Integration of Artificial Intelligence Tools for Improved Teaching of Electronics Work Trade in Technical Colleges for Sustainable Employment in Enugu State

by

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Abstract
This study sought to determine how to integrate artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State. The study was carried out in Enugu State and the population was 78 respondents comprising of 33 technical college administrators and 45 teachers sampled purposively from Nsukka educational zone. The instrument for data collection was a structured five-point Likert's scale and weighted questionnaire with a 20-items statement developed by the researcher. The instrument was validated by three experts with the reliability index of 0.73 established using Cronbach's Alpha. Mean and standard deviation were used to answer the research questions while hypotheses were tested using t-test at .05 level of significance and appropriate degree of freedom. Some of the findings include; Utilize AI to create advanced simulation software that will imitate electronic systems and circuits, design a workshop that specialize on AI applications in electronics, offer professional development to Teachers to familiarize them with AI technologies among others. Also, the study showed that High Costs of Procuring AI tools, software licenses, and necessary infrastructure, many instructors lack the expertise to use AI tools effectively, among others are the are challenges.
Keywords: Artificial Intelligence Tools, Teaching, Electronics works Trades, Technical Colleges, Sustainable Employment.

Introduction

Technological advancements have significantly reshaped educational policies and planning globally, necessitating a thorough reexamination and adaptation of teaching, learning, and assessment frameworks to align with new educational contexts. Electronics trade in Nigerian technical colleges currently face a complex array of challenges that impede its effective operation. The historical background is crucial for understanding the current status of technical education and serves as a foundation for considering innovative approaches, such as the incorporation of artificial intelligence (AI), to tackle these difficulties (Avik, 2018). The emergence of digital environments, coupled with an array of tools and applications, has created avenues for substantial improvements in education, enhancing the quality and relevance of teaching and learning practices. Since the release of OpenAI's GPT-4 text generating technology, artificial intelligence (AI) has emerged as a crucial field of study in computer science. This technology is becoming more and more common in a variety

of contexts, such as the workplace, daily life, and education. The Digital Education Action Plan (2021-2027) was introduced by European Union authorities in 2020 in recognition of the urgent need to integrate digital capabilities into education. Its goal is to support the growth of digital skills in both students and teaching staff (European Commission, 2020).

The integration of artificial intelligence (AI) into education has the potential to revolutionize teaching and learning. In the field of electronics work trade, AI can offer innovative solutions to enhance the learning experience, improve student outcomes, and prepare learners for the demands of the modern workforce. Although AI is primarily associated with computers, research indicates that its scope has broadened beyond mere computational applications (Chen et al., 2020), leading to the emergence of Artificial Intelligence in Education (AIED). The importance and necessity of applying AI in education have been acknowledged by researchers, educators, policymakers, and international organizations like UNESCO, which advocates for the implementation of AI across educational sectors, administration, teaching, and learning (UNESCO, 2019).

AI in education is a relatively nascent field; however, a substantial body of research highlights both new opportunities and challenges associated with its use in educational settings. Roll and Wylie (2016) certified that the utilization of artificial intelligence has come in various structure like customized realizing which has to do with versatile learning stage. In such stages, it brings man-made intelligence-controlled stages can adjust to the singular requirements and learning speed of every understudy, giving customized opportunities for growth. These stages can distinguish information holes and designer guidance in like manner. Man-made intelligence driven mentoring frameworks can offer ongoing input, clarifications, and direction to understudies, mimicking the job of a human coach. Ouyang and Jiao (2021) distinguish that in upgraded recreation and augmented reality, simulated intelligence rely upon different type of reenactment.

While sensible reenactment's structure, computer-based intelligence can make exceptionally reasonable recreations of hardware workplaces, permitting understudies to rehearse abilities and investigation with various situations without risk. Computer generated Reality Labs which incorporate augmented simulation (VR) innovation can give vivid growth opportunities, empowering understudies to connect with virtual gear and parts. Coppin (2004) places simulated intelligence in savvy appraisal and assessment where robotized reviewing makes man-made intelligence to computerize the evaluating of tasks, tests, and tests, saving teachers' the ideal opportunity for more customized criticism and support.AI-fueled testing frameworks can change the trouble level of inquiries in light of an understudy's exhibition, it is both testing and suitable to guarantee that appraisals.

Simulated intelligence controlled virtual coaches can take part in normal language discussions with understudies, responding to questions, giving clarifications, and offering direction. Man-made intelligence-based language interpretation devices can work with correspondence and cooperation among understudies from different foundations (UNESCO, 2019). There are cases in understudy achievement expectation, where simulated intelligence can dissect understudy information to recognize in danger understudies and anticipate their scholastic exhibition, considering early mediation and backing. Information examination can assist instructors with streamlining the educational plan by recognizing regions where understudies might be battling and making essential changes. Holmes et al., (2019) opined that AI-powered robots can be used to provide hands-on learning experiences in electronics work trade, allowing students to

interact with real-world equipment and systems. AI can automate routine tasks, freeing up students' time to focus on more complex and creative projects. Incorporating "train-the-trainer" programs can help build a sustainable system where trained teachers, in turn, train their colleagues. This is essential for spreading new teaching techniques and ensuring that all students benefit from well-prepared instructors. Empirical research shows that educators who receive continuous professional development are better equipped to adopt new teaching strategies, making learning more interactive and engaging for students (Susa Africa, 2023). Njoku (2018) believed that techniques utilized in electronic work incorporate conversation, project, field outing and talk strategy. Traditional electronics education often requires components like resistors, capacitors, and batteries, which are used in physical experiments. The frequent need for new materials contributes to environmental waste, particularly in developing countries where recycling systems may be limited. Virtual labs and simulation platforms powered by AI present an eco-friendly alternative, enabling students to engage with practical electronics concepts without generating physical waste.

An approach to improve electronics teaching in Nigeria is to integrate technology and AI-powered tools that facilitate both theoretical and practical learning (Nwosu, 2024). AI and adaptive learning platforms can provide personalized learning paths for students, allowing them to study complex electronics concepts at their own pace. AI-enabled learning platforms like Labster and Tinkercad allow students to engage in virtual labs, simulating real-world electronics without the need for physical components. This can be highly beneficial for institutions with limited resources, as students gain hands-on experience in a virtual setting.

Furthermore, mobile-based learning resources can improve access in regions with limited internet infrastructure. Rahiem (2020) said offline capabilities of educational apps allow students in remote areas to download instructional content, which they can later access without a consistent internet connection. Solar-powered mobile labs are also a promising solution, providing power and connectivity to students who would otherwise have little access to digital resources. Chinaemerem, Sani, Hassan and Bena (2023) affirmed that with programs like the Edves platform, which streamlines school administration, and the EduStat system, which the West African Examinations Council (WAEC) uses to evaluate educational data, Nigeria has made progress in utilizing AI in spite of these obstacles. Both systems use operational efficiency and data-driven insights to increase educational accessibility and quality, especially in underprivileged communities. If the government and private sector invest in infrastructure and training to create equitable opportunities across all regions, artificial intelligence (AI) has the potential to significantly improve access and quality of education in Nigeria (Samuel-Okon & Abejide, 2024). For electronics courses, AI-enabled virtual labs replicate real-world scenarios and enable students to apply theoretical knowledge in practice without depleting resources, thus aligning with sustainable educational goals (Alam, 2023). Moreover, adaptive AI applications foster a sustainable approach by reducing the reliance on physical materials.

Electronics work Trade is one of the primary trade areas offered at the technical college level (Ezugu, Bala& Muhammad, 2023). Appliance maintenance and repairs, electrical installation and maintenance work, instrument mechanics work, radio, television, and electronic serving are among the programs that fall under electrical and electronic crafts, according to Emesini (2016). Maxwell (2019) asserted that electronic works trade is designed to give training in the skills and

impart the necessary attitudes that are needed in order to become an enterprising and self-reliant craftsmen or technicians in workmanship. Okwelle and Assor (2022) stated that electronics as one of the trades studied in technical and vocational centres covers electronics maintenance and repair, electronics appliance, electronics circuit reading, electronics measuring instrument power supply system, electronic instrumentation and control and radio and television among others. Chijoke and Benchuks (2012) stated that the electronics work trade is aimed at training skilled technical manpower equipped with the necessary technical knowledge and practical skills for diagnosing and repairing faults in radio and television systems. These tasks are to be carried out by the student step by step before arriving at final stage of accomplishing the task.

The expected skills of electrical and electronics graduates of a technical college (irrespective of their specialization) include measuring and cutting of metals, interpretation of circuit diagrams, carrying out basic Electricity calculations, understanding of the working principles and applications of various Electrical and Electronics devices, troubleshooting of Electrical and Electronics systems, installation of Electrical and Electronics systems and production of Electrical and Electronics drawing (NBTE, 2016). Okwelle and Okeke (2012) stated that the technical college, Electronics work trades curricula among others are aimed at training skilled technical manpower equipped with the necessary technical knowledge and practical skills for installing Electrical power systems as well as diagnosing and repairing faults in Electronics systems. Studies show that adaptive learning platforms, which adjust content based on a student's progress, provide tailored exercises that deepen understanding of electronics components, circuit design, and diagnostic techniques (Christodoulou &Angeli, 2022; Rane, Choudhary & Rane, 2023). AI has proven effective in enhancing personalized learning experiences, especially in specialized fields like electronics. For instance, personalized AI-driven tutoring in electronics provides real-time feedback and addresses individual knowledge gaps, which enhances learning efficiency and engagement. Frank (2024) highlighted the use of AI for personalized learning in mathematics, showing that such systems improve student engagement and comprehension, a benefit that applies similarly in electronics education, where complex concepts require iterative and customized learning strategies. Digital simulations allow students to perform experiments virtually, which minimizes the waste and energy consumption associated with using physical components repeatedly in practice labs.

Artificial Intelligence (AI) in electronics work trade can improve learning outcomes by providing students with more hands-on, practice-oriented training. For instance, virtual lab simulations allow students to engage in electronics work without the need for a fully equipped physical lab. .Wonu and Amannah (2024) opined that in Nigerian classrooms, this method has showed promise, especially in math classes where pupils gain from interactive and adaptable learning tools that cater to a range of learning styles and speeds. Studies show that students learn and retain more effectively when they can practice repeatedly without the limitations of physical resources. Recent studies indicate that AI simulations and real-time feedback lead to a 20% improvement in skill retention among electronics students, as compared to traditional teaching methods (Elendu et al 2024; Li, 2023).

Also, Ally and Wark (2020) posit the integration of AI in education offers opportunities to align learning practices with the sustainable development goals. Emerging technologies such as augmented reality (AR)

and virtual reality (VR), powered by AI, hold potential for further reducing reliance on physical labs by creating immersive experiences that mimic real-world electronics environments. However, challenges remain, including the need for substantial investment in AI infrastructure and training. According to empirical research, expanding AI adoption in Nigeria and similar regions requires collaborations between government, educational institutions, and technology providers to ensure long-term sustainability and resource allocation for digital transformation in education. Bilderback (2024) suggested as global industries shift towards sustainable practices, incorporating sustainability topics within electronics courses can prepare students to meet these demands. Teaching students about renewable energy, energy-efficient systems, and environmentally-friendly practices in electronics aligns their skills with the goals of sustainable development. Courses can integrate modules on designing electronics with minimal environmental impact or working with sustainable energy sources, such as solar and wind power. This knowledge is not only essential for global competitiveness but also addresses local needs, as Nigeria continues to expand its renewable energy sector. Yu (2020) said that access disparities mean that urban schools are more likely to benefit from AI, which risks widening the educational gap. However, the integration of Artificial Intelligence (AI) in the teaching of the electronics work trade at technical colleges can greatly enhance the educational experience for students while also preparing them for sustainable employment in Enugu State, Nigeria.

Statement of Problem

The recent advancement of technology innovation has given rise for a reassessment of educational practices, particularly in technical colleges that prepare students for vocation in fields such as electronics. In Nigeria, the teaching of the electronics work trade faces several challenges, including outdated pedagogical methods, the limited access to modern laboratory equipment, which is essential for hands-on learning. Many educational institutions, especially those in rural areas, struggle with outdated or insufficient equipment, hindering students' ability to engage deeply with electronics work. Another barrier is the shortage of well-trained instructors. Many teachers in Nigerian institutions lack current, in-depth knowledge of electronics or exposure to the latest technologies, limiting their ability to provide effective instruction. insufficient hands-on training, and a lack of industry-relevant skills among graduates. These gaps hinder students' employment prospects and their ability to engage with the evolving demands of the electronics industry.

Also, the integration into the curriculum of technical colleges has been limited. This presents a significant problem as students miss out on the opportunity to learn how AI can enhance design, diagnostics, and problem-solving in electronics. Furthermore, educators often lack the training and resources to effectively incorporate AI into their teaching methods, resulting in a skills gap that adversely affects both student engagement and employability.

The lack of a systematic approach to integrating AI in teaching practices further exacerbates the issue, as there is no established framework for educators to follow. Without targeted interventions, the gap between industry expectations and the competencies of graduates will likely widen, resulting to increased unemployment and underemployment in the region.

This study seeks to address these issues by exploring the integration of artificial intelligence in the teaching of the electronics work trade at technical colleges in Enugu State. By identifying effective strategies for

incorporating AI into the curriculum, the study aims to enhance educational outcomes, improve students' practical skills, and ultimately contribute to sustainable employment in the electronics sector.

Purpose of the Study

This study sought to determine ways of integrating of artificial intelligence for improved teaching of electronics work trade in the technical college for sustainable employment in Enugu State. Specifically, the study sought to identify;

1. The strategies for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state.
2. The challenges for the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State.

Research Questions

The following research questions guided the study

1. What are the strategies for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state?
2. What are the challenges of integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State?

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant difference between the mean responses of Technical Teachers and Administrators on the strategies for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state.
2. There is no significant difference between the mean responses of Technical Teachers and Administrators on the challenges for the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State.

Methodology

Descriptive survey research design was employed for this study. The study was carried out in Enugu State. The population was 78 respondents comprising of 33 technical college administrators and 45 teachers sampled purposively from Nsukka educational zone. The instrument for data collection was a structured five-point Likert scale and weighted questionnaire with a 20-items statement developed by the researchers. The questionnaire had two sections, namely: A and B. Part A comprised of the demographic of the respondents while B had the questionnaire items with response options of Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D) and Strongly Disagree (SD) assigned numerical values of 5, 4, 3, 2 & 1 respectively. The instrument was validated by three experts two from Electrical Electronics Technology Education and one from measurement and evaluation all from Faculty of Education, ESUT. The reliability index of 0.73 established using Cronbach's Alpha. In analyzing the data collected, mean and standard deviation were used to answer the research questions. Upper and lower limits of the mean were used as the basis for decision making, thus; Strongly Agree (SA): 4.21 - 5.00, Agree (A): 3.41 - 4.20, Neutral (N): 2.61 - 3.40 Disagree (D): 1.81 - 2.60, Strongly Disagree (SD): 1.00 - 1.80. The null hypotheses were tested at .05 level of significance with appropriate degree of freedom using t-test. The null hypotheses were

accepted when the associated probability value is less or equal to 0.05 level of significance.

Results

The results are presented in line with the research questions and corresponding null hypotheses that guided the study and they are presented below.

Research Question 1:

What are the strategies for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state?

Table 1

Mean and standard deviation of respondents regarding the strategies for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state include

	Item	Administrators (33)		Teachers (45)		Total (78)		
		($\bar{x}$)	SD_1	($\bar{x}$)	SD_2	($\bar{x}$)	SD_3	Decision
1	Implement AI-driven tutoring systems that ensure real-time feedback and assistance to students.	3.72	1.442	3.97	1.215	3.87	1.312	Agree
2	Integrate AI-focused modules in the electronics syllabus to expose students to modern technologies.	4.00	1.620	4.60	0.889	4.34	1.277	Strongly Agree
3	Utilize AI to create advanced simulation software that will imitate electronic systems and circuits	3.84	1.460	4.51	0.869	4.23	1.194	Strongly Agree
4	Design a workshop that specialize on AI applications in electronics	4.15	1.438	3.71	1.455	3.89	1.455	Agree
5	Promote awareness of the importance of AI among stakeholders	3.60	1.712	4.20	1.272	3.94	1.493	Agree
6	Offer professional development to Teachers to familiarize them with AI technologies	3.72	1.442	3.97	1.215	3.87	1.312	Agree
7	Use virtual labs where students can simulate electronics projects and receive instant feedback on their designs.	4.00	1.620	4.60	0.889	4.34	1.277	Agree
8	Encourage AI-driven learning management systems (LMS) that can provide personalized learning process.	3.84	1.460	4.51	0.869	4.23	1.194	Strongly Agree
9	Use AI tools for coding simulations and designing circuits	4.15	1.438	3.71	1.455	3.89	1.455	Agree
10	Gather feedback from students and teachers to continuously improve the implementation process	3.60	1.712	4.20	1.272	3.94	1.493	Agree
	Cluster Mean	3.	1.534	4.19	1.140	4.05	1.201	Strongly

	86	Agree

Data presented in Table 1 showed that the mean responses of respondents on the items number 2, 3 and 8 are 4.34, 4.23 and 4.23 indicating strongly agree responses while items number 1, 4, 5, 6, 7, 9, and 10 were agree as the strategies required for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state, with aggregate scores range of 3.87 to 3.94. The Table shows that the itemized strategies are required for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state. The cluster mean value of 3.67 also attested to that while the cluster standard deviation of 1.346 indicates homogeneity in opinions of respondents.

Hypothesis One

There is no significant difference between the mean responses of Technical Teachers and Administrators on the strategies required for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state.

Table 2

T-test analysis between technical college administrators and teachers regarding the strategies required for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state

RESPONDENT	N	X	SD	DF	P.	T-CAL	T-TAB	DECISION
Administrators	33	3.86	1.534	76	0.6	1.265	1.980	NS
Teachers	45	4.24	1.099					

Data in Table 2 revealed that the hypothesis test of no significant difference yield t-calculated value of 1.012 against t-tabulated value of 1.980 at 76 degree of freedom and .05 significance level. Hence, the null hypothesis is not rejected. Therefore, a significant difference does not exist in the mean ratings between technical college administrators and teachers regarding the strategies for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state.

Research Question 2:

What are the challenges in the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State?

Table 3

Mean and standard deviation of the respondents regarding the challenges in the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State include

	Items	Administrator		Teacher		Total		Decision
		$(\bar{x})$	SD_1	$(\bar{x})$	SD_2	$(\bar{x})$	SD_3	
1	Teachers may be afraid that AI will replace their roles rather than complement them, leading to resistance.	3.72	1.463	4.35	1.090	4.08	1.291	Agree
2	processing the data of the student to personalize learning raises concerns about privacy and security	3.93	1.477	4.57	0.722	4.30	1.143	Strongly Agree
3	Electronics work often requires physical learning that AI cannot fully replicate	3.90	1.588	4.64	0.883	4.33	1.275	Strongly Agree
4	Over dependence on AI tools might reduce the development of critical manual and problem-solving skills in students.	3.78	1.596	4.15	1.242	4.00	1.405	Agree
5	Many instructors lack the expertise to use AI tools effectively,	3.81	1.570	3.44	1.560	3.60	1.565	Agree
6	AI content delivery allowed to students to practice troubleshooting electronic circuits or systems in a virtual setting.	3.72	1.463	4.35	1.090	4.08	1.291	Agree
7	Absence of clear policies governing AI deployment and data security can create uncertainties and barriers to adoption.	3.93	1.588	4.64	0.722	4.30	1.143	Strongly Agree
8	Resistance to Change among stakeholders	3.90	1.588	4.64	0.883	4.33	1.275	Strongly Agree
9	High Costs of Procuring AI tools, software licenses, and necessary infrastructure	3.78	1.596	4.15	1.242	4.00	1.405	Agree
10	AI systems rely on high-quality, data for training and functioning, which may not always be	3.81	1.570	3.44	1.560	3.60	1.565	Agree

available for specialized areas like electronics work.							
Cluster Mean	3.83	1.549	4.24	1.099	4.06	1.336	Strongly Agree

Furthermore, the data presented in Table 3 showed that the mean responses of respondents on the items number 2, 3, 7 and 8 are 4.30, 4.33, 4.30 and 4.33 indicating strongly agree responses while items number 1, 4, 5, 6, 9, and 10 were agree as the challenges affecting the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State, with aggregate scores range of 3.60 to 4.08. The table revealed that the itemized challenges affecting the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State. The cluster mean value of 4.06 also attested to that while the cluster standard deviation of 1.336 indicates homogeneity in opinions of respondents.

Hypothesis Two

There is no significance difference between the mean responses of Technical Teachers and Administrators on the challenges affecting the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State.

Table 4: t-test analysis between technical college administrators and teachers regarding the challenges affecting the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State

RESPONDENT	N	X	SD	DF	P.	T-CAL	T-TAB	DECISION
Administrators	33	3.83	1.5489	76	05	1.265	1.980	NS
Teachers	45	4.24	1.099					

Data in Table 4 revealed that the hypothesis test of no significant difference yield t-calculated value of 1.267 against t-tabulated value of 1.980 at 76 degree of freedom and .05 significance level. Hence, the null hypothesis is not rejected. Therefore, a significant difference does not exist in the mean ratings between technical college administrators and teachers regarding the challenges affecting the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State.

Discussion of Findings

The study found the following as the strategies for integrating artificial intelligence for improved teaching of electronics in Enugu state. Some of these strategies include; Utilize AI to create advanced simulation software that will imitate electronic systems and circuits, design a workshop that specialize on AI applications in electronics, offer professional development to Teachers to familiarize them with AI technologies among others.The findings are in support of Frank (2024) unlined the use of AI for personalized learning in mathematics, showing that such systems improve student engagement and comprehension, a benefit that applies similarly

in electronics education, where complex concepts require iterative and customized learning strategies. In the same vein, the hypothesis test of no significant difference shows that significant difference does not exist in the mean ratings between technical college administrators and teachers regarding the strategies required for integrating artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu state. Hence, the null hypothesis is therefore not rejected for these items.

Findings on Table 2, observed that there are the challenges affecting the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State. Some of the challenges include the following: Electronics work often requires physical learning that AI cannot fully replicate, High Costs of Procuring AI tools, software licenses, and necessary infrastructure, Many instructors lack the expertise to use AI tools effectively, among others are the findings are in consonance with Lack of technical support needed to maintain digital technologies and troubleshoot issues that may occur, existing curriculum are not designed to incorporate digital technologies effectively, Epileptic power supply and Infrastructure Deficiencies among others. The findings tally with the report of Yu (2020) said that access disparities mean that urban schools are more likely to benefit from AI, which risks widening the educational gap. However, the result of the corresponding hypothesis shows there is no significance difference between the mean responses of Technical Teachers and Administrators on the challenges affecting the integration of artificial intelligence for improved teaching of electronics work trade in technical colleges for sustainable employment in Enugu State. This implies that the t calculated value obtained was low against the t-tabulated value at the appropriate degree of freedom and significance level.

Conclusion

Integrating AI in teaching electronics work courses at technical colleges in developing countries holds transformative potential. AI can address skill gaps, enhance student engagement, and provide personalized learning experiences. These advancements not only improve learning outcomes but also support sustainable development by equipping students with skills that match industry needs, fostering innovation, and promoting long-term employment. However, effective integration requires thoughtful planning, resource allocation, and ongoing support to ensure accessibility, relevance, and adaptability in line with local context and sustainable development goals.

Recommendation

1. Management ofTechnical and Vocational Technical Education should partner with government or NGO or educational and tech institutions to ensure these platforms are cost-effective, easy to use, and scalable across regions to implement localized, AI-driven educational tools that adapt to the specific learning paces and needs of students in electronics courses. This approach supports sustainable learning by ensuring that resources and skills are accessible, relevant, and adaptable to the local context.
2. Educators and instructors of the technical colleges should be targeted in training programs for help them effectively utilize AI tools in their teaching. This training should focus on AI applications for personalized instruction, data-driven assessment, and project-based learning, which are highly relevant to electronics courses.

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