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Investigating Availability and Utilization of Information and Communication Technology Facilities in Physics Education in Tertiary Institutions in South – South Geopolitical Zone of Nigeria

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Abstract: **The study was carried out to investigate the availability and utilization of Information and Communication Technology (ICT) facilities for teaching and learning of Physics education in tertiary institutions in south-south geopolitical zone of Nigeria. The study adopted descriptive design. The population of the study comprised of all Physics teachers and students in all the tertiary institutions of the south-south geopolitical zone of Nigeria. The sample of the study comprised of ten (10) Physics teachers and five (5) Physics \ students each from four universities, four Polytechnics and four Colleges of Education drawn from the six states in the south-south geopolitical zone of Nigeria. The instrument for data collection was structured four point scale questionnaire. Four research questions guided the study. The research questions were analyzed using mean and standard deviation. The results of the data analysis showed that most of the ICT facilities that will enhance the teaching and learning of Physics are not available. The study also revealed that the extent to which teachers and students use ICT facilities for teaching and learning of Physics education is low. Furthermore, the results from the study also show that the level of ICT skills of both the Physics teachers and students are high but there are lot of challenges facing the use of ICT facilities for teaching and learning of Physics education in tertiary institutions in south- south geopolitical zone of Nigeria.**

Keywords: **Challenges, Education, Extent, Information and communication technology, Learning, Teaching, Utilization, Physics.**

1. INTRODUCTION

Information and communication technologies (ICT) is a collective term used to describe the various technologies that are used in the processing of information including its coding, creation, storage, retrieval, manipulation, dissemination and transmission (Zulu, 2010). ICT facilities include computer based technologies, digital imaging, the internet, files servers, data storage devices, network infrastructure, desktops and laptops. Another aspect of ICT is broadcasting technologies which include radio, television and telephone which are used as instructional tools at Schools. The integration of ICT in the teaching and learning process provides students with adequate knowledge and skills making the teaching profession to move from teacher-centered to student-centered learning environments. The utilization of ICT in teaching and learning

of Physics is very crucial to nation building since Physics plays a major role in technological advancement and sustainable development of a nation. Nowadays, ICT facilitates are not only used for the delivery of lessons but also for the learning process itself Nowadays, ICT facilitates are not only used for the delivery of lessons but also for the learning process itself.

In recent years, several studies and reports have highlighted the opportunities and the potential benefits of ICT for improving the quality of education. In educational context, ICT has the potential to increase access to education and improve its relevance and quality. ICT has a tremendous impact on education in terms of acquisition and absorption of knowledge to both teachers and students through the promotion of active learning, collaborative and cooperative learning, creative learning, integrative learning, and evaluative learning Not many works have been done on the availability and utilization of ICT in teaching and learning in Nigerian tertiary institutions. Wokotcha and Allen (2021) investigated the availability and extent of use of ICT facilities in teaching of science in secondary schools in Port- Harcourt, Rivers state, Nigeria. They found out that computer laptops, desktops, scanners, printers are used to an high extent, but most ICI facilities are not available for use. Yusuf, Zainab and Fatima (2019) carried out a research to review various applications of ICT in effective teaching and learning of Physics education in Nigerian educational sector. Their findings revealed that the use ICT as additional instruments for teaching and learning Physics is lacking in Nigeria educational sector. They concluded by advocating urgent need for the development of an ICT friendly curriculum in Physics

Akinfolarin and Rufai (2017) carried out a research on extent of ICT utilization for students learning in tertiary institutions in Ondo state, Nigeria. Their finding revealed that ICT facilities such as projectors, laptops, printers, public address system, ICT centers, and scanners were available for use. Igwe (2015) in in investigation into the factors influencing the use of ICT in teaching and learning computer studies in Ohukwu local government area of Ebonyi state, Nigeria. asserted that cost of ICT equipment, teacher attitude to computer usage are major factors influencing the use of ICT. Israel, Chetta and Lebe, (2014) examined the availability of ICT infrastructure, the qualifications and skills of Physics teachers and students in using ICT facilities for teaching and learning in selected secondary schools in Eleme local government area of Nigeria. Their findings revealed that some ICT facilities were available in some secondary schools in the study area but that the drive for its application was lacking due to some serious hindrances such as lack of skilled computer literate teachers and unsteady power supply. Yusuf, Afolabi and Loto (2013) carried out a research to appraise the role of ICT as a change agent for higher education in Nigeria. They discovered that inadequate computer trained and certified teachers, irregular power supply, high cost of ICT facilities, lack of relevant software and poor financial support are major constrains to the use of ICT in tertiary schools in Nigeria.

Salehi and Salehi (2012) also carried out a research investigating the obstacles that teachers experience in the integration of ICT in their classrooms either in teaching and learning of Physics or other science subjects. They found that lack of confidence among teachers, lack of access to resources, lack of time for the integration, lack of effective training, technical problems while the software is in use and lack of steady power supply are barriers militating against effective use of ICT in Physics lessons. Oye , Salleh, and Iahad, (2011) investigated into factors hindering the effective integration of ICT in teaching and learning of physics in tertiary institutions in Nigeria.. He observed that: inadequate or non availability of internet access, limited bandwidth and unsteady power supply are major factors. Amajuooyi (2012) carried out research on impact of ICT on students. His finding reveals that ICT has the ability to improve efficiency in the educational process, memory retention, increase motivation as well as deepens understanding

Ajadi, Salawu, and Adeoye (2008) observed that irregular and frequent interrupted power supply in Nigeria is a perennial problem affecting the use of ICT. They explained further that most rural areas in Nigeria are not even connected to the national grid. Still on factors militating against the use of ICT in teaching and learning of Physics, Folorunso , Ogunseye and Sharma (2006) identified mass unawareness, low computer literacy level and cost as critical factors affecting the acceptability of e-learning by students and lecturers of Nigerian universities. Ikemenjima (2005), carried out a research on the availability of ICT facilities for teaching in Nigeria. He observed that there are inadequate ICT infrastructure such as computer hardware and software, bandwidth access, lack of skilled manpower to manage available systems and inadequate training facilities for ICT education at the tertiary level.

Statement of the Problem

Students learning remain central in any academic achievement debate. ICT provide a window of opportunity for educational institutions and other organizations to harness and use technology to complement and support the teaching and learning process. Despite the enormous advocacy of integration of ICT in teaching and learning, many tertiary institutions in Nigeria are still being faced with the challenge of how to transform students learning process to provide students with the skills to function effectively in this dynamic, information-rich, and continuously changing environment. The cause of concern is that unless this problem is addressed, Nigeria will still be backward in terms of technological advancement since physics remains the backbone of technology.

Purpose of the Study

The aim of this research work therefore is to evaluate the availability and utilization of ICT in the teaching and learning of Physics in tertiary institutions in the South-South geopolitical zone of Nigeria. The specific objectives of this research are:

1. To find out the types of ICT facilities available for teaching and learning of Physics in tertiary institutions in the South-South geopolitical zone of Nigeria.
2. To establish the extent of ICT usage by teachers and students in teaching and learning of Physics in tertiary institutions in the South-South geopolitical of Nigeria.
3. To assess the ICT skills of teachers and students in Physics in tertiary institutions in the South-South geopolitical zone of Nigeria.
4. To find out the challenges facing Physics teachers and students in utilization of ICT in teaching and learning of Physics in tertiary institutions in the South-South geopolitical zone of Nigeria.

Research Questions

The following research questions guided the study.

1. What types of ICT facilities are available for teaching and learning of Physics in tertiary institutions of South-South geopolitical zone of Nigeria?
2. To what extent do teachers and students use ICT facilities in teaching and learning of Physics in the tertiary institutions in the South- South geopolitical zone of Nigeria?
3. What is the level of ICT skills of both the Physics teachers and students in the tertiary institutions of South-South geopolitical zone of Nigeria?
4. What are the challenges facing Physics teachers and students in utilization of ICT in teaching and learning of Physics in tertiary institutions in the South-South geopolitical zone of Nigeria?

2. METHODOLOGY

The research was carried out in some selected tertiary institutions in the South-South geopolitical zone of Nigeria. The research adopted descriptive survey design. The population of the study comprised of all Physics students and their teachers in all the tertiary institutions in the South- South geopolitical zone of Nigeria. The sample of the study comprised of ten (10) Physics teachers and five (5) Physics students each from four (4) Universities, four (4) Polytechnics and four (4) Colleges of Educations randomly selected using simple random sampling technique from the tertiary institutions in the South- South geopolitical zone of Nigeria. The instrument used for data collection was a four point scale rating structured questionnaire. The questionnaire is made up of two sections, A and B. Section A contains the demographic data of the respondents while section B is made up of four clusters. Cluster one contains twenty three (23) statement items that focus on types of ICT facilities available for teaching and learning of Physics Education in south- south geopolitical of Nigeria. The scale rating of items in cluster 1 is: Much Available (4), Available (3), Scarcely Available (2) and Not Available (1). Cluster 2 contains nineteen (19) statement items on extent to which teachers and students use ICT facilities in teaching and learning of Physics Education in south- south geopolitical zone of Nigeria. The scale rating of item in cluster 2 is Very High Extent (4), High Extent (3) Low Extent (2) and Very Low Extent (1). Cluster 3 contains ten (10)

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statement items on the level of ICT skills of both Physics teachers and students in tertiary institutions in south-south geopolitical Zone of Nigeria. The scale rating of item in cluster 3 is Very High (4), High (3), Low (2) and Very Low (1). Cluster 4 contains fourteen (14) statement items on challenges facing the use of ICT facilities in teaching and learning of Physics education in tertiary institutions in south – south geopolitical zone of Nigeria. The scale rating of items in cluster 4 is Strongly Agree (4), Agree (3), Disagree (2) and strongly Disagree (1).

The instrument was validated by two lecturers; one from the University and the other one from College of Education. their inputs were made and corrections effected. A pilot study of the instrument was carried out by administering the instrument to ten (10) Physics teachers and five (5) Physics students each in one university, one Polytechnic and one College of Education outside the south- south geopolitical of Nigeria to test its reliability using Pearson's correlation coefficient. The result yielded a correlation coefficient of 0.78. This shows that the instrument is reliable. The research questions were analyzed using mean and standard deviations. The mean value of a tour point scale instrument is 2.5. Therefore the value of 2.5 was used as a benchmark for taking decisions.

3. RESULTS

Research Question One : What types of ICT facilities are available for teaching and learning of Physics Education in tertiary institutions of South-South geopolitical zone of Nigeria?

Table I : Mean (x) and Standard Deviation (S.D) of Responses of Respondents to Research Question One

S/N	Type of ICT Facilities	X	S.D	Remark
1.	Computer projector	2.57	1.22	Available
2.	An interactive star board	1.98	1.80	Available
3.	Desktop and laptop computers	3.08	1.86	Available
4.	Internet (WIFI)	2.53	1.33	Available
5.	Printers	3.04	1.80	Available
6.	Cable or Satellite Dish	1.89	2. 13	Available
7.	Computer simulation	1.74	1.95	Available
8.	Public address system	2.94	1.70	Available
9.	Video camera	1.67	1.84	Not Available
10.	Electronic black board	1.78	2.02	Not Available
11	Large screen television sets	1.63	1.80	Not Available
12.	DVDs, VCD and VCR player/recorder	1.79	2.00	Not Available
13.	Audio-visual multimedia	1.91	2.13	Not Available
14.	Virtual laboratories	1.83	2.04	Not Available
15.	Educational software	1.77	1.94	Not Available
16.	Generator	2.57	1.37	Available
17.	Scanning machine	2.43	2.56	Not Available
18.	Email Facilities	3.20	1.40	Available
19.	Wide Area Network (WAN)	1.59	1.77	Not Available
20.	Local Area Network (LAN)	1.57	1.72	Not Available
21.	Uninterrupted Power Supply	1.70	1.89	Not Available
22.	Speakers	2.67	2.25	Available
23.	CD Rom	2.04	2.28	Not Available

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Table I shows the mean and standard deviation of respondents to types of ICT facilities are available for teaching and learning of Physics education in tertiary institutions of South-South geopolitical zone of Nigeria. Any item with mean of 2.5 and above is considered available. Any item with mean below 2,5 is considered not available. From table I above, the available ICT facilities are projectors, desktop and laptops, printers, public address systems, generators, email facilities and speakers, and internet facilities. Most of the ICT facilities that will enhance the daily teaching and learning of physics are not available. These facilities as indicated in table I are interactive star board, Satellite dish, computer simulations, video camera, large screen television, DVD, VCD and VCR players/ recorders, audio visual multimedia, virtual laboratory, scanning machine, electronic black board, education software, WAN, LAN, CD Rom and interrupted power supply

Research Question Two: To what extent do teachers and students use ICT facilities in teaching and learning of Physics Education in the tertiary institutions in the South- South geopolitical zone of Nigeria?

Table II: Mean (X) and Standard Deviation (S. D) of Responses of Respondents to Research Question Two

S/N	Statement Item	X	S.D	Remark
24.	Teachers and students make use of computer system for teaching and learning purposes	2.07	1.76	Low Extent
25.	Teachers and students make use of computer peripherals such as CD writers, printers, cameras etc for teaching and learning purposes	2.16	1.84	Low Extent
26.	Teachers and students make use of Skype, zoom etc for teaching and learning purposes	2.47	2.08	Low Extent
27.	Teachers and students make use of computer projector for lectures in lecture room.	2.33	2.05	Low Extent
28.	Teachers and students make use of public address system for projecting their voices during teaching and learning process.	2.56	2.15	High Extent
29.	Teachers and students make use of power point presentations during seminars and workshops	2.40	2.05	Low Extent
30.	Teachers and students make use of Word Processing software such as Microsoft Word for assignments	2.39	2.08	Low Extent
31.	ICT Centre is utilized for both teaching and learning of Physics Education courses	2.26	1.90	Low Extent
32.	ICT facilities are use in teaching in audio or conference hall	2.40	2.01	Low Extent
33.	ICT facilities are used in preparing lesson for instruction	2.51	2.00	High Extent
34.	Students are given assignment through online	2.30	1.98	Low Extent
35.	ICT facilities are used in lesson presentation	2.31	2.14	Low Extent
36.	ICT facilities are used in teaching students when teachers are not physically present	2.19	1.90	Low Extent
37	Use ICT facilities in downloading textbooks for learning activities	2.48	2.04	Low Extent
38.	Students incorporate ICT in their social activities	2.66	2.27	High Extent
	Grand Mean	**2.37**		

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Table II above shows the mean and standard deviation of respondents to the extent to which Physics teachers and teachers and students use ICT facilities in teaching and learning of Physics education . in the tertiary institutions in the South-South geopolitical zone of Nigeria. Any item with mean of 2.5 and above is is considered to be used at a high extent. Any item with mean of 2.5 and below is considered to be used to a low extent. From the table above,, it can be seen that teachers and students do make use of public address system and use ICT facilities in preparing lesson for instruction to an high extent. Students also incorporate ICT in their social activities to an high extent. The use of computer projector for lectures in lecture room., use of power point presentations during seminars and workshops , use of Microsoft software such as Microsoft word for assignment, use of ICT centre for low extent. The grand mean is 2.37 which is lower than 2.5. This value indicates that Physics teachers and students use ICT in teaching and learning of Physics education to a low extent.

Research Question Three: What is the level of ICT skills of both the Physics teachers and students in the tertiary institutions of South-South geopolitical zone of Nigeria?

Table III: Mean (X) and Standard Deviation (S.D) of Responses of Respondents to Research Question Three.

S/N	Statement Item	X	S.D	Remark
39.	Ability to use electronic board in teaching and learning of Physic Education courses	3.28	2.89	High
40.	Ability to use flash drive for storing instructional materials	3.18	2.79	High
41.	Ability to use video recorders for recording teaching and learning activities in Physics Education classroom	2.99	2.65	High
42.	Ability to use e-mail resources to help in the individualization of instruction	3.09	2.74	High
43	Ability to use power point package for lecture presentations.	3.42	2.97	High
44.	Ability to use internet facilities for academic research purposes	3.19	2.80	High
45.	Ability to use chat rooms (such as Face Book, YouTube, twitter, WhatsApp for sourcing, sending and receiving information	325	2.88	High
46.	Ability to use computer projector which helps to share notes digitally during teaching and learning activities	3.20	2.80	High
47.	Ability to use online tutors such as YouTube for instructional delivery saves time for lectures.	3.00	2.67	High
48.	Ability to use computer simulation in teaching and learning of Physics Education courses	2.89	2.59	High
	Grand Mean	**3.25**		

Table III above shows the mean and standard deviation of respondents on the level of ICT skills of Physics teachers and students in the tertiary institutions of South-South geopolitical zone of Nigeria. All the items (39 – 48) have mean of 2,5 and above with grand mean of 3,15. This shows that the level of ICT skills of both the Physics teachers and students in tertiary institutions of south – south geopolitical zone of Nigeria is very high.

Research Question Four: What are the challenges facing Physics teachers and students in the use of ICT facilities in teaching and learning of Physics Education in tertiary institutions in the South-South geopolitical zone of Nigeria?

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Table IV: Mean (X) and Standard Deviation (S.D) of Responses of respondents to Research Question Four

S/N	Statement Item	X	S.D	Remark
49.	Inadequate supply of ICT hardware facilities.	3.37	2.91	A Challenge
50.	Slow internet connection to relevant websites and resources	298	259	A Challenge
51.	Epileptic power supply within and outside the school.	3.21	2.83	A Challenge
52.	Inadequate funding for ICT facilities	3.28	2.87	A Challenge
53.	Low literacy level and inexperience of some students in the use of ICT facilities	3.13	2.70	A Challenge
54.	Poor attitude towards ICT facilities by the school authorities and management.	3.00	2.66	A Challenge
55.	High cost of ICT equipment and maintenance	3.04	2.70	A Challenge
56.	Inadequate training of teachers in the use of ICT facilities	2.84	2. 53	A Challenge
57.	Lack of personal access to ICT facilities during lesson preparation	3.24	2.86	A Challenge
58.	Inadequate number of available and accessible ICT facilities	3.52	3.05	A Challenge
59.	Breakdown of computers, printers and other ICT facilities.	2.78	2.44	A Challenge
60.	Lack or inadequate technical support	2.68	2.41	A Challenge
61.	Inexperience and negative attitude of teachers in the use of ICT facilities	2 52	2.21	A Challenge
	Grand Mean	**3.02**		

Table IV above shows the mean and standard deviation of respondents to the challenges facing the use of ICT in teaching and learning of Physics education in tertiary institutions in the south- south geopolitical Zone in Nigeria. All the items in the table IV above have mean of 2.5 and above indicating that all the stamen items are challenges facing the use of ICT in teaching and learning of Physics in tertiary institutions in the south- south geopolitical Zone in Nigeria. The challenges are inadequate supply of ICT hardware, slow internet connection to relevant websites and resources., epileptic power supply within and outside the school, inadequate funding for ICT facilities. , poor attitude towards ICT facilities by the school authorities and management, high cost of ICT equipment and maintenance, lack or inadequate training of teachers in the use of ICT facilities, lack or inadequate time for integrating ICT in teaching and learning activities., lack of personal access to ICT facilities during lesson preparation., inadequate number of available and accessible ICT facilities.. lack or inadequate technical support and inexperience and negative attitude of teachers in the use of ICT facilities.

4. DISCUSSION OF RESULTS

The findings on the type of ICT available for teaching and learning of Physics in tertiary institutions in the south-south geopolitical zone of Nigeria reveal that ICT facilities available are projectors, desktop and laptops, printers, public address systems, generators, email facilities, and internet facilities. This finding s are in agreement with the findings of Wokotcha and Allen (2021), Yusuf et al (2019), Akinfolarin and Rufai (2017), and Ikemenjina (2005). They all asserted that

projectors, desktop and laptops, printers, public address systems, generators, email facilities are available. The finding further reveals that most of the ICT facilities such as interactive star board, satellite dish, computer simulations, video camera, large screen television, DVD, VCD and VCR players/ recorders, audio visual multimedia, virtual laboratory, scanning machine, electronic black board, education software, WAN, LAN, CD Rom that will enhance the teaching and learning of Physics are not available The finding on the extent to which Physics teachers and students use ICT facilities in teaching and learning of Physics \in tertiary institutions in South – South geopolitical zone of Nigeria reveals that the extent of usage is very low. This finding is in agreement with the findings of Wokotcha and Allen (2021) who opined that only few ICT equipment were on usage at high extent. On the level of ICT skills of both the Physics teachers and students in tertiary institutions of South – South geopolitical zone of Nigeria, the findings reveal that the ICT Skills of both the teachers and students are very high.

Furthermore, the findings on the challenges facing Physics teachers and students in utilization of ICT in teaching and learning of Physics in tertiary institutions in the South-South geopolitical zone of Nigeria reveal that both the teachers and students are faced with the challenges of inadequate supply of ICT hardware facilities, slow internet connection to relevant websites, epileptic power supply within and outside the schools, inadequate funding for ICT facilities, poor attitude towards ICT facilities by the school authorities and management, high cost of maintenance of ICT facilities, inadequate number of available and accessible ICT facilities., breakdown of computers, printers and other ICT facilities and inadequate technical support . These findings corroborate with the findings of Igwe (2015), Ireal et al.,(2014), Yusuf et al.(2013). Saleh and Saleh (2012), Oye et al. (2011), Agadi et el. (2008) and Folorunso et al.(2006) on the challenges facing the use of ICT in schools in Nigeria.

5. CONCLUSION

The study investigated availability and utilization of information and communication technology facilities in Physics education in south-south geopolitical zone of Nigerian tertiary institutions. Five research questions and nine hypothesis guided the study. The results of the study reveal that only few ICT facilities were available. The major ICT facilities such as interactive star board, , Satellite dish, computer simulations, video camera, large screen television, DVD, VCD and VCR players/ recorders, audio visual multimedia, virtual laboratory, scanning machine, electronic black board, education software, WAN, LAN, CD Rom and interrupted power supply that will enhance the teaching and learning of Physics were not available. The extent of the use of ICT facilities for teaching and learning of Physics is very low. Furthermore, the levels of ICT skills for both the teachers and students are very high in the Universities, Polytechnics and Colleges of Education. However there are numerous challenges facing the use of ICT in Physics education in the south-south geopolitical Zone of Nigeria. Some of the challenges include inadequate supply of ICT hardware facilities, slow internet connection to relevant websites and resources, epileptic power supply within and outside the schools, inadequate funding for ICT facilities, low literacy level and experience of some students in the use of ICT facilities, poor attitude towards ICT facilities by the school authorities and management, High cost of maintenance of ICT facilities, inadequate number of available and accessible ICT facilities., breakdown of computers, printers and other ICT facilities and inadequate technical support.

It is hopeful that the Finding of this research work will help the government in development of infrastructure, training of Physics teachers in acquiring more technical skills that will help in integration of ICT in teaching and learning processes. This will probably help in bridging the observed gap in technological advancement between developing nation like Nigeria and developed nations of the world. Furthermore, development of ICT infrastructure will assist in encouraging the students to appreciate and further develop interest in application of ICT to studies and other meaningful uses.

6. RECOMMENDATION

Based on the findings of this research, the following recommendations are made:

1. The government at all levels should provide ICT facilities needed for effective teaching and learning of Physics in tertiary institutions in the south-south geopolitical zone of Nigeria.
2. Non- governmental organizations should also assist government in providing ICT facilities in tertiary institutions/

3. Government should ensure adequate power supply in tertiary institutions in south-south geopolitical zone of Nigeria.
4. Funds should be made available by government for maintenance of ICT facilities in tertiary institutions in south-south geopolitical zone of Nigeria.
5. Adequate training should be provided by the government for Physics teachers on how to use education software for teaching in the classroom.
6. Government should recruit ICT support staff to assist the teachers and students for effective utilization of ICT facilities in tertiary institutions in south-south geopolitical zone of Nigeria.
7. Physics teachers should create time to integrate ICT in teaching and learning activities.

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