduces test anxiety, and better identifies individual strengths and weaknesses (Ihichr et al., 2024). Implementing these techniques in TVET can significantly improve the assessment of creativity and innovation by accommodating diverse learner profiles.

Role of AI in Enhancing Creativity and Innovation Assessment

AI has the potential to revolutionize the assessment of creativity and innovation by enabling the evaluation of complex cognitive processes that traditional tests cannot capture (Acar, 2023). AI-driven tools such as natural language processing and semantic analysis allow for the assessment of originality and problem-solving strategies in student work (Rafner et al., 2023; Xie et al., 2022). Additionally, AI systems can support project-based assessments by analyzing multimedia submissions, simulations, and collaborative activities, thus providing a more holistic view of learner creativity (Bajahzar, 2024). Empirical research indicates that AI-enhanced assessments encourage learners to engage in innovative thinking by providing adaptive challenges and personalized feedback (Tan et al., 2024). These capabilities align well with the goals of TVET to produce not only technically competent but also innovative graduates.

RESEARCH METHODS

Research Design

This study adopted a descriptive survey research design to investigate the integration of Artificial Intelligence (AI) into Technical Vocational Education and Training (TVET) assessment systems in Nigeria. The design was deemed appropriate for collecting detailed, quantifiable information from a broad range of respondents, including TVET educators, students, and ICT personnel, with the aim of describing their perceptions, experiences, and attitudes toward AI-driven assessment practices.

Population and sample

The target population comprised TVET educators, students and ICT personnel in Nigerian TVET institutions. These stakeholders are directly involved in the teaching, assessment, and learning processes within TVET institutions and are therefore crucial to understanding the feasibility and impact of AI-based assessment redesign. The purposive sampling technique was used to select participants and the total number of respondents is 285 (Etikan et al., 2016). Table 1 contains the Respondents profile.

DEMOGRAPHICS	**DISTRIBUTIONS**	
ROLE	Educator	85 (29.8%)
	Student	170 (59.6%)
	ICT Personnel	30 (10.5%)
Total Number of Respondents = 285		

Table 1. Respondents profile

Data Collection Methods

Data for this study were gathered through a combination of primary and secondary sources to enhance the depth and reliability of the analysis.

Primary Data

Primary data were obtained through survey method. A structured questionnaire was administered to TVET educators, students and ICT personnel in Nigerian TVET institutions to capture quantitative data on participants' experiences with current assessment methods, awareness of AI technologies, attitudes towards AI integration in TVET assessments and explore challenges, perceptions, and recommendations for AI adoption. The questionnaire was administered online. Although the study initially aimed to reach 300 respondents, a total of 285 valid responses were received. This represents a 95% response rate, which is widely regarded as highly satisfactory for conducting statistical analysis.

Secondary Data

secondary data were collected from existing literature, official reports, academic journals, and other documented materials, which offered valuable contextual background and supported the interpretation of primary findings.

Ethical Consideration

The study adhered to strict ethical standards, including obtaining informed consent, ensuring confidentiality, and protecting participant anonymity. Data was securely stored, accessible only to the research team. Participants were informed of their right to withdraw at any stage without penalty. The study was also sensitive to cultural and institutional norms within Nigerian TVET environments to foster trust and open communication.

Data Analysis methods

The study utilized descriptive statistical techniques, such as frequencies, percentages, means, and standard deviations, for data analysis. To ensure accurate and reliable statistical results, the data were processed using IBM SPSS Statistics version 26 (IBM Corp., 2019).

Data Presentation and Interpretation

The analyzed data are displayed in Table 2, accompanied by detailed interpretations.

NO.	**QUESTIONS**	**RESPONSES**						
1.	How would you rate the effectiveness of the current assessment methods in capturing students' technical skills?	Very Effective (5)	Effective (4)	Neutral (3)	Ineffective (2)	Very Ineffective (1)	Mean	Standard Deviation
		38 (13.3%)	78 (27.4%)	85 (29.8%)	60 (21.1%)	24 (8.4%)	3.16	1.17
2.	To what extent do current assessment systems	To a Great Extent (5)	To a Considerable Extent (4)	To a Moderate Extent (3)	To a Slight Extent (2)	Not at all (1)	Mean	Standard Deviation

	evaluate creativity and innovation?							
		25 (8.8%	55 (19.3%)	95 (33.3%)	70 (24.6%)	40 (14%)	2.84	1.16
		Continued						

Table 2. Results

Table 2. Continued

NO.	QUESTIONS	RESPONSES						
3.	How often are continuous or formative assessments used in your institution?	Always (5)	Often (4)	Sometimes (3)	Rarely (2)	Never (1)	Mean	Standard Deviation
		42 (14.7%)	80 (28.1%)	100 (35.1%)	45 (15.8%)	18 (6.3%)	3.29	1.08
4.	Are you aware of Artificial Intelligence (AI) applications in educational assessment?	Yes		No				
		165 (57.9%)		120 (42.1%)				
5.	If yes, which AI technologies do you know or have	AI Technology		Frequency (N)		Percent of Responses (%)		Percent of Cases (%)
		Adaptive Testing		112		28.1%		67.9%
		Automated Grading		98		24.6%		59.4%

	experience with? (Select all that apply) Adaptive Testing; Automated Grading; Learning Analytics; AI-powered Tutoring Systems	Learning Analytics		102		25.6%		61.8%
		AI-powered Tutoring Systems		88		22.1%		53.3%
		Total		400		100%		242.4%
6.	How do you perceive the integration of AI in TVET assessments?	Very Beneficial (5)	Beneficial (4)	Neutral (3)	Detrimental (2)	Very detrimental (1)	Mean	Standard Deviation
		105 (36.8%)	110 (38.6%)	40 (14%)	20 (7%)	10 (3.5%)	3.98	1.01
		Continued						

Table 2. continued

NO	QUESTIONS	RESPONSES						
7.	How confident are you in using AI technologies to	Very Confident (5)	Confident (4)	Neutral (3)	Not Confident (2)	Not Confident at all (1)	Mean	Standard Deviation

	improve assessment practices?	45 (15.8%)	75 (26.3%)	80 (28.1%)	55 (19.3%)	30 (10.5%)	3.08	1.22

8.	What are the main challenges to adopting AI-based assessments in your institution? (Select all that apply) Lack of infrastructure (hardware/software); Insufficient training and skills; Resistance to change among staff; High cost of implementation; Poor internet connectivity	AI Adoption Challenge	Frequency (N)	Percent of Responses (%)	Percent of Cases (%)
		Lack of infrastructure	190	24.4%	66.7%
		Insufficient training and skills	165	21.2%	57.9%
		Resistance to change among staff	130	16.7%	45.6%
		High cost of implementation	150	19.2%	52.6%
		Poor internet connectivity	145	18.6%	50.9%
		Total	780	100.0%	273.7%

9.	What opportunities do you see in integrating AI into TVET assessments? (Select all that apply) Personalized learning and assessment; Real-time feedback for students; Enhanced evaluation of creativity and innovation; Improved efficiency and accuracy; Better	Opportunities Identified	Frequency (N)	Percent of Responses (%)	Percent of Cases (%)
		Personalized learning and assessment	85	18.6%	29.8%
		Real-time feedback for students	105	23%	36.8%
		Enhanced evaluation of creativity	95	20.8%	33.3%
		Improved efficiency and accuracy	120	26.3%	42.1%
		Better tracking of student progress	50	11.3%	17.5%
		Total	455	100%	159.5%

	tracking of student progress				
		Continued			

Table 2. Continued

NO	QUESTIONS	RESPONSES						
10.	To what extent do you agree that AI-driven assessments can better evaluate students' creativity compared to traditional methods?	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Mean	Standard Deviation
		77 (27%)	105 (36.8%)	60 (21.1%)	28 (9.8%)	15 (5.3%)	3.70	1.08
11.	AI-enabled adaptive testing can provide challenges that encourage innovative thinking. Do you agree?	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Mean	Standard Deviation
		85 (29.8%)	110 (38.6%)	55 (19.3%)	25 (8.8%)	10 (3.5%)	3.83	1.02
12	How likely is AI-based assessment to improve students' problem-solving skills in TVET programs?	Very likely (5)	Likely (4)	Neutral (3)	Unlikely (2)	Very Unlikely (1)	Mean	Standard Deviation
		87 (30.5%)	115 (40.4%)	48 (16.8%)	23 (8.1%)	12 (4.2%)	3.85	1.04
13	What support would be most helpful for successful AI integration in TVET assessment?	Support Option			Frequency	Percent of Responses (%)		Percent of Cases (%)
		Training and capacity building for educators			250	23.3%		87.7%

	(Select all that apply) Training and capacity building for educators; Upgrading digital infrastructure; Policy guidelines and institutional support; Funding and resource allocation; Collaboration with technology providers	Upgrading digital infrastructure	235	21.9%	82.5%
		Policy guidelines and institutional support	200	18.6%	70.2%
		Funding and resource allocation	210	19.6%	73.7%
		Collaboration with technology providers	179	16.7%	62.8%
		Total	1,074	100.0%	376.9%
		Continued			

Table 2. continued

NO	QUESTIONS	RESPONSES			
14	In your opinion, what features should an AI-powered assessment system prioritize? (Rank top 3) Adaptive difficulty levels; Real-time feedback; Multimedia evaluation capabilities; Automated grading and scoring; Creativity and innovation measurement	Feature	Frequency (Top 3 Ranks)	Percent of Total Responses (%)	Percent of Cases (%)
		Creativity and innovation measurement tools	210	24.6%	73.7%
		Real-time feedback	185	21.6%	64.9%
		Adaptive difficulty levels	150	17.5%	52.6%
		Learning analytics and reporting	120	14%	42.1%

	tools; Learning analytics and reporting	Automated grading and scoring	100	11.7%	35.1%
		Multimedia evaluation capabilities	90	10.5%	31.6%
		Total Ranked Selections	855	100%	300%

Interpretation of Results

The data presented in number 1 of table 2 reveals a generally mixed perception regarding the effectiveness of current assessment methods in capturing students' technical skills within Nigerian TVET institutions. Out of the total respondents, only 13.3% rated the current assessment methods as *Very Effective*, while 27.4% found them *Effective*, indicating that slightly over 40% hold a positive view. However, a significant portion, 29.8% remained *Neutral*, suggesting uncertainty or inconsistency in experiences. Furthermore, 21.1% rated the methods as *Ineffective*, and 8.4% as *Very Ineffective*, highlighting notable dissatisfaction among nearly 30% of the participants. The mean score of 3.16, on a 5-point scale, falls marginally above the neutral midpoint, indicating an overall moderate perception of effectiveness. The standard deviation of 1.17 shows a relatively wide variation in responses, suggesting diverse opinions among respondents, possibly due to differences in institutional practices, assessment tools, or student engagement levels. This distribution underscores the need for improvement and modernization of assessment strategies to better evaluate technical competencies in line with evolving educational and industry demands.

The data presented in number 2 of table 2 indicates that the current assessment systems in Nigerian TVET institutions are generally perceived as insufficient in evaluating students' creativity and innovation. Only a small proportion of respondents, 8.8%, believe these systems assess creativity and innovation *to a great extent*, while 19.3% think they do so *to a considerable extent*. The largest group, 33.3%, rated the extent as *moderate*, suggesting that while there may be some efforts to assess these skills, they are not strongly emphasized. Notably, 24.6% of respondents felt that assessment systems evaluate creativity and innovation *to a slight extent*, and 14% said *not at all*, together forming nearly 39% who believe the systems fall short in this area. The overall mean score of 2.84, which is below the neutral midpoint of 3 on a 5-point scale, reflects a generally low perception of effectiveness in this regard. The standard deviation of 1.16 indicates a moderate spread in opinions, showing some variation in how different respondents experience or perceive the emphasis on creativity and innovation in assessments. These findings highlight a significant gap in the current assessment approach and suggest the need for reform that incorporates more innovative and creativity-focused evaluation methods.

The data presented in number 3 of table 2 shows that the use of continuous or formative assessments in Nigerian TVET institutions is moderate, with varying levels of frequency reported by respondents. A combined 42.8% indicated that such assessments are used either *always* (14.7%) or *often* (28.1%), suggesting that a significant portion of institutions recognize the value of ongoing assessment. However,

the largest group, 35.1% reported that these assessments are used only *sometimes*, indicating inconsistency in their implementation. Additionally, 15.8% noted that formative assessments are *rarely* used, and 6.3% stated they are *never* used, highlighting that a notable number of institutions still lack regular formative evaluation practices. The overall mean score of 3.29, slightly above the midpoint of the 5-point scale, reflects a moderate frequency of use, while the standard deviation of 1.08 points to some variation in responses. This suggests that while continuous assessment practices are present in many institutions, their application is not yet widespread or uniform, underscoring the need for more structured and consistent formative assessment strategies to support student learning and improvement.

The data presented in number 4 of table 2 reveals that a majority of respondents, 57.9%, are aware of Artificial Intelligence (AI) applications in educational assessment, while a significant minority of 42.1% are not. This indicates a moderate level of awareness among stakeholders in the Nigerian TVET sector regarding the integration of AI in assessment practices. Although over half of the participants are informed about AI's potential role in transforming educational assessment, the substantial proportion of those unaware suggests that more efforts are needed to raise awareness, build capacity, and promote understanding of AI-driven assessment tools. This gap in awareness may hinder the effective adoption and utilization of AI technologies for enhancing creativity and innovation in TVET assessment systems.

The data presented in number 5 of table 2 highlights the varying levels of familiarity and experience respondents have with specific AI technologies in educational assessment within the Nigerian TVET system. Adaptive Testing is the most recognized or experienced technology, with 112 responses representing 28.1% of total responses and reported by 67.9% of participants, indicating a strong awareness of personalized assessment methods. Learning Analytics follows closely with 102 responses (25.6%), known by 61.8% of respondents, suggesting growing recognition of data-driven approaches to monitor and support student learning. Automated Grading was identified by 98 respondents (24.6%) and acknowledged by 59.4% of the sample, reflecting interest in AI tools that enhance assessment efficiency and objectivity. AI-powered Tutoring Systems received the lowest but still significant recognition, with 88 responses (22.1%) from 53.3% of the participants, indicating moderate awareness of intelligent instructional support tools. The total percentage of cases across all technologies exceeds 100% due to multiple responses per individual, showing that many respondents are familiar with more than one AI application. Overall, the results suggest a reasonably high level of exposure to various AI technologies, with the strongest familiarity centered on tools that personalize assessment and track learner performance.

The data presented in number 6 of table 2 indicates a strong positive perception of AI integration in TVET assessments among respondents. A significant majority, 36.8% and 38.6%, respectively view it as *very beneficial* or *beneficial*, amounting to 75.4% who hold favorable opinions. Meanwhile, 14% of respondents remain *neutral*, possibly reflecting limited exposure or uncertainty about AI's practical impact. Only a small fraction considers AI integration *detrimental* (7%) or *very detrimental* (3.5%), suggesting minimal resistance or concern. The mean score of 3.98, which is close to 4 on a 5-point scale, reinforces this generally optimistic outlook, while the standard deviation of 1.01 shows a moderate spread in views.

Overall, the data reflects a strong belief in the potential of AI to enhance assessment processes in technical vocational education, particularly in fostering creativity and innovation.

The data presented in number 7 of table 2 shows a mixed level of confidence among respondents regarding the use of AI technologies to improve assessment practices in Nigerian TVET institutions. While 15.8% of respondents indicated they are *very confident* and 26.3% are *confident*, only about 42.1% express a clear sense of readiness to engage with AI tools. A significant portion, 28.1%, selected *neutral*, suggesting uncertainty or lack of sufficient exposure or training. Meanwhile, 19.3% reported being *not confident*, and 10.5% *not confident at all*, indicating that nearly one-third of the participants feel unprepared to adopt AI in assessments. The mean score of 3.08, just above the neutral point on the 5-point scale, reflects an overall moderate level of confidence, while the relatively high standard deviation of 1.22 indicates substantial variation in respondents' comfort levels. These findings suggest a need for targeted training and capacity-building initiatives to enhance educators' and stakeholders' confidence and competence in effectively integrating AI into assessment systems.

The data presented in number 8 of table 2 highlights several significant barriers to the adoption of AI-based assessments in Nigerian TVET institutions, with multiple respondents identifying more than one challenge. The most frequently cited issue is *lack of infrastructure*, accounting for 24.4% of responses and affecting 66.7% of the participants, indicating that many institutions do not have the necessary hardware or software to support AI integration. *Insufficient training and skills* follow closely, noted by 21.2% of responses and reported by 57.9% of respondents, reflecting a widespread skills gap among educators and administrators. *High cost of implementation* and *poor internet connectivity* are also prominent, each reported by over half of the participants (52.6% and 50.9% respectively), suggesting that financial and connectivity limitations pose serious obstacles. *Resistance to change among staff* was identified by 45.6% of respondents, showing that attitudinal barriers also play a role in slowing down AI adoption. Overall, the findings demonstrate that the challenges are multifaceted, spanning technological, financial, human, and infrastructural domains. The total percentage of cases exceeding 100% confirms that many institutions face multiple concurrent challenges, underscoring the need for a comprehensive, multi-level approach to facilitate the successful integration of AI into TVET assessment systems.

The data presented in number 9 of table 2 reveals that respondents perceive multiple valuable opportunities in integrating AI into TVET assessments, with a strong emphasis on improving assessment quality and efficiency. The most frequently identified benefit is *improved efficiency and accuracy*, cited by 26.3% of responses and recognized by 42.1% of participants, indicating a widespread expectation that AI can streamline assessment processes and reduce human error. *Real-time feedback for students* follows closely, with 23.0% of responses and 36.8% of respondents seeing it as a key advantage, highlighting the potential for AI to enhance learner engagement and timely support. *Enhanced evaluation of creativity and innovation* is also a significant opportunity, selected by 20.8% of responses and 33.3% of participants, suggesting that AI could help address current gaps in assessing these critical skills. *Personalized learning and assessment* was identified by 18.6% of responses and 29.8% of respondents, reflecting interest in tailoring assessments to individual learner needs. Lastly, *better tracking of student progress* was noted by 11.3% of responses and

17.5% of participants, indicating some awareness of AI's role in monitoring performance over time. The total percentage of cases exceeding 100% shows that many respondents recognize multiple benefits simultaneously, underscoring the broad potential AI holds for enhancing the effectiveness and responsiveness of TVET assessment systems.

The data presented in number 10 of table 2 indicates a generally positive perception of AI-driven assessments' ability to better evaluate students' creativity compared to traditional methods. A combined 63.8% of respondents either *strongly agree* (27%) or *agree* (36.8%) with this statement, demonstrating a majority confidence in AI's potential to enhance creativity evaluation. Meanwhile, 21.1% remain neutral, possibly reflecting uncertainty or lack of direct experience with AI assessment tools. Only a smaller portion, 15.1%, expressed disagreement, with 9.8% disagreeing and 5.3% strongly disagreeing, indicating some skepticism or resistance. The mean score of 3.70 on a 5-point scale reflects an overall favorable attitude, while the standard deviation of 1.08 suggests moderate variation in opinions among respondents. These results highlight a promising openness toward adopting AI for more effective assessment of creativity in Nigerian TVET institutions, though some reservations remain.

The data presented in number 11 of table 2 shows a strong positive perception among respondents regarding the potential of AI-enabled adaptive testing to provide challenges that foster innovative thinking. A combined total of 68.4% of participants either *strongly agree* (29.8%) or *agree* (38.6%) with the statement, reflecting considerable confidence in AI's ability to create stimulating and creativity-enhancing assessments. Meanwhile, 19.3% of respondents remained *neutral*, indicating some uncertainty or limited experience with adaptive testing technologies. Only a small minority expressed disagreement, with 8.8% disagreeing and 3.5% strongly disagreeing. The mean score of 3.83, which is well above the midpoint of the scale, underscores the overall favorable attitude, and the standard deviation of 1.02 suggests moderate variation in opinions. This indicates a promising level of acceptance for AI-enabled adaptive testing as a tool to challenge students and encourage innovative thinking in Nigerian TVET assessment systems.

The data presented in number 12 of table 2 indicates a generally optimistic view of the potential for AI-based assessments to enhance students' problem-solving skills in TVET programs. A majority of respondents, 30.5% *very likely* and 40.4% *likely*, express confidence in AI's ability to improve these skills, together accounting for over 70% of the sample. Meanwhile, 16.8% of participants remain neutral, which may reflect uncertainty or limited firsthand experience with AI assessment tools. A smaller portion, totaling 12.3%, view the improvement as *unlikely* or *very unlikely*, indicating some skepticism or doubt. The mean score of 3.85 on a 5-point scale supports a positive overall perception, while the standard deviation of 1.04 suggests moderate variability in opinions. This data reflects a favorable attitude toward the integration of AI in TVET assessments as a means to foster better problem-solving abilities among students.

The data presented in number 13 of table 2 highlights several key areas of support that respondents consider crucial for the successful integration of AI in TVET assessment systems. The most frequently identified need is *training and capacity building for educators*, with 23.3% of responses and an overwhelming 87.7% of participants recognizing it as essential, underscoring the importance of equipping teachers with the

necessary skills to effectively use AI tools. *Upgrading digital infrastructure* follows closely, with 21.9% of responses and 82.5% of respondents highlighting the need for improved technological facilities to support AI integration. *Funding and resource allocation* and *policy guidelines and institutional support* were also prominently noted, with roughly 19.6% and 18.6% of responses respectively, and over 70% of participants each acknowledging their importance, pointing to the necessity of financial backing and clear regulatory frameworks. Lastly, *collaboration with technology providers* was identified by 16.7% of responses and 62.8% of respondents, indicating the value of partnerships to access expertise and innovations. The total percentage of cases exceeding 100% confirms that respondents view these support areas as complementary rather than mutually exclusive, emphasizing a multi-faceted approach to enabling AI adoption in Nigerian TVET assessment systems.

The data presented in number 14 of table 2 reveals clear priorities among respondents for features that an AI-powered assessment system should emphasize in Nigerian TVET programs. The highest-ranked feature is *creativity and innovation measurement tools*, selected by 24.6% of responses and identified by nearly three-quarters (73.7%) of participants, highlighting a strong demand for assessments that can effectively capture and encourage creative thinking and innovative skills. *Real-time feedback* follows closely, chosen by 21.6% of responses and 64.9% of respondents, reflecting the importance of immediate, actionable insights to support student learning and improvement. *Adaptive difficulty levels* rank third, with 17.5% of responses and 52.6% of participants favoring personalized assessment challenges tailored to individual learners' abilities. Other features such as *learning analytics and reporting* (14.0%), *automated grading and scoring* (11.7%), and *multimedia evaluation capabilities* (10.5%) were ranked lower but still recognized by a notable portion of respondents. This distribution underscores a strong preference for AI systems that not only assess technical skills accurately but also foster creativity and provide timely, personalized support to learners, aligning well with the goal of enhancing innovation in TVET assessment.

DISCUSSION OF FINDINGS

The findings of the study reveal a generally moderate perception of the effectiveness of current TVET assessment methods in Nigeria, with only 40.7% of respondents considering them effective in capturing technical skills. This aligns with Edidiong et al. (2024), who emphasized that traditional assessments often fail to reflect students' practical competencies. Similarly, a low mean score of 2.84 for evaluating creativity and innovation indicates a gap in the current system's capacity to assess 21st-century skills, a concern also raised by Yusop et al. (2024). The frequency of formative assessments showed inconsistency, echoing Holmes et al. (2023), who emphasized the need for continuous evaluation to support adaptive learning. Notably, 57.9% of respondents were aware of AI in education, indicating a growing but not yet universal familiarity, consistent with Aderigbe et al. (2023), who noted uneven awareness levels in developing contexts. AI tools like adaptive testing, learning analytics, and automated grading received high recognition, reflecting global trends as highlighted by Kumar and Sharma (2023), supporting the claim that awareness is concentrated around practical tools. The positive perception of AI integration (mean = 3.98) and belief in its ability to enhance creativity (mean = 3.70) correspond with findings by Acar (2023) and Rafner et al. (2023), who noted AI's effectiveness in creativity assessment. However, the moderate confidence in using

AI (mean = 3.08) underscores the skills gap among educators, consistent with Ilieva et al. (2025). Challenges like poor infrastructure, lack of training, and high costs were also prevalent, mirroring the barriers reported by Hassan et al. (2022). Opportunities identified, such as improved feedback, efficiency, and personalized learning, were in line with studies by Hao et al. (2024) and Iqbal (2023), who emphasized AI's potential to transform education through data-driven personalization. Respondents also prioritized creativity measurement, real-time feedback, and adaptive difficulty as key AI assessment features, reaffirming the shift toward competency-based and learner-centered approaches supported by Mahamuni et al. (2024) and Tan et al. (2024). Overall, the study's findings largely align with existing literature, confirming both the promise and the challenges of AI adoption in Nigerian TVET assessment systems.

Significance of the study

This study is significant as it addresses the critical need to modernize assessment practices in Nigerian Technical Vocational Education and Training (TVET) through the integration of Artificial Intelligence (AI). Traditional assessment methods in TVET have often failed to adequately measure essential 21st-century competencies such as creativity, innovation, and problem-solving. By exploring how AI technologies, such as adaptive testing, learning analytics, and AI-powered tutoring systems, can be used to redesign assessment frameworks, the study provides evidence-based insights into more personalized, efficient, and competency-based evaluation systems. This transformation is essential not only for improving the quality of technical education but also for producing a workforce that is innovative, industry-relevant, and globally competitive. Additionally, the study offers practical recommendations for policymakers, educators, and stakeholders on addressing the challenges associated with AI integration. It contributes to existing literature by filling a contextual gap in research on AI applications in TVET within developing countries like Nigeria, thereby informing future educational reforms and digital strategies for national development.

CONCLUSION

This study concludes that the integration of Artificial Intelligence (AI) into assessment systems holds significant potential to transform Technical Vocational Education and Training (TVET) in Nigeria, particularly in enhancing creativity, innovation, and problem-solving skills. Findings revealed that current assessment methods are moderately effective in capturing technical competencies but fall short in evaluating creativity and innovation, core competencies for 21st-century employability. Although there is growing awareness of AI tools among stakeholders, actual confidence in using such technologies remains moderate, indicating the need for targeted capacity-building efforts. AI tools such as adaptive testing, learning analytics, and real-time feedback mechanisms were positively perceived for their ability to personalize assessments and better track student performance. However, the successful adoption of AI in TVET assessment is currently hindered by infrastructural deficits, limited training, high costs, and institutional resistance. Despite these challenges, the study identified strong opportunities for improvement, including enhanced assessment accuracy, personalized learning, and better creativity evaluation. Respondents emphasized the need for support in the form of educator training, upgraded digital infrastructure, policy development, adequate funding, and partnerships with technology providers. Overall,

the study provides compelling evidence that, if adequately supported and strategically implemented, AI-powered assessment systems can significantly improve the relevance, quality, and effectiveness of Nigeria's TVET programs and contribute to the development of a more innovative and industry-ready workforce.

Limitations

The scope of this research was constrained by time and resource limitations, which may affect the depth and breadth of data collection and analysis.

Recommendations

Based on the findings, the following recommendations have been proposed.

1. **Invest in Educator Training and Capacity Building**: Given the moderate confidence levels in using AI for assessments, targeted training programs should be implemented to equip TVET educators, ICT personnel, and administrators with the necessary digital competencies to effectively utilize AI tools in assessment practices.
2. **Upgrade Digital Infrastructure in TVET Institutions**: The widespread challenge of inadequate infrastructure calls for significant investment in modern ICT facilities, stable internet connectivity, and AI-compatible assessment platforms to support technology-driven evaluation.
3. **Develop Clear Policy Guidelines and Institutional Support**: Government and educational bodies should establish comprehensive policy frameworks and institutional support systems that promote the integration of AI in assessments while addressing ethical concerns, data privacy, and quality assurance.
4. **Promote the Use of AI Tools that Foster Creativity and Innovation**: AI-powered systems should prioritize features such as adaptive testing, creativity and innovation measurement tools, and real-time feedback mechanisms to align with the goals of TVET in producing industry-relevant and innovative graduates.
5. **Address Financial and Technical Barriers**: Funding should be allocated to support the implementation of AI tools, especially in under-resourced TVET institutions. Public-private partnerships and collaboration with technology providers can help mitigate high costs and offer technical expertise.
6. **Raise Awareness and Foster a Culture of Technological Adoption**: Awareness campaigns and stakeholder engagement initiatives should be carried out to increase understanding of AI's benefits in education, reduce resistance to change among staff, and encourage wider acceptance of AI-based assessment methods across TVET institutions.

Further research Directions

- Further research should explore longitudinal impacts of AI-based assessments on student outcomes in creativity and innovation.
- Investigate the cost-benefit analysis of AI adoption in various types of TVET institutions.
- Examine the ethical implications and societal perceptions of AI in student evaluation across different regions of Nigeria.

REFERENCES

Acar, S. (2023). Creativity Assessment, Research, and Practice in the Age of Artificial Intelligence. *Creativity Research Journal,* 37(2), 181-187.

Aderigbe, A.O., Ohenhen, P.E., Nwaobia, N.K., Gidiagba, J.O. & Ani, E.C. (2023). Artificial intelligence in developing countries: Bridging the gap between potential and Implementation, *Computer Science & IT Research Journal,* 4(3), 185-199.

Akpan, D. (2023). *Nigeria's Technical, Vocational Education, and Training Programs: Insights and Analysis*. The University of North Carolina at Chapel Hill.

Bajahzar, A. Multimedia Educational System and its Improvement Using AI Model for a Higher Education Platform. *Sn Comput. Sci.* 5, 702 (2024). https://doi.org/10.1007/s42979-024-03038-2

Edidiong, I.S., Ntiedo, A.U. & Odudu, M.E. (2024). Exploring Innovative Assessment Methods in Technical Vocational Education and Training to Enhance Effective Skill Acquisition in Nigerian Institutions. *International Journal of Education and Evaluation (IJEE)*, 10(3), 536-546.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1–4.

Hao, J., von Davier, A.A., Yaneva, V., Lottridge, S., von Davier, M., Harris, D.J. (2024). Transforming Assessment: The Impacts and Implications of Large Language Models and Generative AI. *Educational Measurement: Issues and Practice,* 43(2), 16-29. https://doi.org/10.1111/emip.12602

Hassan, E., Groot, W. & Volante, L. (2022). Education funding and learning outcomes in Sub-Saharan Africa: A review of reviews, *International Journal of Educational Research Open,* 3, 100181. https://doi.org/10.1016/j.ijedro.2022.100181

Holmes, W., Bialik, M., & Fadel, C. (2023). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

IBM Corp. (2019). *IBM SPSS Statistics for Windows, Version 26.0*. Armonk, NY: IBM Corp.

Ihichr, A., Oustos, O., El Idrissi, Y.B. & Lahcen , A.A. (2024). A Systematic Review on Assessment in Adaptive Learning: Theories, Algorithms and Techniques. *International Journal of Advanced Computer Science and Applications*, 15(7), 855-868.

Ilieva, G., Yankova, T., Ruseva, M. & Kabaivanov, S. (2025). A Framework for Generative AI-Driven Assessment in Higher Education. *Information*, 16(6), 472. https://doi.org/10.3390/info16060472

Iqbal, M. (2023). AI in Education: Personalized Learning and Adaptive Assessment. *Cosmic Bulletin of Business Management*, 2(1), 280-297.

Korter, G.O. (2023). Addressing Youth Unemployment in Nigeria: The Role of TVET and Strategies for Empowerment. *International Journal of Science and Research (IJSR),* 12(7), 26-31, DOI: https://www.doi.org/10.21275/SR23629151503

Kumar, S. & Sharmar, P.K. (2023). Machine Learning: Trends, Perspectives, and Prospects. *Journal of Propulsion Technology,* 44(6), 3302-3311.

Mahamuni, A.J., Parminder, Tope, S.S. (2024). Enhancing Educational Assessment with Artificial Intelligence: Challenges and Opportunities. 2024 International Conference on Knowledge Engineering and Communication Systems (ICKECS). Chikkaballapur, India, 1-5. DOI: 10.1109/ICKECS61492.2024.10616620

Minn, S. (2022). AI-assisted knowledge assessment techniques for adaptive learning environments, *Computers and Education: Artificial Intelligence,* 3, 100050, https://doi.org/10.1016/j.caeai.2022.100050

Nair, R.B., Naveen S.G. & Narmadha, D. (2023). Educational data mining: a systematic review of machine learning algorithms, *International Conference on Computer Vision and Internet of Things 2023 (ICCVIoT'23)*, Coimbatore, India, 310-315.

Onatere-Ubrurhe, J.O. & Ubrurhe, E. (2024) The Role of Technical and Vocational Education and Training (TVET) and Rail Transportation in the Socio-Economic Development of Nigeria, *International Journal of Vocational and Technical Education Research*, 10(2), pp.13-27.

Rathi, S., Mule, S., Nichat, S., Mulla, J. & Neware, S. (2024). Analysis and Implementation of Machine Learning Approaches for Adaptive Learning Using Personalized Assessment, 2024 2nd International Conference on Intelligent Data Communication Technologies and Internet of Things *(IDCIoT)*, Bengaluru, India,1533-1541.

Rafner, J., Beaty, R.E. & Kaufman, J.C. (2023). Creativity in the age of generative AI. *Nat Hum Behav* 7, 1836–1838. https://doi.org/10.1038/s41562-023-01751-1

Tan, C.W., Khan, M.A.M. & Yu, P.-D. (2024). *AI-assisted Programming and AI Literacy in Computer Science Education,* O'Dea, X. & Ng, D.T.K. (Eds.) Effective Practices in AI Literacy Education: Case Studies and Reflections, Emerald Publishing Limited, Leeds, 189-198. https://doi.org/10.1108/978-1-83608-852-320241020

Udoudo, N.J. & Ikeji, F.I. (2023). Policy reforms in Technical Vocational Education and Training (TVET) for sustainable development in Abia State, Nigeria. *Integrity Journal of Education and Training,* 7(2), 26-35.

Xie, C., Luchini, S., Beaty, R. E., Du, Y., Liu, C., & Li, Y. (2022). Automated Creativity Prediction Using Natural Language Processing and Resting-State Functional Connectivity: An fNIRS Study. *Creativity Research Journal*, *34*(4), 401–418. https://doi.org/10.1080/10400419.2022.2108265

Yusop, S.R.M., Rasul,M.S. & Yasin, R.M. (2024). Challenges, strengths, and relevance of integrating classroom-based assessment in technical and vocational education training. *International Journal of Evaluation and Research in Education (IJERE),* 13(4), 2440-2449.