

Utilization of Emerging Digital Technologies for Achieving the Sustainable Development Goals in Technical Colleges in Anambra State

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Abstract

The study determined the extent of utilization of emerging digital technology in technical colleges for achieving the sustainable development goals in Anambra State. The study was guided by one research question and two null hypotheses. The population used for the study was 186 technical teachers 10 accredited technical colleges in Anambra State. A census survey design was adopted for the study. The instrument used for data collection was 15-item structured questionnaire that addressed the research purpose. The items were structured in four-point rating scale. The instrument was validated and the reliability of the instrument was determined using Cronbach Alpha which yielded 0.75. Out of 186 copies distributed, 179 copies were returned giving 96.24% return rate. Mean, standard deviation and t-test statistics were the statistical tools used in data analysis. Based on the data analysis, the study identified low extent of utilization of emerging technologies in teaching vocational skills subjects in technical colleges in Anambra State. Based on the findings of the study, recommendations were made among which include: technical teachers should utilize the available emerging technologies in preparing lesson, delivering teaching and conducting practical; and government should provide resources to enable teachers to improve their level of utilization of emerging technologies in teaching technical subjects in the schools.

Key Words; Emerging Technologies, Digital Technologies, Technical Colleges and Sustainable Development Goals

Introduction

The attainment of sustainable development goals in industry, innovation and infrastructure (both human and physical) depends on the skills and knowledge of human resource that make up the labour force in the nation. The society today is driven by the digital skills and knowledge resulting from the emerging technologies. Also, the innovation in science and technology, exploration, experimentation and development in the 21st century require that attention be directed to building a knowledgeable and skillful workforce in all areas of emerging

technologies. Emerging technologies enable people to have access to information independently, acquire new research skills and work with modern technological facilities, not only within the classroom but also across all works of life. According to Mormah and Bassey (2021), emerging technologies are technologies whose development and practical applications are new and largely unrealized. Emerging technologies are capable of changing the status quo. These technologies have been a major driver for realizing the objectives of education, research and productive activities.

Emerging technology is characterized by radical novelty, relatively fast growth, coherence, prominent impact, uncertainty and ambiguity. It refers to innovations that are in the early stage of development and adoption and have the potential to significantly impact various industries or aspects of society. Emerging technologies include innovations such as educational technology, information technology, social media, nanotechnology, cloud computing, industry 4.0, blockchain, virtual reality, biotechnology, robotics, artificial intelligence (AI) among others. Emerging technologies are those technical innovations which represent progressive development within the field for competitive advantages. This new technology is found in all areas of human life including education evidence in the use of Information and Communication Technology (ICTs) tools in teaching (Naz and Murad, 2017).

The 21st century classroom requires a new face of teachers with an ICT-compliant status and mindset to support the teaching and learning processes. Emerging technologies bring fundamental changes to the lives of 21st century learners, who are the most frequent users of emerging technologies and online service (Organization for Economic Cooperation and Development, OECD, 2016). To key into global best practices in education, FRN (2013) stated that, teaching and learning should be activity-based, learner-centered and experimental as well as Information and Communication Technology (ICT) supported. The emerging technology concepts in education include the internet back-bone as well as other electronic media devices and facilities that ensure e-learning. Its application covers the use of broadband desktop, laptop, tablets, smartphones and other hand held devices, wide range of electronic technology devices such as radio, cassette tapes, audio streams, downloadable packages, internet services, television, Ipads, interactive boards etc. The teachers' application of these in teaching and learning situation would improve the quality of teaching in digital age. Oluka, Odeluga and Mbah (2021) opined that 21st century learners need emerging technology in order to make the teaching-learning activities attractive and learner centred. In teaching the students in technical colleges, emerging technologies are equally needed to provide the students with state of arts facilities and skills for modern industrial development.

Technical colleges are post primary education programme designed to train craftsmen and master craftsmen in different vocational/career and technical skill areas. Mbah (2016) and Okolie, Igwe and Elom (2019) stated that technical college programmes are aimed at training intermediate

workforce with relevant skills for employment in facilities that machines, electrical, electronics control techniques and materials. Technical colleges are vocational training institutions with the objective of training craftsmen and master craftsmen that can use tools and materials properly in production and service setting.

Further, technical colleges in Nigeria are designed to develop abilities, understanding, work habits and appreciation encompassing knowledge, skills and information needed by workers to enter and make progress in employment on a useful and productive basis. At this technical college level, occupational-specific education is provided to students through technical education instructional approaches. The curriculum of technical colleges (TCs) focus on crafts, engineering trades and technical skills (Okolie, Igwe and Elom, 2019) and this curriculum require the use of emerging technologies for its implementation to achieve the desired objectives in the learners. The application of emerging technologies in the trade subjects would facilitate capacity building of ICT competent craftsmen and master craftsmen from technical colleges. Amongst the trades offered to students in Nigeria TCs include Bricklaying, Carpentry, Plumbing, Painting, Motor Vehicle Repair and Maintenance, Air-Condition and Refrigeration, Radio and Television Maintenance, Machining, Welding and Fabrication and Home Economics. The trades are properly planned to equip learners to understand skills to be employable in specific occupational area. Poor implementation of technical colleges programmes according to Akegbejo (2016) have hindered the socio-political, technological and economic development of the Nigeria society and more importantly in ICT based environment.

In recent times, technical colleges like other educational institutions are facing a daunting task of using digital and emerging technology such as to teach their students. Digital technology are electronic tools, system, devices and resources that generate, store or process data. Well known example include social media, online games, multimedia and mobile phones. According to Victoria (2015) digital technologies are referred to as the use of advance and communication technology to collect, store, analyze and share physical information and market information in each link of the product value chain, providing important technical support for innovation in various field. It is the combination of digital technology, e-content and instructional strategies to support teaching and learning activities and tasks online. According to Olaniyi (2022) digital teaching and learning is any type of teaching and learning that is accompanied by digital technologies or by pedagogical approaches that use the technology effectively. Digital technologies are supposed to be utilized by teachers in technical colleges in teaching their students in digital era. Among the emerging technologies relevant in technical college instructional delivery includes cloud computing, virtual classroom, industry 4.0 technology, computer diagnostic tools, computer numeric control machine, audaces 360 technology application and Internet of Things (IOT) technology among others.

Furthermore, it is pertinent to state that the utilization of these emerging technologies is necessary for achieving the sustainable development goals in practical skill training of students for self-employment. Education is for empowerment but technical and vocational education offered in technical colleges empower the students to be productive, creative and self-employed. The application of emerging technology in technical colleges would make the students to be occupationally relevant in the use of modern tools and machines in the world of work. Therefore, becoming sustainable in their work for paid and self-employment. The sustainability of the human capital development is critical in achieving the sustainable development goals. The sustainable development goals (SDGs) or global goals are a collection of seventeen interlinked objectives designed to serve as a share blueprint for peace and prosperity of people and planet. According to Onoh (2014) the sustainable development goals are; no poverty; zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities; responsible consumption and production, climate action; life below water, life on land; peace, justices and strong institutions and partnerships for the goals. The SDGs emphasize the interconnected environment, social and economic aspects of sustainability at their centre. It is important to note that there are cross-cut issues and synergy between the different goals and sustainable self-employment that helps in achieving the goals.

Sustainable self-employment is geared toward developing a profitable career of independent from paid and government provided employment. It is based on the believe that self-employment is one of the key solutions to unemployment. Mbah (2016) opined that self-employment is a situation in which an individual works for himself or herself instead of working for an employer that pays a salary or wages. They earn their income through conducting profitable operations or services from a trade or business that operate directly. Using emerging technology in teaching students in technical colleges would facilitate self-employment which is a factor in achieving sustainable development goals.

Furthermore, the achievement of the goals depends on the quality of training and education given to the people that manage material resources in the environment to attend the needed goals. The extent of utilizing emerging technology is essential to the study to promote the achievement of overall development of training human capital in technical colleges for sustainability. Achieving sustainable development goals is not central to only capital investment but skills of the citizens upon which socio-economic, productive and sustainable self-employment is dependent on. Hence, this research work aims at determining the extent of utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Statement of the Problem

The technical college programme need to continue in the new normal of using emerging technology in teaching and providing salable skills for sustainable technological, social and economic development. The utilization of emerging technology is basic to achieving quality training of students in ICT based work skills. On the other hand, it is pertinent to use emerging technologies to engage the students on academic and productive work, instead of using their time in useless activities which the emerging technologies have provided the society with. The emerging technological facilities provided in school need to be utilized to promote learning and skill development of the students in contemporary issues. The teachers should implement measures that will promote effective teaching and learning in technical colleges using these emerging technologies. If the teachers fails to utilize these emerging technological facilities, the students may use them negatively in unproductive activities, lack the skills and knowledge of using similar tools in solving work related challenges which they are expected to do. Eze (2016) opined that the teachers have not utilized ICT based facilities properly to promote quality teaching and learning in modern society. This has affected the skill acquisition and employability of the students after graduation in modern industrial settings. This has contributed to the youth unemployment hindering the achievement of the sustainable development goals. Consequently, there is need to determine the extent of utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Purpose of the Study

The main purpose of the study was to determine the extent of utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State. The study specifically sought to determine the;

1. Technical teachers' perception on the extent of utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Research Questions

The study was guided by the following research question:

1. What is the technical teachers' perception on the extent of utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

- H₀₁ There is no significant difference on the mean ratings of male and female technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

H₀₂ Significant difference does not exist on the mean ratings of urban and rural technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Method

This study adopted a census survey research design. According to Nworgu (2015) survey research design is one in which a group of people or items are studied by collecting and analyzing data from only a few of them the entire group. This design was adopted due to the polychotomous instrument was used and the opinions of the technical were sought for on the extent of utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State. The area of the study was AnambraState of Nigeria. Anambra State is one of the five states in South-East geopolitical zone of Nigeria. The population comprised 186 teachers in 10 accredited technical colleges in Anambra State. The population was determined based on the field survey conducted by the researcher. The number was manageable and as such, there was no sampling.

The data collection was carried out using 15item structured questionnaire developed by the researcher based on the review of related literature. The instrument was structured in four point response scales. The instrument was validated by three experts in Technology and Vocational Education and Measurement and Evaluation. Their corrections and suggestions were used to produce the final instrument used for the study. The instrument was trial tested using 20 copies on technical college teachers in Enugu State who were not part of the population under study. The reliability coefficient yielded 0.75 using Crombach Alpha method. This 0.75 coefficient is in-line with Uzoagulu (2013) that reliability index of 0.60 to 1 shows that the instrument is highly reliable.

Three research assistants were used in the administration of the questionnaire and out of 186 copies distributed 179 copies were returned giving 96.24% return rate. Weighted means and standard deviations were used to answer the research questions. 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. The t-test statistics of no significance difference was used to test the null hypotheses. The significant value (at 2-tail) was compared with .05 level of significance at the appropriate degree of freedom. The null hypothesis was significant where the significant value was less than the .05 level of significance value at appropriate degree of freedom; otherwise the null hypothesis was not significant.

Results

The results of the study obtained were presented in Tables based on the research questions and hypotheses that guided the study (see table 1-3).

Research Question 1

What is the technical teachers' responses on the extent of utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State?

Table 1: Mean ratings and standard deviation of the technical teachers' responses on the extent of utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State

S/N	extent of utilization of emerging technology in achieving the sustainable development goals includes;	Male Teachers N= 123		Female Teachers N= 56		Overall		Decision
		$\bar{X}_1$	SD ₁	$\bar{X}_2$	SD ₂	$\bar{X}_G$	SD _G	
1	Cloud computing	2.15	1.04	1.50	0.55	2.07	1.01	Low Extent
2	Educational technologies based on artificial intelligence	1.66	0.69	1.65	0.69	1.65	0.69	Low Extent
3	Block chain	1.62	0.67	1.63	0.65	1.62	0.66	Low Extent
4	Virtual classroom	1.65	0.66	1.68	0.66	1.67	0.66	Low Extent
5	Industry 4.0 technology	1.72	0.67	1.68	0.68	1.68	0.67	Low Extent
6	Computer diagnostic tools	1.66	0.68	1.62	0.63	1.64	0.65	Low Extent
7	Computer numeric control machine	1.62	0.65	1.63	0.68	1.63	0.67	Low Extent
8	5G technologies	1.70	0.71	1.64	0.66	1.65	0.67	Low Extent
9	Machine learning	1.69	0.68	1.59	0.64	1.61	0.65	Low Extent
10	Smart manufacturing devices	1.64	0.63	1.63	0.65	1.63	0.65	Low Extent
11	3D printing	1.73	0.72	1.64	0.68	1.66	0.69	Low Extent
12	Mobile learning	2.35	0.85	2.30	0.84	2.33	0.89	Low Extent
13	Online classes	2.05	1.06	2.40	0.63	2.23	1.02	Low Extent
14	Audaces 360 technology application	2.15	0.81	2.17	0.98	2.16	0.86	Low Extent
15	Internet of Things (IOT) technology	1.69	0.73	1.66	0.71	1.67	0.71	Low Extent
	Grand Mean	1.81	0.75	1.76	0.69	1.79	0.74	Low Extent

Note: X =Mean; SD = Standard Deviation; N = Number of respondents

The data presented in Table 1 indicates that the overall item mean ratings of the technical teachers ranges from 1.61 to 2.33 depicting low extent. The items have overall cluster mean of 1.79 and standard deviation of 0.74. The low level of standard deviation of 0.74 shows obtained indicates that the respondents have consensus opinion in their responses to the items on the low extent of utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Hypothesis 1

There is no significant difference on the mean ratings of male and female technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Table 2

Summary of t-test analysis of mean ratings of male and female technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State

Variables	N	t	df	Sig. (2tailed)	Mean Difference	Std. Error Difference	Decision
Male	123	0.436	177	0.671	0.29310	0.68797	NS
Female	56						

The result of t-test analysis in Table 2 shows that the t-value at 0.05 level of significant and 177 degree of freedom for the 15 items is 0.436 with a significant value of 0.671. Since the significant value of 0.671 is more than the 0.05 level of significance the null hypothesis is not significant. This means that there is no significant difference on the mean ratings of male and female technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Hypothesis 2

Significant difference does not exist on the mean ratings of urban and rural technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Table 3: Summary of t-test analysis of mean ratings of urban and rural technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State

Variables	N	t	df	Sig. (2tailed)	Mean Difference	Std. Error Difference	Decision
Urban	108	0.403	177	0.511	0.33308	0.63626	NS
Rural	71						

The result of t-test analysis in Table 3 shows that the t-value at 0.05 level of significant and 177 degree of freedom for 15 items is 0.403 with a significant value of 0.511. Since the significant value of 0.511 is more than the 0.05 level of significant, the null hypothesis is not significant.

This means that there is no significant difference with respect to the items on the mean ratings of urban and rural technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Discussion of Findings

The result of data analysis according to the research question showed that the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State is to a low extent. The findings indicated that emerging technology utilized by the teachers to a low extent in technical colleges includes; cloud computing, educational technologies based on artificial intelligence, block chain, virtual classroom, industry 4.0 technology, computer diagnostic tools, computer numeric control machine, 5G technologies, machine learning, Smart manufacturing devices, 3D printing, Mobile learning, Online classes, audaces 360 technology application and Internet of Things (IOT) technology among others. The implication of the findings of the study was that the teachers are utilizing the emerging technology to a low extent in teaching and learning of vocational skill programme in technical colleges. This low extent means that the teachers need to be retrained and motivated in the use of emerging technology in teaching the students digital technologies for achieving sustainable development goals in Anambra State. The findings of the study were in consonance with Mormah and Bassey (2021) that emerging technologies have not been utilized to improve the quality of teaching and learning programmes provided to the learners. The finding were in agreement with Okeke (2019) that digital technology tools are not given the needed attention for sustainable education development in 21st century. The author pointed that teachers should be given in-services training in the utilization of social media to improve their service delivery in schools and distance locations. Therefore, technical teacher are required to increase effort in the utilization of emerging technologies in order to achieve sustainable development goals in technical college training in Anambra State.

Moreover, the findings in the null hypothesis one showed that significant difference does not exist on the mean ratings of male and female technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State. This implies that gender of the respondent had no influence on the identified low extent. Further, the finding in the null hypothesis two showed that significant difference does not exist on the mean ratings of urban and rural technical teachers on the utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State. This implies that location of the technical teachers had no influence on the identified low extent. The findings of no significant difference were in consonance with Victoria (2015) that the gender educators have no influence on their utilization of digital technology in teaching.

Conclusion

The study identifies the technical teachers' perception on the extent of utilization of emerging technologies in achieving the sustainable development goals in technical college training in Anambra State. The findings showed that technical teachers utilize emerging technology to a low extent in teaching in the technical colleges. The gender and location of the technical teachers have no influence on the identified low extent of utilization of emerging technology. These findings would enable the government and technical college administrators to ensure that training and re-training programmes are given to the teachers to improve their utilization of emerging technology in technical colleges for achieving the sustainable development goals in Anambra State.

Recommendations

Based on the findings, the following recommendations were made:

1. Technical teachers should utilize the available emerging technologies in preparing lesson, delivery their learning and conducting practical.
2. Government should providing resources to enable the teacher to improve their level of utilization of emerging technologies in teaching technical subjects in school.
3. School administrators should developing strategies that will enable the teachers to conduct teaching using emerging technologies.

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