WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Utilization of Information and Communication Technology (ICT) Tools for Teaching and Learning of Science Education in Colleges of Education for sustainable development in North-West Zone, Nigeria

Abah Onyikwu Victoria[1], Owamoyo Najeem[2]

[1]Department of Foundations of Education, Federal University of Education Zaria, PMB 1041 Kaduna State, Nigeria
[2]Department of Computer Science, Federa University of Education Zaria, PMB 1041 Kaduna State, Nigeria.

A B S T R A C T

The current advancement of information and communication technologies (ICT) give huge chances to further develop teaching and learning. The utilization of ICT facilities in science education offers considerably more benefits because of the alluring premises to recreate and intelligently investigate and tests, which would be too costly or too hazardous in genuine settings. This study examined the degree of effective use of ICT tools as instructional delivery for sustainable development in North-West Zone, Nigeria. Survey research design was used. The population of the work comprised of all sciences educators in some selected colleges of education northwest region of Nigeria. The primary data were gathered through structured questionnaire, to achieve the objectives of the study. Cronbach's alpha was used to determine the internal consistency and reliability of the instrument in which coefficient was estimated to 0.89. The study provided with both research questions and hypotheses. Data were analyzed by using mean, standard deviation while ANOVA was employed for analysis on the hypotheses through SPSS Version 23.0. The results obtained show that sciences educators do not use ICT as instructional delivery and learning evaluation's purpose. The study therefore recommended among others that Government should put in place relevant and adequate ICT tools in various schools. Students and lecturers should be encouraged to involved in ICT building capacity training.

Keywords: ICT, Sustainable Development, Teaching and Learning, Instructional Delivery, Science Education

INTRODUCTION

Information Communication and Technology (ICT) has been referred to as the bedrock of the nation and the advancement is rapidly impacting world. ICT is an overhang word, which incorporates report apparatuses or application de-indecencies or application, which connected them (Mayah and Mayah, 2021). It is additionally vital to push that ICT incorporates different applications for registering and satellite innovation. Accessibility and effective use of ICT office for informative processes supports the educator's capacity to care for individual contrasts and encourages students' learners, cooperation and understanding, which assist them in establishing their considerations and feeling and in turns with adding to great scholastic execution in schools. In this ongoing period, ICTs are perceived as method for quality affirmation in educational to plan the curriculum improvement. For example, the utilization of ICT to train students will assist them with learning better as they do not necessarily in all cases fail to remember what they have learnt when utilized alongside by the conventional strategy for teaching (Oluwalola, 2021). The steady changes of ICT over the most recent twenty years back have affected the existence of many individuals and the idea of occupations in all areas of science and education.

In accordance with the quick turn of events and use of ICT in the working environment, the ongoing age of students should be able to be conversant with ICT tools and abilities for them to confront the undertakings in the realm of work. ICT has been viewed as vital in worldwide education in which Nigeria is part of the country. Hence, basic to furnish every one of the instructive institutions with the required ICT assets for instructing and learning of all the course including business and science education. Such offices are likewise completely used in teaching and learning of science, business and business education as well as different courses in the educational plan. The advancement of any country is normally estimated by the level of social-economy and political upgrades that are brought to bear through the venture of science, technology and mathematics, and which implies that ICT plays a basic part to play in the improvement exertion round the world. In this contemporary time, the acknowledgment of public and sustainable development cannot be imaginable without sufficient use of advancements of technology (Okafor and Enemuo, 2022).

Usman et al., (2019) revealed that instructive pioneers are intrigued in how teachers and students use ICT devices in teaching and learning and how such can be used to upgrade learning. it is as a result of students, educational experts and graduates calculated- model have been purposefully connected to each other's, so their connectivity permits educators and students to evaluate their adequacy in involving ICT advances in educating and learning. Educators' and students' aim to use ICT devices are additionally determined by their assessments of their utility, usability, and real utilization of ICT advances. This research will utilize proposed system that will take a gander at ICT devices as wellsprings of extra educational substance for science

educators in the class. Subsequently, in a few higher institutions. ICT tools such as instructive transmitters, smart board, ICT lab, e- library, and among others are not accessible to be utilized in educating and training science subjects, while, generally speaking where a portion of the ICT facilities like projector, digital camera, workstations, and among others are accessible, they are not adequately used by the instructors for teaching and learning of science subjects, consequently keeping the students from learning how to utilize those ICT tools (Amahi and Odigili, 2021).

ICT tools user takes on a few measures and instruments to make life simple for their self and in this contemporary time, the devices utilized for everyday exercises are the utilization of advances or current contraptions. No individual, groups, association or establishment can work really and proficiently in this 21st century years without a useful and working ICT learning (Umoren, 2019). This research investigates the degree of ICT utilization in science education for sustainable development in North-West zone of Nigeria.

Problem Statement

The utilization of ICTs in teaching and learning is becoming more extensive in scope today in our institution of learning across the country. ICT is not simply confined to its use as educational materials in type of rendering helps, however it has turned into a device to reshape information transmission and improve the educators and students' course work in the classroom. In any case, studies had shown that most students in colleges do not possess ICT basic skills. This is because of non-accessibility of these facilities in schools. Despite the perception of certain schools to lay out ICT schooling programs, they are still facing tremendous issues that might obstruct the legitimate use of these innovations. The most critical of these is poor ICT access and utilizations among Nigeria colleges. Practically all the science and technical institutions in Northwest Nigeria territories have no ICT framework to be specific absence of infrastructure and media transmission facilities (Umoren, 2019). Most importantly, this failure of ICT framework is the consequence of inadequate funds budget to the colleges.

However, the greater part of the science educational graduates is not exceptional with the ICT skills expected to acquire. Thus, the students after graduation may not be productively utilized and in any event, also some lecturers have not ready to utilize ICT in delivering their lessons, which eventually led to extremely low productivity when they get employed, their efficiency usually extremely low (Winzenried, 2020). As opposed the background of the exploration participated in this study, the accessibility and use ICT innovations in educating and learning of science education has been analyzed in this review

Purpose and Objectives

The purpose of this study is to explore the of utilization of Information and Communication Technologies (ICTs) in the educating of science subjects by science education lecturers in Colleges of Education (COE) in Northwest zone of Nigeria.

The objectives are to:

1. examine the degree of effective utilization of ICT as instructional delivery procedure in science subjects in Northwest COE of Nigeria
2. investigate the degree of ICT usage in creating and organizing lesson note in teaching and learning of science subjects Northwest COE of Nigeria
3. determined the degree of ICT usage in assessment of teaching of science subjects in Northwest COE of Nigeria

Research Questions

1. What is the degree of effective use of ICT as instructional delivery procedure in science subjects in Northwest COE of Nigeria?
2. What is the degree of ICT usage in creating and organizing lesson note in teaching and learning of science subjects Northwest COE of Nigeria?
3. What is the degree of ICT usage in assessment of learning of science subjects in Northwest COE of Nigeria?

Hypothesis

Null Hypothesis were formulated as follows:

1. There is no significant difference in the degree of effective use of ICT as instructional delivery procedure in science subjects in Northwest COE of Nigeria
2. There is no significant difference in the degree of ICT usage in creating and organizing lesson note in teaching and learning of science subjects in Northwest COE of Nigeria
3. There is no significant difference in the degree of ICT usage in assessment of teaching of science subjects in Northwest COE of Nigeria

Methodology

Study Area

The North-West geo-political zones comprises of seven states, namely; Kaduna, Kano, Katsina, Zamfara, Kebbi, Sokoto and Jigawa. The zone has several Colleges of Education (COE) scattered across the states. To show up at a reasonable populace. Five out of the institutions that comprises of two Federal, two State and one Private COE which fills in as a portion of the institutions in the sone were chosen. These set of colleges have high profile of academic manpower. They include Federal Colleges of Education (FCE); FCE Zaria, FCE Kano, State Colleges of Education; Isa Kaita College of Education, Funtua Katsina State (IKCE Katsina), Zamfara State College of Education (ZSCE Zamfara) and Private College; Biga College of Education Sokoto (BCE Sokoto)

Research Design

This study employed survey research design. Survey design has to do with methodology where quantitative data is methodically gathered from a moderately enormous example chosen from a populace. As a result, no variable used in this study was manipulated, rather used as it was existed naturally and conducted in COE Northwest geopolitical zone, Nigeria. Subsequently, descriptive survey research design was employed. This design was considered fitting since it empowered the researcher to investigate, portray and gather appropriate information on ICT utilization in teaching of science education in COE In Northwest geopolitical zone. The decision of this research is educated by its efficient way of gathering data about the populace examined, simplicity of directing questionnaire which can be custom-made to the issue the analyst is considering.

Population, and Sample Size

The population of the study comprises of all science education academic staff estimated to be around 655 in the five selected federal colleges of education in the Northwest zone. A multi-stage sampling method is embraced for the research. At primary stage, purposive testing method is used to choose the respondents lecturers from general population of the staff in the chosen COE. In the subsequent stage, random sampling procedure is utilized to choose designated 250 respondents from scholastic staff in COE in Zaria, Kano, Katsina, Zamfara, and Sokoto.

Instrumentation

Based on the literature reviewed, a structured questionnaire was developed as instrument for the collection of data. The instrument was grouped into two parts; A and B. Part A sought for personal data while part B consist of items related to effective use of ICT tools in teaching science as a subject. Utilization of ICT by science lecturers was examined, it determines the extent at which lecturers use ICT in teaching science courses using four point's scale which has four options i.e. Very High Extent Utilized – VHEU, High Extent Utilized -HEU; Low Extent Utilized - LEU and Very Low Extent Utilized -VLEU for respondent was adopted with assigned values 0f 4,3,2,1 respectively. The study was validated by two professionals from department of science education FCE kano, 20 technologies instructors were used for pilot test though not included in the main study. Cronbach's alpha was used to determine the internal consistency and reliability of the instrument in which coefficient was estimated to 0.89.

Procedure for Data Collection and Data Analysis

The study embraces both the primary and secondary source of data gathering. The primary source utilized a quantitative strategy where data were gathered through a self-planned questionnaire. For the secondary source, data were sourced from articles, journal papers, web sources among others. Copies of the instrument were administered to the responded by the help of 3 field research assistant. Total number of 219 were retrieved back from 250 questionnaire distributed and used for the analysis. The statistical analysis of the research was conducted with efficient technique in the Statistical Packages for Social Science (SPSS). The data collected from the three questions were subjected and analyzed using Mean and standard deviation while the three hypotheses were tested by using ANOVA at 0.05 level of significance. The responses were grouped as 0-1.49 Very Low Extent Utilized (VLEU), 1.50-2.49 as Low Extent Utilized (LEU), 2.50- 3.49 as High Extent Utilized (HEU) and 3.5-4.5 as Very High Extent Utilized (VHEU).

Hence, mean rating that found between the ranges is called as designated. As for the data analysis as regard to hypothesis where p-value is higher than or equal to 0.05, hypothesis of no significant difference was accepted at the probability of 0.05 level of significance; in other hands where p-value is below 0.05, hypothesis of no significant difference was not accepted at 0.05 level of significant.

Results and Discussion

Research Questions 1:

What is the degree of effective use of ICT as instructional delivery procedure in science subjects in Northwest COE of Nigeria?

Table 1: Mean Rating of the degree of effective use of ICT as instructional delivery

S/N	Effective use of ICT as instructional delivery	Mean	Stand Dev	Remark
1	Science education lecturers deliver their teaching with projector	2.38	0.84	LEU
2	Science education lecturers browsed for materials through internet to improve their teaching and learning	1.38	0.64	VLEU
3	Use of tutorial packages through media from websites and CDs to deliver lesson	1.38	0.63	VLEU
4	Science education lecturers use multimedia such as Television and video to deliver lesson	2.43	0.75	LEU
5	Use e-mail in sending and receiving assignments	1.34	0.54	VLEU
6	Use of virtual class in delivering lesson	1.40	0.66	VLEU
7	Use of online chatroom for student and lecturers collaborative work	1.34	0.54	VLEU

Source: Fieldwork, 2024

Table 1 shows that mean rating for lecturers on the degree of effective use of ICT as instructional delivery procedure ranged from 1.34 to 2.43. Total numbers of five items found between the range of 0 – 1.49 which means "Very Low Extent Utilized (VLEU)" while the use of projector and multimedia such as Television and video to deliver lesson by lecturers were Low Extent Utilized (LEU). Standard deviation (Stand Dev) of the items that falls from 0.54 to 0.84. The close responses from the lecturers indicated that they have similar decision.

Research Questions 2:

What is the degree of ICT usage in creating and organizing lesson note in teaching and learning of science subjects Northwest COE of Nigeria?

Table 2: Mean Rating of the degree of ICT usage in creating and organizing lesson note

S/N	ICT usage in creating and organizing lesson note	Mean	Stand Dev	Remark
1	Science education lecturers use e-library to organize and improve learning	1.39	0.56	VLEU
2	Use of various search engines to create a standard material	3.23	0.88	HEU
3	Download and Upload file/material online	3.27	0.79	HEU
4	Science education lecturers browsed for online materials to improve their teaching and learning	2.19	0.81	LEU
5	Use of web-based resources to explore advancement in technology	2.41	0.83	LEU

Source: Fieldwork, 2024

Table 2 shows that mean rating for lecturers on the degree of ICT usage in creating and organizing lesson note ranged from 1.39 to 3.27. An item is found between the range of 0-1.49 which means "Very Low Extent Utilized (VLEU)" two of the items seen between the range of 1.50-2.49 which means "Low Extent Utilized (LEU)" while the remaining two seen between the range of 2.50-3.49 which means that "High Extent Utilized (HEU)". Standard deviation (Stand Dev) of the items that falls from 0.56 to 0.88. The close responses from the lecturers indicated that they have similar decision.

Research Questions 3:

What is the degree of ICT usage in assessment of learning of science subjects in Northwest COE of Nigeria?

Table 3: Mean Rating of the degree of ICT usage in assessment of learning of sciences

S/N	ICT usage in assessment of learning of sciences	Mean	Stand Dev	Remark
1	Use of e-mail in assessing assignments of the students	1.33	0.63	VLEU
2	Use of ICT facilities in providing assessment questions	1.83	0.64	LEU

3	Use of ICT facilities in generating standard examination questions	1.27	0.48	VLEU
4	Use of ICT facilities in marking questions	1.23	0.44	VLEU
5	Computation of students result through ICT facilities	1.34	0.63	VLEU
6	Use of ICT facilities in generating appropriate result data and presentation	1.38	0.56	VLEU
7	Use of ICT in processing students' information	3.71	0.61	VHEU

Source: Fieldwork, 2024

Table 3 shows that mean rating for lecturers on the degree of ICT usage in assessment of learning of sciences ranged from 1.23 to 3.71. Total numbers of five items found between the range of 0 – 1.49 which means "Very Low Extent Utilized (VLEU)" while one is noted to be seen within the range of 1.50-2.49 showing that "Low Extent Utilized (LEU)" and the other one item showing "Very High Extent Utilized (VHEU)". Standard deviation (Stand Dev) of the items that falls from 0.44 to 0.64. The close responses from the respondents indicated that they have similar decision.

Hypothesis 1: There is no significant difference in the degree of effective use of ICT as instructional delivery procedure in science subjects in Northwest COE of Nigeria

Table 4: Analysis of Variance (ANOVA) of the mean rating of lecturer's responses on the degree of effective use of ICT as instructional delivery procedure in science subjects in Northwest COE of Nigeria

Variation	Sum of Square	df	Mean Square	F-cal	P-value	Remark
Between group	0.364	4	0.091	2.116	0.079	Accepted
Within group	9.173	214	0.043			
Total	9.537	218				

FCE Zaria=59, FCE Kano=41, IKCE Katsina=52, ZSCE Zamfara=29 and BCE Sokoto =38, P>0.05.

Table 4 indicates that there is no significant difference in the degree of effective use of ICT as instructional delivery procedure among lecturers teaching science subjects in Northwest COE of Nigeria. This was affirmed from the table 4 because the P-value of 0.079 is higher than 0.05 level of significant, therefore the hypothesis 1 was accepted.

Hypothesis 2: There is no significant difference in the degree of ICT usage in creating and organizing lesson note in teaching and learning of science subjects Northwest COE of Nigeria

Table 5: Analysis of Variance (ANOVA) of the mean rating of lecturer's responses on the degree of ICT usage in creating and organizing lesson note in teaching and learning of science subjects Northwest COE of Nigeria

Variation	Sum of Square	df	Mean Square	F-cal	P-value	Remark
Between group	0.160	4	0.041	0.661	0.619	Accepted
Within group	13.851	214	0.062			
Total	14.011	218				

FCE Zaria=59, FCE Kano=41, IKCE Katsina=52, ZSCE Zamfara=29 and BCE Sokoto =38, P>0.05.

The table 5 depicts that there is no significant difference in the degree of ICT usage in creating and organizing lesson note among lecturers in teaching and learning of science subjects Northwest COE of Nigeria. This is shown from the table 5 since the P-value of 0.661 is higher than the 0.05 level of significant. The null hypothesis 2 got accepted.

Hypothesis 3: There is no significant difference in the degree of ICT usage in assessment of teaching of science subjects in Northwest COE of Nigeria

Table 6: Analysis of Variance (ANOVA) of the mean rating of lecturer's responses in the degree of ICT usage in assessment of teaching of science subjects in Northwest COE of Nigeria

Variation	Sum of Square	df	Mean Square	F-cal	P-value	Remark
Between group	0.135	4	0.034	0.264	0.901	Accepted
Within group	27.512	214	0.129			
Total	27.647					

FCE Zaria=59, FCE Kano=41, IKCE Katsina=52, ZSCE Zamfara=29 and BCE Sokoto =38, P>0.05.

The table 5 depicts that there is no significant difference in the degree in the degree of ICT usage in assessment learning among lecturers in teaching of science subjects in Northwest COE of Nigeria. This is revealed from the table 6 since the P-value of 0.901 is higher than the 0.05 level of significant. The null hypothesis 3 got accepted.

Discussion

The analysis of science educators, as it is revealed from the study the various degree at which lecturers utilized ICT in teaching and learning of science subjects in the Northwest COE of Nigeria. Based on the finding and in relation to research question 1 as illustrated in table 1. It was showed that lecturers do not use ICT in instructional delivery procedure. The research revealed that the extent at which lecturers utilized projectors, multimedia such as television and video to deliver lesson was low. This is in line with the finding of Winzenried (2020) which pointed out that some lecturers have not fully ready to use ICT tools in delivering their lessons, which eventually led to extremely low productivity when they get work, their efficiency is usually extremely low.

The finding of the research on question 2 as it is shown in table 2 that lecturers have high extent in utilizing ICT in downloading and uploading file materials online, also use of various search engines to gain access to materials and create a standard material. The researchers added that there some others variables such as lack of technical support staff, lack of ICT professional, good collaboration among educators that are willing to mediate ICT instructions. Also, Science education lecturers that use e-library to organize and improve learning were extremely low in term of influencing effectiveness teaching of science-oriented courses. The finding also indicated that some lecturers used web-based resources to explore advancement in technology. The test of the finding is in conformity with that Umoren (2019) who opined that good use of ICT resources by the lecturers can enhance also influence lecturers' effectiveness while in classroom and demonstrate itself in overall generality of students' decision-making capability and comprehension needed for effective teaching and learning of science, technology and business education related courses in colleges of education in Nigeria.

It is strongly believe by the researcher as shown in test research question 3 and table 3 that use of ICT resources in assessing assignments of the students, generating standard examination questions, computation of students result, generating appropriate result data and presentation were very extremely low. This work is in consonance with the finding of Olasedidun and Ganiyu (2020) that highlighted the limitations of higher institutions business and science lecturers encounter in utilization of ICT in teaching and learning of business and science educations related courses.

Conclusion

Based on the findings of the study it was shown that science education lecturers in Northwest COE of Nigeria fell behind in ICT tools instructional delivery usage and assessment of students learning. The successful use of ICT facilities in science education expects that educators integrate it in their curriculum activities. Consequently, the utilization of ICT in educational setting, planning and creating lesson note as well as assessment of students' learning will essentially be of extraordinary advantage to our general society. it was concluded that science education lecturers opinioned that usage of ICT facilities in teaching and learning in Northwest COE of Nigeria to be extremely low. ICT facilities usage in instructing has critical impact on instructing and that of science educators experience comparative issues in the use of ICT facilities in educating of science education courses. The circumstance calls for dire and convincing ICT-instructed methodologies if really Nigerian government and stakeholders believes that Northwest Nigeria institutions should produce quality students that will rival their counterpart in the worldwide work market remembering that ICT is presently unavoidable in the general society.

Recommendations

Government and other significant partners in education should endeavor to provide required ICT facilities for the purpose of educating of science education courses in higher institutions. This will empower educators to successfully utilize them while in the classroom and simultaneously help to train students with suitable ICT skills required for compelling working in the cutting-edge electronic age.

National Commission for Colleges of Education (NCCE) should ensure the integration of utilization ICT tools for teaching into their various content of curriculum of all sciences education course**.**

Science and Technical educators should thrive to see the requirement for taking on the ongoing strategies in teaching and learning of interactive instructing tools which include workstations, TV and media projectors, PC programming/bundles (learning guides on Disc ROMs/cards) that consolidate text, sound, brilliant pictures and so forth, that can give testing and authentic contents that improve students growing experience and skills.

Capacity building programme such as seminars, workshop, studios on ICT tools usage ought to be mounted consistently for serving science lecturers in colleges of education. This will empower them learn and up-date existing ICT tools usage skills that are continually evolving.

The Ministry of Education should make sure that there is availability of ICT tools required for legitimate usage of ICT as a device for teaching and learning in science and specialized colleges of education.

Acknowledgements

The authors express their appreciation to the Tertiary Education Trust Fund (TETFUND) Federal Republic of Nigeria, it was financially supported by IBR TETFund Research Projects (Batch-10, 2024). Authors Appreciation also extended to the Management of University of Education, Zaria and their TETFUND Research Committee for recommending and forwarding the application for sponsorship to TETFund for final approval.

References

Amahi, F. U, & Odigili, B. C., (2021). Evaluating instructional facilities in teaching and learning business education courses. Nigeria Journal of business education 8(1),229-234.

Mayah, D.A. & Mayah, E.`(2021). Availability And Utilization of Information And Communication Technology in Teaching of Business Education in Colleges of Education in Delta State. *Journal Of Teacher Perspective, 16(1), 2-4.*

Olasedidun, O. K. & Ganiyu, R. S. (2020). Colleges Of Education Lecturers' Attitude And

Intention Towards Using Social Media In Instruction In South-West, Nigeria. *International Journal of Innovative Technology Integration in education (IJITIE) 4(2), 4-6.*

Oluwalola, F. K. (2021). Evaluation of ICT tools accessibility to business education lecturers and students. *Journal of Education and Learning (Edu Learn*). 15(1), 64-69.

Okafor, P. C. & Enemuo, C. J. (2022). Role of ICT in socio-economic transformation in educational system. *International Journal of Educational Research*, 5(9), 12- 21.

Umoren, G. (2019). Impact of information and communication technology (ICT) on teaching and learning in Nigeria. *Journal of Education, Society, and Behavioural Science*, 31(4), 1-6

Usman, M., Mika'ilu, M., & Nasiru, M. G., (2019). Effectiveness Of the Use of ICT Tools On Students Learning in Senior Secondary Schools in Sokoto South L. G. Sokoto State, Nigeria. *International Journal of Innovative Information Systems& Technology Research* 7(3), 25-33.

Winzenried, A., (2020). Assessment of Teachers' Perception on Modern ICT and Communication Efficiency: A Case Study. *International Journal of Education and Development using Information and Communication Technology (IJEDICT),* 17(3), 217-233.