

MANAGING THE INTEGRATION OF ARTIFICIAL INTELLIGENCE IN VOCATIONAL EDUCATION IN NIGERIAN PUBLIC SECONDARY SCHOOLS FOR NATIONAL DEVELOPMENT

By

Okonkwo, Bernadette. Ngozi. (Ph.d)

School of General Education

Department of Educational Foundations

Benjamin Uwajumogu (State) College of Education Ihitte Uboma, Imo State

zikaokonkwo@gmail.com (08033779470)

Abstract

This study on managing the integration of artificial intelligence in vocational education in Nigerian public secondary schools for national development stems from the researcher's interest to examine teacher's awareness and readiness on the integration of artificial intelligence in vocational education in Imo state secondary schools. This study adopted a descriptive survey research design. Two research questions guided the study. The population of the study was 6,429 made up of 285 principals and 6,144 teachers in the public secondary schools in Imo State. A sample size of 150 respondents comprising 120 teachers and 30 principals was drawn from secondary schools in Imo state using clustered random sampling technique. The instrument for data collection was a 21-item questionnaire based on the 4-point Likert rating scale. The instrument was face validated and a reliability co-efficient of 0.88 was obtained using the Cronbach Alpha reliability of estimate of internal consistency. The data generated was analyzed with descriptive statistics of frequency tables, and mean scores. The study found that teacher readiness for the adoption of artificial intelligence in the teaching of vocational education is quite low. In addition, it was found that the infrastructures and facilities for the integration of artificial intelligence in vocational education are inadequate and recommended that State Education Management Board (SEMB) should organize regular in-service training and workshops to enable them acquire the needed competence to integrate AI in the teaching of vocational education.

Key words: artificial intelligence, vocational education, teachers and national development.

Introduction

The adoption of artificial intelligence (AI) in human activity has led to phenomenal and far-reaching changes in all spheres of life. AI has become a game-changer which has brought about innovative solutions to all sectors of our social and economic life. In the sphere of education, the introduction of AI has been described as a revolutionary development in teaching and learning. Therefore, managing this important digital resource is crucial to the realization of educational objectives especially in the teaching and learning of vocational subjects at the secondary school level.

Teachers are very crucial to the implementation of educational objectives. For any educational objective to succeed, teachers must be available in the right quality and quantity. Thus for AI to be fully integrated in vocational education, the teachers to drive the process must not only be qualified but must also be adequately sufficient to drive the process. They must be professionally qualified and motivated to make the required input. In order to adequately manage the integration of vocational education in Nigerian public schools, the quality and expertise of the teachers to drive the process must be monitored and evaluated on a regular basis. Although the integration of AI in Nigeria's secondary school is still in its embryonic stage, the immense benefits realizable in its

adoption and the need to evaluate readiness/ awareness level of the human resources required to drive the process constitute enough stimulus not only to provoke research interest but to also encourage robust conversations on the concept in academic and policy making circles in Nigeria. In the present era in which technology has become an important resource for success, the need for an AI compliant work force has been brought to the fore in the spheres of education. It is expected that teachers and students would embrace the technological imperatives of artificial intelligence to make them relevant in the present and future labour market. Investment in education is geared towards improving the quality of life of the citizenry by equipping them with the necessary tools to increase their productivity and improving their standard of living. Vocational education seeks to empower citizens with the necessary skills and competencies to live a meaningful life and having a means of livelihood by filling the identified gaps in new technologies associated with the labour market. Nowadays, the increasing rate of unemployment among young people has necessitated a need to expose them to skills which will make them job creators rather than job seekers. The aim of vocational education is to unlock the potentials in our youth in order to make them active participants in the labour market. AI has been considered useful not only to teachers and students but also for the planning and management of educational objectives. The management and realization of secondary education goals depends on the availability of human and material resources to realize set objectives. Artificial intelligence has been described as one of the tools that can be deployed for effective management of secondary school education. Nevertheless, the planning and management of public secondary schools seem not to be at its peak because of identified challenges which constrain the full utilization of artificial intelligence in every facet of the educational delivery process. This demands for research efforts to unravel the weak link in the process of integrating artificial intelligence with vocational education in order to achieve national development goals. Unfortunately, there is a paucity of research efforts on the level of AI utilization and compliance at the secondary school level. This study therefore is an attempt to close this gap in research efforts.

Statement of problem

In this 21st century in which technological advancement has reached its very peak, many secondary schools in Nigeria are still lagging behind in embracing artificial intelligence technologies which have led to a phenomenal paradigm shift in teaching and learning globally. In the present dispensation, many Nigerian secondary schools are yet to embrace the new digital platforms which has been imbibed by the educational system of advanced countries of the world. In the same vein, our teachers are still using the conventional face-to face method of instructional delivery which has been found deficient in many aspects. This suggests that our teachers are yet to fully embrace AI which is a revolutionary and emerging technology which seeks to make the teacher's work easier. It has been suggested that the incorporation or adoption of AI can be used to revolutionize or transform vocational education system especially at the secondary school level where overcrowded classrooms, high student/teacher ratio, lack of personalized teacher engagement and other challenges have led to drawbacks in teaching and learning. But the question remains whether our teachers are aware and prepared to adopt AI in teaching vocational education in our secondary schools. It is worthy of note that several studies indicate the positive impact of AI integration in vocational education in Nigeria secondary schools but the benefits inherent in the adoption of AI in vocational education is yet to be seen among secondary school leavers in Nigeria. However, the benefits may not be realized without paying attention to the teachers to implement the adoption of AI in vocational education in Nigerian secondary schools.

Objectives of study

1. To ascertain the AI readiness of teachers in secondary schools to adopt artificial intelligence in teaching vocational education for national development.
2. To examine the availability of digital infrastructure in secondary schools in Imo state to drive the adoption of artificial intelligence in secondary schools for national development.

Research questions

1. How prepared are teachers to facilitate the adoption of artificial intelligence in teaching vocational education in public secondary schools in Imo State?
2. What digital infrastructures are available to drive the adoption of artificial intelligence in public secondary schools in Imo state?

Artificial Intelligence (AI)

Globally, AI has become a buzzword in all spheres of human activities such as education, finance, engineering, accounting, banking, agriculture etc. Essentially, AI refers to the configuration of computer systems and machines which can perform tasks which ordinarily need human intelligence to execute. This definition shares striking similarity with that of Ogunode and Ukozor (2023) who defined AI as programs designed with human-like intelligence and structured in forms of computer, robot, or other machines to aid in provision of any kind of service or tasks to improve social economic and political development of the society. It is worthy of note from this definition that AI is capable of leading to positives outcomes in educational service provision.

Nevertheless, Alagbe (2023) took the role of AI further by defining it as the ability of a computer system or machine to operate with abilities that are similar to the human mind in terms of providing solutions through decision making, responding to request from members of the public and performing repetitive tasks. Therefore, AI can be referred as digitally designed systems, packages and applications which are run on computers and machines to execute assignments and tasks which are characteristic of those executed by human intelligence. This view was corroborated by (Ukala, Ukala & Chukwuemeka, 2025) who observed that AI is the replication of human intelligence in machines that are programmed to think and learn like humans, performing tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation. This definition simply means AI is the configuration of computer systems to operate like the human brain. Therefore, AI can be seen as a branch of Information Communication Technology which uses computer configuration and software applications in the execution of tasks which require human intelligence. This not suggest the complete isolation of the human brain in the scheme of things rather it represents a shift from depending solely on the human brain. This explains why Swargiary (2024) defined AI is an innovative generative language system capable of engaging in sophisticated, human-like conversations. This process is made possible through machine learning and processing of data input to achieve its predetermined purpose. In the field of education AI is expressed in intelligent tutoring systems, chat GPT, intelligent tutoring robots, interaction between humans and computers, virtual classrooms, automated grading systems, smart school, Virtual Reality (VR) and Augmented Reality (AR) technologies,

The implication from these definitions is that for AI integration /adoption to take place successfully, the technological knowledge and facilities must be possessed by the users. Invariably, this means teachers and students must be well versed in the field of computer technology and also have access to the necessary digital infrastructure. However, Osika and Essien (2014) found that technological equipment and facilities such as computers, projectors, and other ICT accessories are grossly inadequate in Nigerian secondary schools. This view was also corroborated by Obasi (2018) who found that the level of provision of technical vocational education and training schools for human capacity building is very low in Imo State. These findings simply means that without adequate infrastructural support in terms hardware and software and digital competence of the users the potential of integrating AI in vocational education will be diminished. Nigeria, however, faces considerable barriers in integrating AI in the teaching of vocational education even though evidence suggests that AI can bridge workforce skill gaps, improve employment opportunities, and support national development goals (Stephen, 2021). Nevertheless, effective and judicious use of AI technologies depends largely on the readiness of teachers' and willingness to adopt those

technologies in influencing pedagogic experiences (Adedokun-Shittu & Shittu, 2020). This view was reinforced by the study of Gupa et.al(2025) who found that AI has transformative potential for Nigeria's education system but requires investments in infrastructure, teacher training, and strong policy frameworks.

Vocational education and national development

Education is central to the development of any nation because it helps to train and equip the human resources that will transform the natural resources of a nation into goods and services which will make life meaningful. Without a trained and skilled citizenry, the natural resources of a nation will remain in a state of inertia or dormancy. This draws attention to the importance of education as the backbone of national development. The assumption here is that the level of development of any society is correlated with the skills and intellect of its citizens. This is in alignment with the National Policy on Education (2013) which describes education as an instrument “per excellence” for national development. In this context national development refers to the ability of a nation to improve the lives of its citizens socially, economically and politically. This implies that a developed nation is that which gives education of the citizens priority in order to have socially responsible in addition to having a strong economy and stable political system.

It is worthy of note that technology has become a critical factor of economic growth and social development and it is through its application that the natural resources of a country could be transformed into goods and services for better quality of life of the majority of the country's citizens. The argument here is that education makes the citizens of a nation functional and equipped to conquer not only ignorance and disease but also possess the ability to harness the available natural resources in order to improve their standard of living..

Vocational education is a multidisciplinary and pragmatic sphere of study devoted to equipping individuals with the necessary technical and literary skills which will enhance their ability to be relevant and functional in the society. This role of vocational education makes it a sine qua non for national development. According to the National Policy on Education (2013) vocational education is the form of education which is obtained at the technical college equivalent to the senior secondary education but designed to acquire practical skills, basic scientific knowledge and attitude required as craftsmen and technicians at sub-professional level. This definition portrays vocational education as primarily concerned with the acquisition of practical skills in preparation for the labour market. This was buttressed by Pautler (2009) when he asserted that vocational education is charged with preparing people for work. The objectives of technical and vocational as stated in the National Policy on Education (2013) are:

1. To provide trained manpower in the applied science and technology and business particularly at craft, advanced craft and technical level.
2. To provide the technical knowledge and vocational skills necessary for agriculture, commercial and economic development.
3. To give training and impart the necessary skills to individual who shall be self-reliant economically.

In this regards, secondary school students are exposed to subjects such as practical agriculture, basic technology, business studies, home economics, local crafts, computer education, cultural and creative arts, music etc. are taught at the secondary school level. Despite the importance of vocational education, it is yet to be given the prime attention it deserves in Nigeria. This view was corroborated by Obasi (2018) who found out that the level of provision for vocational education and training schools for human capacity building is very low in Imo State.

Secondary school teachers and vocational education

Secondary education is the education received after primary school before the tertiary levels. Technically related subjects are included in the school curriculum. This include technical drawing, general metal work, basic electricity, auto mechanics, wood work, home management, building

construction and food and nutrition. In addition trade and entrepreneurial subjects are included. The aim is to give students a spectrum of vocational skills to choose from to enable them acquire functional skills for their personal goals and national development. In order to achieve this vocational education objectives, teachers are expected to play a very crucial role.

AI and Infrastructural deficit

Most studies have identified the drawbacks to the integration of AI in the teaching of vocational education. Vocational education has a strong inclination on practical training which requires appropriate tools and equipment for practice. AI can bridge the gap through the use of visuals and simulations for training. Similarly, AI adoption in the teaching of vocational education is dependent on the provision of basic infrastructures and facilities such as adequate power supply, stable internet connectivity, standard laboratories, training workshops etc. However, the Nigerian reality is characterized with perennial challenges such as inconsistent internet connectivity, poor electricity supply, high costs of digital tools and socio-economic inequality that raises critical questions about the feasibility and exclusivity of AI adoption (Adedokun-Shittu & Shittu, 2020). This is in consonance with the observation of Nwafor & Ololube (2024) that many schools still struggle with basic digital integration, making it difficult to implement advanced AI solutions. In the same vein, Sunday-Cookey & Nwankwo (2025). asserted that the efforts of school administrators in Nigeria to use artificial intelligence (AI) to improve educational development is often frustrated by unstable internet connection and an unpredictable power supply. Therefore, the adoption of AI in Nigerian secondary schools faces several challenges of infrastructural and facilities deficit.

Methods

This study employed a descriptive survey research design because it is appropriate for the collection of data from respondents on the variables under investigation.

The population of this study comprised 285 principals and 6114 teachers based on data obtained from the Imo State Education Management Board. A sample size of 150 respondents comprising 120 teachers and 30 principals was drawn from secondary schools in Imo state using clustered random sampling technique to ensure balance and equal chances of selection. The instrument used for data collection was a structured 21-item questionnaire based on a 4-point Likert rating scale (Strongly Agree(SA) = 4; A-Agree (A) = 3; Disagree (D) = 2; SD-Strongly disagree (SD) = 1. The instrument was titled **Questionnaire to Evaluate Teachers Preparedness to Adopt AI in Vocational Education in Imo State**. (QETPAIVEIS). The instrument was subjected to face validity and the reliability co-efficient of 0.88 obtained using the Cronbach alpha reliability of estimate of internal consistency was considered adequate. Two research questions guided the study and mean scores of 2.50 was used as a benchmark to estimate the responses to the research questions. In this regards, statements with mean score of 2.50 and above were regarded as agreed and accepted, while those with mean score of less than 2.50 were regarded as disagreed and not accepted.

Results

Responses obtained were presented and analysed using frequency tables to address the research questions.

Research question 1: How prepared are teachers to facilitate the adoption of artificial intelligence in teaching vocational education in public secondary schools in Imo State?

Table 1: Mean scores of principals and teachers on the readiness of teachers to integrate artificial intelligence in the teaching of vocational education in Imo state secondary schools.

Item Statement		Principals Responses		Teachers Responses	
S/N	Teachers readiness to adopt AI	$\bar{X}$	Remark	$\bar{X}$	Remark
1.	Teachers have the skills to apply AI-powered tools (e.g., ChatGPT, AI graders) in teaching.	1.65	Disagree	1.79	Disagree
2.	Teachers can undertake automated assessment of vocational education students learning	2.23	Disagree	2.07	Disagree
3.	Our vocational education teachers have the basic qualification to integrate AI in instructional delivery	2.65	Agree	2.86	Agree
4.	Virtual and intelligent tutoring are applicable to teach students in my school	1.87	Disagree	1.77	Disagree
5.	Vocational education teachers are exposed to regular in-service training on artificial intelligence platforms	2.40	Disagree	2.33	Disagree
6.	Teachers in my school are conversant with AI powered Apps such as Skype, Edmodo, and Google Classroom .	2.39	Disagree	2.48	Disagree
7.	There is provision for Automated Assessments of vocational education students in my school	2.23	Disagree	1.67	Disagree
8.	My school participates in AI workshop and seminar regularly	2.41	Disagree	2.47	Disagree
9.	Teachers apply Adaptive Learning Platforms (ALP) to teach vocational education	2.45	Disagree	2.14	Disagree
10	Teachers have access to laptops and digital devices such as android and I-phones	2.97	Agree	3.12	Agree
11	Teachers have access to a digital library in my school	2.11	Disagree	1.43	Disagree
12	Teachers can deliver their classes and assignments to students online	2.01	Disagree	2.33	Disagree
13	There is adequate funding to support the integration of AI in vocational education.	2.17	Disagree	1.31	Disagree
14	Vocational education teachers are regularly exposed to AI platforms	1.26	Disagree	1.38	Disagree
15	Assessments of vocational education students are automated	1.35	Disagree	2.22	Disagree
16	Vocational education students are exposed to AI-driven simulations during training.	2.34	Disagree	2.07	Disagree
17	Teachers have adequate practical training on AI technologies	2.41	Disagree	1.58	Disagree
Pooled mean		2.17		2.06	

Data on table 1 reveals that mean scores on item 1 and 2 have 1.65 and 2.23 for principals while that of teachers had mean scores of 1.79 and 2.07 respectively. This simply means that teachers lack the skills to apply AI powered tools and could also not undertake automated assessment of vocational education students. The mean scores of by principals and teachers respectively indicate that principals and teachers are of the opinion that vocational education teachers have the basic qualification to integrate AI in teaching. However, item 17 indicate that the teachers do not have adequate practical training on AI technologies. This reflected in the mean scores of 2.41 and 1.58 for principals and teachers respectively. Items 12-16 also came up with low mean scores for principals and teachers respectively. The pooled mean for principals 2.17 is while that of teachers is 2.06 respectively.

On item 10 principals and teachers had mean scores of 2.97 and 3.12 respectively. These mean scores were above the benchmark score of 2.50. This means that principals and teachers were of

the opinion that teachers have access to laptops and digital devices such as android and I-phones. Items 4-9 and items 11-17 in table 1 all had low mean scores below the 2.50 benchmark. Item 4(1.87),5(2.40),6(2.39), 7(2.23) 8(2.41),9(2.45) for principals and 1.77,2.33,2.48, 1.67, 2.47 and 2.41 for teachers reveal that artificial intelligence tutoring and learning are hardly applicable to teach students . in addition it revealed that vocational education teachers are not exposed to in-service training/workshops and seminars on artificial intelligence.

Research question 2.What digital infrastructures are available to drive the adoption of artificial intelligence in public secondary schools in Imo state?

Table 2:Mean scores of principals and teachers on the digital infrastructures available to drive the adoption of artificial intelligence in public secondary schools in Imo state.

Item Statement		Principals Responses	Teacher: Respons	
S/N	Availability of digital infrastructures to adopt AI	$\bar{X}$	Remarks	$\bar{X}$
18	Classrooms are equipped with up-to-date technology that supports AI integration.	2.01	Disagree	1.97
19	My school has stable internet connectivity for AI powered teaching and learning.	2.15	Disagree	2.06
20	My school has a stable power supply to operate AI technologies.	2.31	Disagree	2.28
21	Our vocational education workshops and laboratories are well-equipped with digital equipment	2.19	Disagree	2.12
Pooled mean		2.16		2.10

Data on table 2 on the digital infrastructures available to drive the adoption of artificial intelligence in public secondary schools in Imo state reveal a consensus between principals and teachers that classrooms are not equipped with up-to-date technology to support AI integration, there is no stable internet connectivity and power supply, while vocational education workshops and laboratories are not well-equipped with digital equipment. This is reflected in low mean scores on items 18-21. This can be seen in the low mean score for principals 18(2.01), 19(2.15),20(2.31),21(2.19) and low mean scores for teachers:18(1.97) 19(2.06) 20(2.28) 21 (2.12). based on table results, the pooled mean for principals is 2.16 while that of teachers is 2.10 respectively.

Discussion of findings

The findings of this study indicate that the level of readiness of teachers to adopt artificial intelligence in the teaching of vocational education subjects is quite low. This could be attributed to the fact that the awareness of the potentials of AI is yet to be realized at the secondary school level in Nigeria. Apart from the possession of android phones and laptops, teachers in Imo state scored low in many parameters used to assess their readiness. Perhaps this is due to a lack of concise education policy within the state to ginger efforts towards the implementation of the integration of artificial intelligence in the teaching of vocational subjects. This finding is in consonance with the study of Obasi (2018) who found that the level of provision of technical vocational education and training schools for human capacity building is very low in Imo State.

Furthermore, this study revealed that digital infrastructures and facilities to boost the

implementation of AI- powered pedagogical experiences by teachers and students are inadequate or lacking in Nigerian secondary schools. This finding is supported by the finding of Osika & Essien (2014) who found that technological equipment and facilities such as computers, projectors, and other ICT accessories are grossly inadequate in Nigerian secondary schools,. This finding is also in line with the finding of Ogunode &Abiodun (2023), who stressed infrastructure and funding as systemic barriers in in Nigerian secondary schools.

Conclusion

The implementation of the objectives of vocational education can only be effectively attained through the management of human and material resources. Thus, the teachers to drive the process in secondary schools must be ready to utilize an emerging technological resources such as Artificial Intelligence. Artificial intelligence holds a lot of potentials and prospects for the the teaching of vocational education in Nigerian secondary schools. Teachers are expected to be well prepared to ensure its success. But the results of this research shows that the adoption of artificial intelligence in the teaching of vocational education in secondary schools in Imo state is on the low side as the teachers fall below average on key indices and parameters of readiness to ensure its success. Likewise, the facilities and infrastructures that will support a robust implementation of the integration of artificial intelligence in the pedagogical experiences of teachers of vocational education are unavailable. This requires a renewed effort by the stakeholders in the educational system to address the challenges in the integration of AI in the teaching and learning process in order to promote national development.

Recommendations

Based on the findings of this study, the following recommendations are offered:

1. State Education management Board (SEMB) should organize regular in-service training and workshops to enable them acquire the needed competence to integrate AI in the teaching of vocational education.
2. The government and concerned stakeholders should increase investment in the provision of AI related infrastructures and facilities such as stable internet connectivity and stable power supply to facilitate the usage of artificial intelligence facilities in secondary schools for the teaching of vocation education..

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