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Utilization Of Artificial Intelligence (AI) In Technology Education Programmes For Sustainable Human Capital Development In Tertiary Institutions In Anambra State

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ABSTRACT

The central purpose of the study was to determine the measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State. The study was carried out in Anambra State, using a descriptive survey research design. Two research questions and two null hypotheses guided the study. The population for the study was 121 Technology Educators in two tertiary institutions offering technology education programmes in Anambra State. The entire population was used for the study. The instrument used for data collection was a 25-item structured questionnaire developed by the researcher. The instrument was structured using a four-point rating scale. The instrument was face validated by the three experts. Cronbach Alpha was used to determine the reliability coefficient which yielded 0.79. Out of 121 copies of the questionnaire distributed 108 copies were properly filled and used for data analysis representing 89.25% return rate. Mean and standard deviation were used to answer the research questions and t-test was used to test the two null hypotheses at 0.05 level of significant at 106 degrees of freedom. The study revealed the items under the lecturers-related measures and institution administrative-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State. The study therefore concludes that the identified measures would enhance the utilization of AI tools in Technology Education for sustainable human capital development. Based on the findings, some implications were deduced and it was recommended among others that the Technology educators should be provided with in-service training on the use of AI in preparing and assessment of students learning as digital age demand and tertiary institution management should ensure the provision of modern ICT infrastructure necessary for AI adoption.

Keywords: Technology Education, Artificial Intelligence (AI), Sustainable Human Capital Development.

INTRODUCTION

The 21st century innovations have been characterized by Artificial Intelligence technologies. Artificial Intelligence (AI) has become one of the most transformative technological innovations, impacting virtually every sector of human endeavor including human capital development in education. Within the context of Technology Education, AI holds the potential to revolutionize teaching and learning, improve pedagogical outcomes, and strengthen the employability of graduates in a world that is increasingly digitized and knowledge-driven. According to Felix & Webb (2024) Artificial intelligence (AI) is an innovative technical framework that encompasses the creation of computer systems with the ability to execute activities that usually need human intellect. These activities involve problem-solving, acquiring knowledge, comprehending language, and seeing visual information.

Artificial intelligence is ability of a technological device to perform tasks that normally require human intelligence automatically. AI refers to the simulation of human intelligence in machines that are programmed to think, learn and perform task like humans. Obi (2022) pointed that AI in education refers to the application of artificial intelligence technologies to enhance teaching, learning, and educational administration processes. AI offers enormous opportunities to personalize learning experiences, provide intelligent tutoring systems, analyze data for student performance, and simulate real-world business scenarios that enhance understanding. The universities are yet to fully harness the possibilities of AI in implementing their Technology Education programmes for sustainable human capital development.

Technology Education is a discipline that integrates both theoretical knowledge and practical skills in training students in different technological and engineering fields of study. Technology Education also known as industrial technology is a branch of education that equips learners with scientific knowledge, technical skills, and practical competencies required for industrial and technological occupations (Alio, Mbah & Ideh, 2023). It focuses on the application of technology in solving industrial problems and preparing individuals for industrial employment, teaching, self-reliance, and national development. Technology Education combines theoretical instruction with practical training in areas such as Mechanical Technology, Electrical/Electronics Technology, Building Technology, Automobile Technology, Woodwork Technology and Manufacturing Processes. According to UNESCO (2016), technology education plays a vital role in developing human resources for industrial growth and sustainable economic development. Similarly, National Board for Technical Education (2020) emphasized that Technology Education programmes prepare students with employable skills, technical competence, and entrepreneurial abilities needed in sustainable human capital development. Technology Education also promotes innovation, creativity, problem-solving ability, and adaptability to emerging technologies such as artificial intelligence, robotics, and automation. In Nigeria and particularly Anambra State, Technology Education contributes significantly to the objectives of Technical and Vocational Education and Training (TVET) by reducing unemployment and encouraging self-employment among graduates.

Technology Education programmes are structured to achieve the goal of training human capital for sustainable development. Sustainable human capital development refers to the continuous way of improving the knowledge, skills, norms, values, and productive capacities of individuals in a manner that meets present societal, economic and technological needs without compromising the future generations needs. It emphasizes systematic planned and long-term investment in education, training, innovation, and workforce empowerment for sustainable national growth and development. While sustainability focuses on responsible utilization of resources in ways that support present development and preserve opportunities for future generations, human capital refers to the stock of knowledge, technical skills, norms, values, creativity, experience, and health possessed by individuals that enhance their productivity and contribution to economic and social development. Human capital is developed through education, vocational training, research, health improvement, and lifelong learning opportunities. Therefore, sustainable human capital development is therefore essential for national transformation because it equips citizens with employable and entrepreneurial skills needed for productivity, innovation, and self-reliance. Improving the utilization of AI in technology education would directly affect the training for sustainable

human capital development that would reduce unemployment, poverty, and social inequality while promoting industrial and technological advancement. Technology Education programmes are offered in tertiary institutions in Anambra State. Anambra State is one of the five states in South-East geo-political Zone of Nigeria with increasing educational development, entrepreneurial development and business activities. The peculiarity of this state necessitated the AI improvement in the training of technology education students that will respond to the human capital demands of the labour market. The digitalization of human activities demands that the students should be trained using digital tools like artificial intelligence.

The utilization of AI in Technology Education globally has been tied to significant educational reforms and improvements in instructional quality and learning outcomes. According to UNESCO (2021), AI in education can enhance equity, improve access information and instructional materials, and support personalized learning pathways. Similarly, the Organisation for Economic Co-operation and Development (OECD, 2023) emphasizes that AI tools, when properly integrated, foster creativity, problem-solving, and critical thinking, which are central to technological innovations and development. The World Economic Forum (2023) further notes that the future of jobs will increasingly depend on digital skills and AI literacy, making it imperative for tertiary institutions to expose students to these competencies.

However, in the Nigerian context, especially in the tertiary institutions in Anambra State, barriers such as inadequate infrastructure, insufficient human capacity, lack of clear institutional policies, and low digital literacy among students constrain the effective adoption and utilization of AI (Eze & Okafor, 2022). Technology Education students in this region are therefore not fully benefitting from AI-powered instructional strategies that could bridge learning gaps and improve digital skill development. To achieve the desired improvement the AI utilization, all the stakeholders need to employ effective measures to achieve the desired results. For instance, the lecturers (technology educators), institution management, government agencies and non-governmental organizations need to employ acceptable measures to improve the utilization of AI in the implementation of Technology Education programmes for sustainable human capital development in Anambra State.

The Technology Educator's perception and utilization of AI tools in their curriculum implementation is imperative. Obi (2022) pointed that human resource development is also crucial in improving the use of AI in Technology Education programme. In some institutions, lecturers lack adequate exposure to AI tools for teaching and learning. This gap prevents them from leveraging technologies like AI-powered grading systems, chatbots for student engagement, and predictive analytics for academic performance monitoring. Organisation for Economic Co-operation and Development OECD (2023) insists that teachers' professional development is one of the critical determinants of successful AI integration. Tertiary institutions must therefore invest in structured capacity-building programmes for lecturers, technologists and other staff involved in teaching and learning processes. These could take the form of workshops, online certifications, and international partnerships focusing on AI pedagogy. Educators who receive AI training will not only utilize AI tools into their teaching but will also serve as mentors to colleagues, fostering a culture of innovation within departments. Lecturer-related measures for improving the utilization of artificial intelligence in the Technology Education programmes include continuous professional development to improve lecturers' AI literacy, pedagogical skills, and confidence in utilizing emerging technologies into teaching and learning (UNESCO, 2023).

Further, the institution management has enormous role to play for improving the utilization of AI in implementing Technology Education curriculum for sustainable human capital development. This could be done through infrastructure improvement, monitoring and evaluation, and establishment of clear and context-specific institutional policies. Infrastructure and technological readiness form another significant aspect of improving AI utilization. Technology Education requires robust ICT infrastructure, reliable internet connectivity, functional learning management systems, and access to AI-powered software applications. Unfortunately, many tertiary institutions still struggle with epileptic internet connectivity, inadequate digital labs, and outdated hardware. As in National Information Technology Development Agency's (NITDA) Draft of National AI Strategy (2024) highlights, digital infrastructure is the backbone

of AI adoption in Nigeria. TETFund (2023) has also acknowledged that infrastructural inadequacies remain a major barrier to the effective digitalization of higher education. Addressing this challenge requires deliberate investments in AI-ready infrastructure such as cloud-based learning platforms, licensed AI tools for academic use, and accessible computing resources for students and staff.

Furthermore, monitoring and evaluation (M&E) is equally essential in ensuring that AI adoption translates into academic success. Tertiary institutions must establish mechanisms for tracking the effectiveness of AI initiatives in Technology Education programme. OECD (2023) highlights the importance of governance frameworks and data-informed policies in sustaining effective AI ecosystems in education. Another key measure for improving AI utilization in Technology Education is the establishment of clear and context-specific institutional policies that guide responsible AI adoption and utilization in instructional delivery. Eze & Okafor (2022) that government and institution management should constitute a committee that would develop strategies for implementation and monitoring of AI utilization in study programmes. Without such frameworks, the risks of academic dishonesty, educational ethical violations, and inequitable access could outweigh the potential benefits. This implies the need to adopt Senate-approved AI policies that regulate use in classrooms, emphasizing human-centered approaches that prioritize pedagogy over automation.

Moreover, the effective utilization of artificial intelligence (AI) in the implementation of Technology Education programmes for sustainable human capital development can be improved through deliberate curriculum redesign. The tertiary institutions regulatory bodies may provides regulatory guidelines for Technology Education programmes; however, these guidelines currently reflect limited explicit utilization of AI-related competencies. To address this gap, AI literacy should be systematically embedded into the curriculum through the introduction of modules such as AI Applications in innovations, AI Applications in teaching, Data Analytics for Managerial Decision-Making, and AI Ethics in Management. Such curricular innovations would align Technology Education programmes with global trends and prepare students for technology-driven environments (UNESCO, 2021). The anticipated outcomes of implementing these measures are substantial for students, lecturers, and institutions alike. Improved utilization of AI in Technology Education is expected to improve instructional delivery by enabling lecturers to adopt innovative, learner-centred teaching strategies that increase student engagement. Students would benefit from personalized learning experiences that accommodate diverse learning speeds and styles, thereby fostering inclusivity and equity. Furthermore, exposure to AI-driven simulations, predictive analytics, writing with assessment tools and decision-support tools would strengthen students' critical thinking and problem-solving skills, equipping them for contemporary workplace demands. Through redesigned assessment systems, academic integrity would be safeguarded, while graduates would emerge with relevant digital and AI competencies that improve employability and institutional competitiveness in the global education system (World Economic Forum, 2023).

In a related development, the utilization of Artificial Intelligence (AI) in the implementation of Technology Education curriculum faces several anomalies that hinder its effective adoption. One major challenge is infrastructural inadequacy, as many institutions, lack reliable internet connectivity, stable power supply, and modern ICT facilities required to support AI-driven tools (Okoye & Okwudili, 2021). High cost of acquiring, maintaining, and upgrading AI technologies also poses a barrier, especially in public tertiary institutions with limited funding (Agboola, 2020). Additionally, there exists a significant digital skill gap among Technology Educators and students, since many Technology Education instructors are not adequately trained to integrate AI in teaching and learning, while students often lack the digital literacy required to engage with AI applications in their respective programmes of study (Eze & Okafor, 2022).

In line with the above, it is the business educators that are charged with the responsibility of utilization of AI for the implementation of the programmes. The Technology Education programmes are taught by male and female lecturers also known as technology educators. Technology Educators are lecturers trained with the pedagogical and practical as well as theoretical knowledge of technology and vocational education disciplines. It has to be noted that the question of gender as a factor in perception and

utilization facilities regarding teaching-learning is a complex and controversial one (Ezeugwu & Obayi, 2023). Gender refers to the fact of being a male or a female. Gender represents the social-cultural expression of characteristics and roles associated with specific groups based on their sex, and sexuality, including societal expectations regarding the characteristics, aptitudes, and behaviors of both men and women (Willey, 2019). However, the difference in utilization of AI by different gender has not been as established. Sequel to all these anomalies discussed and gap in establishing gender impact on utilization of AI, the need arose to determine the measures for improving the utilization of artificial intelligence (AI) in the implementation of Technology Education programmes for Sustainable human capital development in tertiary institutions in Anambra State.

Statement of the Problem

Technology Education in Nigeria tertiary institutions, particularly in the Anambra, is faced with the urgent need to adapt to emerging technological innovations that are redefining teaching, learning, and employability. One of these emerging technological innovations in education is Artificial Intelligence (AI). Artificial Intelligence (AI) has become a powerful tool for improving instructional delivery, curriculum relevance, personalized learning, and academic performance across disciplines globally. However, despite its transformative potential, the utilization of AI in the implementation of Technology Education programmes for sustainable human capital development remains limited, fragmented, and largely experimental. Many tertiary institutions lack clear policies, adequate infrastructure, and competent human resources needed for effective AI integration into technology education pedagogy. In addition, challenges such as insufficient funding, poor digital literacy among both facilitators and students, unreliable internet connectivity, and lack of institutional support for AI-based innovations continue to hinder widespread adoption, hence the need for improvement.

Consequently, students in Technology Education programmes often graduate with inadequate exposure to AI-driven technological and business tools and analytical systems required for sustainability and global competitiveness, thereby undermining both academic success and employability. The researchers are worried on the quality of training provided to the students in the AI driven world and therefore the need to improve the utilization of AI in the implementation of the Technology Education Programmes for sustainable human capital development. The absence of structured measures for harnessing AI utilization also raises concerns about quality, credibility, equity, and assessment integrity in the learning process in digital era. This situation therefore, underscores the need to investigate the measures to improve the utilization of AI in Technology Education programmes so as to equip graduates with contemporary skills, promote academic excellence, and position the tertiary institution to meet competitive global standards in sustainable human capital development, hence the study.

Purpose of the Study

The general purpose of this study was to determine the measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State. Specifically, the study determined the:

1. lecturers'-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State.
2. Institution administration-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State.

Research Questions

The following research questions guided the study:

1. What are the lecturers'-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State?

2. What are the institution administration-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State?

Hypotheses

The following Null hypotheses tested at .05 level of Significance guided the study:

H₀₁: There is no significant difference between the mean ratings of male and female Technology Educators on lecturers'-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State

H₀₂: A significant difference does not exist between the mean ratings of male and female Technology Educators on the institution administration-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State.

METHOD

This study adopted a descriptive survey research design. A survey research design is a method of sociological investigation that uses questions based on statistical surveys to collect information about how people think and act (Nwaorgu, 2015). This design was adopted due to the polychotomous instrument used and the opinions of the Technology Educators were sought for. The area of the study was Anambra State, one of the states in South-East, Nigeria. The population for the study was 121 Technology Educators in two tertiary institutions offering technology education programmes in Anambra State. The entire population was used because of the sample size. The instrument used for data collection was a 25-item structured questionnaire developed by the researcher. The instrument was structured using a four-point rating scale. The instrument was face validated by the three experts, two of them, were drawn from School of Industrial Technical Education and one from Measurement and Evaluation Unit all from Federal College of Education (Technical), Umuze Anambra State. Cronbach Alpha was used to determine the reliability coefficient which yielded 0.79. This 0.79 coefficient is in-line with Uzoagulu (2013) that reliability index of 0.60 to 1 show that the instrument is highly reliable. Out of 121 copies of the questionnaire distributed 108 copies were properly filled and used for data analysis representing 89.25% return rate. Mean and standard deviation were used to answer the research questions and t-test was used to test the two null hypotheses at 0.05 level of significance at 106 degrees of freedom. Decisions on the research questions were made using the lower and upper limits of the mean based on a four-point scale. The standard deviation was used to determine the homogeneity or otherwise of the opinions of the respondents.

RESULTS

The results of the study are presented according to the research questions and hypotheses that guided the study.

Research Question One: *What are the lecturers’-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State?*

Table 1: Respondents’ mean ratings on the lecturers’- related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for Sustainable human capital development in tertiary institutions in Anambra State

S/N	Lecturers’-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development are;	Male N= 69		Female N= 39		Overall		Decision
		X ₁	SD ₁	X ₂	SD ₂	X _G	SD _G	
1	Regular training on AI tools for effective implementation of Technology Education programmes.	3.43	0.64	3.52	0.56	3.48	0.60	Agree
2	Personal development to improve AI teaching skills	3.31	0.55	3.30	0.49	3.30	0.52	Agree
3	Integrating AI-based simulations into Technology Education programme	3.26	0.55	3.28	0.49	3.27	0.52	Agree
4	Redesigning student assessments to ensure responsible use of AI tools	3.17	0.48	3.16	0.41	3.16	0.44	Agree
5	Requiring students to declare the extent of AI assistance in their assignments	3.40	0.56	3.42	0.52	3.41	0.54	Agree
6	Adopting process-oriented tasks to reduce misuse of AI tools	3.30	0.54	3.29	0.49	3.30	0.51	Agree
7	Partnering with industry for practical AI application opportunities	3.36	0.59	3.40	0.54	3.38	0.56	Agree
8	Provide after class AI guided learners support to students	3.22	0.73	3.26	0.71	3.24	0.72	Agree
9	Establishing communities of practice among lecturers to promote knowledge sharing in AI utilization	3.35	0.75	3.40	0.73	3.38	0.74	Agree
10	Incentives such as promotions or recognition should be given to lecturers who adopt AI-driven teaching methods	3.34	0.73	3.40	0.73	3.37	0.73	Agree
11	Planning and delivery of instructions with AI tools	3.25	0.71	3.28	0.70	3.26	0.71	Agree
	Cluster Mean/SD	3.31	0.69	3.34	0.52	3.32	0.55	Agree

Note: X = Mean; SD =Standard Deviation;

The analysis of data presented in Table 1 shows that the overall mean ratings range from 3.16 to 3.48 showing highly needed. This means that Technology Educators agree to the items as the lecturers’-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State. The overall cluster mean of 3.32 further confirms agreed. The low standard deviation of 0.55 indicates that the respondents have similar opinion to the items.

Hypothesis 1

There is no significant difference between the mean ratings of male and female Technology Educators on lecturers’-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State.

Table 2: Summary of t-test analysis of mean ratings of male and female Technology Educators on lecturers’-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State

Variables	N	t	df	Sig. (2tailed)	Mean Difference	Std. Error Difference	Decision
Male	69	0.357	106	.334	.21225	.57576	NS
Female	39						

NS= Not Significant

The result of t-test analysis in Table 2 shows that the t-value at 0.05 level of significance and 106 degree of freedom for the 11 items is 0.357 with a significant value of 0.334. Since the significant value of 0.334 is more than the 0.05 level of significance the null hypothesis is not significant. This means that there is no significant difference between the mean ratings of male and female Technology Educators on lecturers’-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State.

Research Question 2: *What are the institution administration-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State?*

Table 3: Mean ratings and standard deviation on the institution administration-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State

S/N	institution administration-related measures for improving the utilization of artificial intelligence (AI) include;	Male N= 69 X ₁	SD ₁	Female N= 39 X ₂	SD ₂	Overall X _G	SD _G	Decision
12	provision of institutional access to licensed AI applications	3.33	0.58	3.39	0.54	3.37	0.56	Agree
13	Establishing AI literacy support centers or clinics on campus	3.43	0.63	3.52	0.56	3.48	0.59	Agree
14	Introducing monitoring/evaluation mechanisms to track the effectiveness of AI	3.32	0.59	3.39	0.54	3.36	0.57	Agree
15	Universities should secure sustainable funding from TETFund in order to support AI integration	3.43	0.62	3.52	0.55	3.48	0.58	Agree
16	Collaboration with local businesses/fintech firms	3.28	0.63	3.38	0.56	3.34	0.59	Agree
17	Providing reliable internet connectivity for integrating AI tools	3.40	0.66	3.51	0.57	3.46	0.61	Agree
18	Universities should establish clear guidelines to regulate the ethical use of AI	3.42	0.66	3.51	0.57	3.47	0.62	Agree
19	Management must integrate AI utilization into the university’s strategic plan for teaching, learning/research	3.55	0.63	3.65	0.54	3.61	0.58	Strongly Agree
20	Adequate funding should be allocated by management to support AI-driven initiatives	3.33	0.61	3.38	0.54	3.36	0.57	Agree
21	University management should ensure the provision of modern ICT infrastructure necessary for AI	3.42	0.62	3.50	0.55	3.47	0.58	Agree

22	adoption Management should invest in licensed AI software and tools	3.38	0.58	3.41	0.53	3.39	0.56	Agree
23	Institutional management should support continuous training programmes for lecturers on AI pedagogy and applications	3.25	0.54	3.27	0.49	3.26	0.51	Agree
24	Institutional management should establish dedicated committees to oversee AI integration	3.37	0.58	3.40	0.53	3.39	0.55	Agree
25	Institutional leaders should organize periodic workshops and conferences to promote awareness on AI	3.15	0.48	3.15	0.41	3.15	0.44	Agree
	Cluster Mean/SD	3.36	0.60	3.43	0.53	3.39	0.57	Agree

Note: X = Mean; SD =Standard Deviation;

The data presented in Table 3 indicates that item 19 had overall mean rating of 3.61 indicating strongly agree. The remaining 13 items overall mean ratings range from 3.15 to 3.48 depicting agree. This shows that the items are the institution administrative related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State. The overall cluster mean rating of 3.39 indicates agree. The low standard deviation of 0.57 shows that the respondent's opinions do not differ remarkably to the itemized.

Hypothesis 2

A significant difference does not exist between the mean ratings of male and female Technology Educators on the institution administrative related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State.

Table 4: Summary of t-test analysis of mean ratings of male and female Technology Educators on the institution administration -related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State

Variables	N	t	df	Sig. (2tailed)	Mean Difference	Std. Error Difference	Decision
Male	69	.719	106	.264	.34595	.63065	NS
Female	39						

NS= Not Significant

The result of t-test analysis in Table 4 shows that the t-value at 0.05 level of significance and 106 degree of freedom for the items is 0.719 with a significant value of 0.264. As the significant value of 0.264 is more than the 0.05 level of significance the null hypothesis is not significant. This means that there is no significant difference with respect to the items on the mean ratings of male and female business educators on the institution administrative related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State.

DISCUSSION

The findings of the study in research question one depicted the lecturers' related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions. The lecturers' related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development includes; regular training on AI tools for effective implementation of Technology Education programmes, personal improvement on AI pedagogy, integrating AI-based simulations into Technology Education courses, redesigning student assessments to ensure responsible use of AI tools, requiring students to declare the extent of AI assistance in their assignments, adopting process-oriented tasks,

partnering with industry for practical AI application opportunities, engaging the students AI platform after school, planning instruction with AI tools among others. This showed that improving the utilization of AI in tertiary institutions, the identified lecturers related measures need to be considered. The findings were in line with OECD (2023) that lecturers' professional development is one of the critical determinants of successful AI integration. The implication of adopting the identified measures was that the Technology Educators who receive AI training will not only integrate AI tools into their teaching but will also serve as mentors to colleagues, fostering a culture of innovation within departments. The result of null hypothesis showed that there was no significant difference between the mean ratings of male and female Technology Educators on lecturers' related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State.

Further, the findings of the study according to research question two showed the institution administration measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State. Among the identified institution administrative measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes include; provision of institutional access to licensed AI applications, establishing AI literacy support centers or clinics on campus, introducing monitoring/evaluation mechanisms to track the effectiveness of AI, collaboration with local businesses/fintech firms, providing reliable internet connectivity for integrating AI tools, institution management should ensure the provision of modern ICT infrastructure necessary for AI adoption and institutional leaders should organize periodic workshops and conferences to promote awareness on AI. These measures are needed to improve the utilization of AI in the implementation of Technology Education programmes. The findings were in consonant with Eze & Okafor (2022) that government and institution management should constitute a committee that would develop strategies for implementation and monitoring of AI utilization in study programmes. In a related development, OECD (2023) opined that institution management should support continuous training programmes for lecturers on AI pedagogy and applications. Based on the findings, there is need to adopt the identified institution administration measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development. Also, the result of null hypothesis showed that there was no significant difference between the mean ratings of male and female Technology Educators on institution administration related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State. This means that gender of the respondents had no influence on the identified institution administration-related measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development.

CONCLUSION

This study determined the measures for improving the utilization of artificial intelligence (AI) in Technology Education programmes for sustainable human capital development in tertiary institutions in Anambra State. Based on the data analysis and findings, it is evident that both lecturers and institution management measures play a critical role in ensuring that AI tools are optimally utilized into teaching, learning, and administrative processes for sustainable human capital development. Based on the findings, the study concludes that to achieved improved utilization of Artificial Intelligence in Technology Education programmes in Anambra State depends largely on a synergistic effort between lecturers and institution management. Lecturers need to embrace AI technologies as innovative tools for content delivery, assessment, and learner engagement, while management must create a supportive environment through funding, policy formulation, and infrastructural development. When these elements are effectively combined, the utilization of AI in Technology Education can lead to improved instructional quality, greater student motivation, and higher academic performance for sustainable human capital development.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

1. Technology Educators should ensure that instructional planning, presentation and assessment are carried out with AI tools.
2. Technology Educators should be provided with in-service training on the use of AI in preparing and assessment of students learning as digital age demand.
3. The tertiary institution administrators should develop policies and framework that will enable the educators to build their capacity in the use of AI in teaching the students.
4. The tertiary institution management must integrate AI utilization into the institution's strategic plan for teaching, learning/research.
5. The tertiary institution management should ensure the provision of modern ICT infrastructure necessary for AI adoption.

REFERENCES

- Agboola, O. G. (2020). Challenges of adopting emerging technologies in Nigerian higher education. *Journal of Education and Practice*, 11(24), 45–53.
- Alio, A. N., Mbah, C. O. & Ideh, N. F. (2023). Re-engineering TVET programme in achieving sustainable economic development of the youths for transnational crime reduction in the South-East States of Nigeria. *African Amani Journal* 9 (2) 19-35.
- Eke, D. O. (2023). Artificial intelligence and academic integrity in higher education. *Ethics and Information Technology*, 25(1), 1–12.
- Eze, T. I., & Okafor, C. A. (2022). Teachers' preparedness for integrating artificial intelligence in business education. *Nigerian Journal of Business Education*, 9(1), 101–112.
- Ezeugwu, D. U. & Obayi, A. U. (2023). Principals gender as a factor in the utilization of education management information system technology in Enugu State Secondary schools. A paper presented at the 2nd annual national conference on global trends and challenges in education: the Nigeria perspective, held at the college of education, Michael Okpara University of Agriculture, Umudike, Abia State. 15-18 November
- Felix, J. & Webb, L. (2024). Use of Artificial intelligence in education delivery and assessment. *UK Parliament Post-Documentation*.
- National Board for Technical Education. (2020). *National vocational qualifications framework implementation guidelines*. NBTE.
- National Information Technology Development Agency (NITDA). (2024). *Nigeria's National Artificial Intelligence Strategy (NAIS)*. Abuja: Government of Nigeria.
- Nworgu, B.G. (2015). *Educational Research; Basic issues and methodology*. Nsukka; University Trust Publishers.
- Obi, M. N. (2022). Ethical Considerations in the Use of Artificial Intelligence in Nigerian Education. *Ethics in Education Quarterly*, 38(1), 45-62.
- Okoye, P. U., & Okwudili, C. C. (2021). ICT infrastructure and the challenges of implementing innovative teaching in Nigerian universities. *International Journal of Education and Development*, 6(2), 77–85.
- Organisation for Economic Co-operation and Development OECD. (2023). *Digital Education Outlook 2023: Towards an Effective Digital Education Ecosystem*. Paris: OECD Publishing.
- Organisation for Economic Co-operation and Development OECD. (2021). *AI in education: Challenges and opportunities*. Paris: OECD Publishing.
- Tertiary Education Trust Fund (TETFund). (2023). *Executive Secretary's speech on 2024 intervention guidelines*. Abuja: TETFund.
- United Nations Educational, Scientific and Cultural Organization UNESCO. (2016). *Strategy for technical and vocational education and training (TVET) 2016–2021*. UNESCO Publishing