

TEACHERS' LEVEL OF AWARENESS ON THE UTILIZATION OF ICT FACILITIES FOR TEACHING PHYSICS IN SENIOR SECONDARY SCHOOLS IN FEDERAL CAPITAL TERRITORY (FCT) – ABUJA.

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Abstract

The study seeks evidence from Physics teachers as to the extent they are aware on the utilization of Information and Communication Technology (ICT) facilities for teaching Physics at senior secondary school level in Federal Capital Territory (FCT). A structured questionnaire was used to collect data from a sample size of ninety (90) respondents. The instrument had a reliability of 0.87 using Cronbach Alpha technique. Results obtained showed teachers are aware of ICT resources with a mean rating of 2.84 followed by availability of ICT with a mean rating of 2.11 while provision of infrastructure trail with a mean rating of 1.57 among others. The test of hypothesis revealed that there is difference in the scale. Recommendation made included that all tiers of governments as well as religious organizations should make commitment to providing supports to schools, Physics teachers should be trained on the use of ICT resource for teaching, computer literacy programme should be provided for both pre-service and in-service teachers.

Keywords: Teachers, Level of Awareness, Utilization of ICT Facilities, Teaching Physics Senior Secondary Schools

Introduction

Science and technology have been known to be the bedrock of the development of any nation. It is obvious that for a country to advance in science and technology, her citizenry needs, to increase in scientific and technological knowledge and competence. According to Osberg & Kuan (2020) developed countries invest substantially in science and technology for realization of technological advancement. Gall (2018) averred that the yardstick with which a nation's level of economic development is measured has always been her level of scientific and technological attainment. In affirmation to that Olagunju, (2019) stated explicitly that Nigerian government has responded to the clarion call for advancement of socio-economic development through the introduction of Information and Communication Technology (ICT) in all levels of her educational system (Carmen, 2020). Aremu, & Okuntade, (2019) noted that the main thrust of national computer education is to ensure that the general populace appreciates the impact of ICT in present society for its effective uses.

More so, now that Information and Communication Technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Nations all over the world now regard its understanding and mastery of basic skills and concepts as crucial in education. This is because it adds value to the processes of learning and to the organization and administration of learning institutions. It encompasses different types of technologies, which are utilized for capturing, processing and transmitting data and information, using computer facilities. It is an umbrella term that includes communication device or application, encompassing radio, television, cellular phones,

computers, network, hardware and software, satellite systems and so on, as well as the various services and applications associated with them (Kumar, 2019). Thus, ICT focuses specifically on the application of these new technologies in an educational context and environment, and serves as a tool for supporting the various components of education. Such components include, among others, teaching and learning, resources management (human, material, financial resources) and admission and examination processes also known as learning assessment (Monday, Akon & Blessing, 2020)

Physics is one of the science subjects that is activity based and demands the use of learning resources. It cannot be denied that the use of ICT in Physics classroom provides some important and useful advantages which embraces and promotes learning as well as providing authentic and immediate information sequel to collaborative learning that encourages teamwork and access to online libraries. A good Physics teacher can use ICT during practicals for lesson simulation, drawing diagrams as well as database. Similarly, the integration of ICT in Physics class lesson delivery does not only boost the job of the teacher as a facilitator of knowledge but also provides proper science process skills. It enhances hands on, minds on learning in students and ensures active participation of learners. Abolade & Yusuf (2020) indicated that when ICT is effectively employed, it transforms classroom into a student-centered learning ground with the teacher as the coach and guide. Also, research findings indicate that proper utilization of instructional materials like ICT fosters learning (Cope, & Ward, 2022;) stimulates interest and guides to meaningful learning (Wanjala, Khaemba, Mukwa, 2021).). According to Monday, Akon & Blessing (2020), the ability to use ICT devices in lesson delivery lessens the burden of science teacher in general and Physics in particular. It can be said that without any contradiction that all the sixes' themes in Physics in the current SSS Physics in curriculum requires of use ICT in one form or another.

In order to maximize the benefits derived from ICT adequate empowerment and training should be provided to teachers. The National Policy on Education (2014) stipulates that government shall provide necessary training and infrastructure for integrating ICT into the school system. The government at both the federal and state levels as well as NGOs have swung into action by making necessary provisions which include computers and digitalization of ICT facilities in secondary schools, training of teachers through seminars and workshops.

To be ICT literate implies being well grounded in basic skills and competencies in ICT usage and ability to apply such skills in problem solving related to information and communication. Eiriemiokhale (2020) explains that a scientifically literate person is one who has acquired fundamental science skills and can utilize such skills in solving both personal and societal challenges. Unfortunately, the extent at which some teachers have benefited in training and empowerment programme provided by government and others cannot be made certain. This seems to be affecting their ICT competency in lesson delivery. Secondly, the extent of training and skill acquired cannot be determined as to make the teachers apply the skills in teaching. This does not encourage the required drive to attain globalization through ICT. Lamanauskas, Šlekienė, & Ragulienė (2020) opined that in a rapidly changing world of today, basic knowledge of ICT is *sine qua non* for an individual to gain access and apply information. The Economic Commission for Africa has also indicated that the ability to access and use information is no longer a luxury but a necessity for development.

Sadly enough, despite all the lofty efforts and strategic interventions to boost and provide the skills and competencies for the utilization of ICT in STEM classroom, researchers still discover that the impact of ICT usage in Physics is nothing to write home about in many Nigerian secondary schools. While Olapade (2019), observed that many science educators possess low level of computer literacy, Lamanuskas, Šlekienė, & Ragulienė (2020), pointed out that teachers at the basic level of education show low level of ICT acquisition and usage. The authors liken it to low level of acquisition of technology and ICT infrastructures like laptops computers and its paraphernalia.

Many times, teachers do not use ICT in teaching and learning process despite its vast potentials which make certain concepts to be grasped difficult. The picture created in the forgoing, demands that teachers who are go between, between curriculum formulation and implementation will be required from time to time in investigating the causes, problems and solutions of the teachers' level of awareness on the utilization of ICT facilities.

Statement of the Problem

The Federal Republic of Nigeria recognizes the important role that ICT in education plays in enhancing access to education, equity, relevance and quality of education. The government through the National ICT policy has outlined the various strategies to accelerate ICT uptake in the Nigerian education sector and had made provisions for infusion of ICT into secondary education. Despite all these efforts, there are concerns over how ICT is being integrated in the teaching and learning process especially for the benefit of the learners. The act of integrating ICT into teaching and learning is a complex process whose success depends on a number of factors. These factors may generally be grouped into teacher factors and school factors. Teacher factors range from teacher's confidence in using ICT tools, teacher's competence and training, teacher's attitude towards use of technology, to teacher's experience, inter alia. School factors include but not limited to: management and technical support in use of ICT tools. Effective teaching of Physics can only function with adequate infrastructure in place. Adequate infrastructure will equip Physics teachers in promoting skills, competences and knowledge-sharing to impact effectively on students' knowledge and improve standards. However, Jenkins, & Springer, (2020). observes that computer is not part of classroom technology in many schools. This implies that the chalk and board and textbook still rear its ugly head in classroom activities in majority of Nigerian secondary schools. One might rightly ask, could it be as a result of lack of awareness of ICT, could it be as a result of lack of interest in using the resources or lack of information literacy? This study therefore, set out to investigates Physics teachers' level of awareness on the utilization of ICT facilities for teaching Physics in senior secondary schools in Federal Capital Territory (FCT) – Abuja.

Purpose of the study

The study seeks to:

- i. Determine the level of Physics teachers' awareness of the existence of ICT resources for teaching and learning Physics
- ii. Identify competencies Physics teachers possess for ICT utilization
- iii. Ascertain availability of instructional resources for ICT utilization
- iv. Find out availability of e-library information services for ICT utilization
- v. Establish infrastructures offered to empower Physics teachers' utilization of ICT

Research Questions

The following research questions guided the study.

- i. To what extent are teachers aware of the existence of ICT resources for teaching and learning of Physics?
- ii. What are the requisite skills possessed by Physics teachers for ICT utilization?
- iii. What are ICT resources available for Physics teachers' utilization?
- iv. What e-library information services are available to update teachers' utilization?
- v. What infrastructures are offered to empower Physics teachers' utilization of ICT?

Research Hypothesis

This study is further guided by the following null hypothesis tested at a 0.05 level of significance.

H₀₁: There is no significant difference in the scores of male and female senior secondary school Physics teachers' perceptions on the scale.

Method

The study employed a descriptive research design to gather information from a few groups to represent the population. It was conducted in Abuja with a targeted population of 312 Physics teachers (Educational Resource Centre, 2016). A multi-stage sampling technique was adopted. This was done at three stages. At the Area Council Level, three Area Councils were randomly selected which were namely, Gwagwalada Area Council (GWAC), Kwali Area Council (KWAC), Abuja Municipal Area Council (AMAC). At the school level, out of 500 schools, 15 were purposely selected from each of the three Area Councils making 45 schools. At the teachers' level, male and female Physics teachers were sampled where there more two teachers to make up a sample size of 90 Physics teachers.

The instrument for data collection was Teachers' Level of Awareness on Utilization of ICT facilities for Teaching Physics Questionnaire (TLAUICTFPQ). TLAUICTFPQ has two main sections A and B. Section A solicits information on teachers' bio-data while section B elicits information on the extent teachers are aware on utilization of ICT facilities in teaching Physics. The instrument was validated by three (3) University lecturers from the Faculty of Education and Corrections in respect of face and content validity were effected. The reliability of the instrument was obtained by pilot testing it on schools not involved in the sample. Cronbach Alpha estimation was used for estimation and a 0.83 co-efficient was obtained.

The responses were measured on 4-point Likert scale of Very High Extent (4-points), High Extent (3-points), Moderate Extent (2-points) and Low Extent (1-point). The instrument was validated by three experts from science education measurement and Evaluation, the University of Abuja. The questionnaire was administered at the three Area Councils. Three research questions and two hypotheses were answered using mean and standard deviations such that a mean of 2.50 indicates a favourable disposition while less than 2.50 indicates negative disposition. The same applies to the cluster means. The hypotheses were tested at 0.05 level of significance using independent t-test statistical technique involving difference of mean

Results

Research Question One: What is teachers' level of awareness on ICT resources for teaching and learning Physics?

Table 1: Responses of Physics teachers' awareness on ICT resources for teaching and learning of Physics

S/N	item	VHE	HE	ME	LE	mean	SD	Remark
1	Computer set	50	23	14	3	3.33	.79	Agree
2	Computer software	35	37	7	11	3.07	.97	Agree
3	Internet facilities	40	45	3	2	3.37	.68	Agree
4	world wide web (WWW)	23	39	17	11	2.82	.56	Agree
5	Satellite	28	45	6	3	2.91	.86	Agree
6	Television set	47	34	6	3	3.39	.56	Agree
7	Video Cassettes	56	23	7	4	3.38	.76	Agree
8	Audio Cassettes	43	34	3	10	3.22	.63	Agree
9	Radio Cassettes	34	39	11	6	3.12	.81	Agree
10	Video player	28	45	9	8	3.03	.92	Agree
11	Fax machine and telex	5	28	45	12	2.29	.56	Disagree
12	scanner	45	28	6	11	3.19	.52	Agree
13	Slide projector	16	41	25	8	2.72		Agree
14	Overhead projector	39	33	11	7	3.16	.69	Agree
Cluster Mean/SD						2.84	0.36	

Table 1 shows the mean ratings of respondents on teachers' level of awareness on ICT resources for teaching and learning Physics. Fourteen (14) items form this subscale, of the fourteen (14) items, the respondents were favourably disposed to all items with a mean score greater than 2.5. The most favorably disposed item is item 6 namely, Television Set with a mean disposition of 3.39, followed by item 7 namely, Video Cassettes with a mean score of 3.38 and item 7 namely, Internet facilities with a mean score of 3.37. The least favourably disposed item is item 11 namely, Fax Machines and Telex with a mean score of 2.29, followed by item 13 namely, slide projector with a mean score of 2.72.

Research Question Two: What are the requisite skills possessed by Physics teachers for ICT utilization?

Table 2: Responses of Physics teachers on the existence of ICT resources for teaching and learning of Physics

S/N	To extent do you have the following abilities	VHE	HE	ME	LE	mean	SD	Remark
15	Using mouse to search website for browsing	18	21	24	27	2.33	1.11	Disagree
16	Creating software programme	9	3	24	54	1.63	.95	Disagree
17	Creating website designs for quality instruction	14	3	29	44	1.86	1.05	Disagree

18	Using simulation for virtual practical activities	4	20	49	17	1.59	.82	Disagree
19	Operating computers and using basic software for word process	20	21	38	11	2.54	1.23	Disagree
20	Creating effective computer based presentation	2	12	20	56	1.56	.62	Disagree
21	Creating multimedia documents to support instruction	6	23	19	42	1.92	.97	Disagree
22	Creating effective computer based presentation	18	21	24	27	2.33	1.11	Disagree
23	Creating multimedia documents to support instruction	9	12	24	45	1.83	.95	Disagree
24	Searching and downloading resources for instruction online	5	3	29	53	1.56	1.05	Disagree
Cluster Mean/SD						1.92	.17	

Table 2 shows mean ratings of respondents on the requisite skills possessed by Physics teachers for ICT utilization. Eleven (11) items make up this cohort, of the eleven (11) items, the respondents were favourably disposed to one (1) item constituting less than 9 percent of the items in this cohort with mean disposition greater than 2.50 while they were less favourably disposed to ten (10) items which represents 91percentof items in the cohort with mean scores less than 2.50. Item19 namely, operating computers and using Basic software for word process with a mean score of 2.54 top the list in the cluster. The least favourably disposed items are items 20, namely creating effective computer based presentation and searching and downloading resources for instruction online with a mean rating of 1.56 each followed by item 16 namely, creating software programme with a mean score of 1.63.

Research Question Three: To what extent are ICT resources available for Physics teachers' utilization?

Table 3: Responses of Physics teachers on available ICT resources for Physics teachers' utilization.

S/N	To extent does each of the following ICT resources available for teachers	VHE	HE	ME	LE	mean	SD	Remark
25	Mouse and keyboard accessories	14	18	27	31	1.89	.56	Disagree
26	Flash drive, CD -ROM, DVD Slides	10	12	48	20	2.13	.67	Disagree
27	Digital Camera with video-Accessories	14	15	50	11	2.35	.78	Disagree
28	TV screens, Projector, Monitors for recording	14	3	29	44	1.85	.56	Disagree
29	Laptops, Software and Tape recorders	21	25	10	34	2.36	.23	Disagree
30	Computers	22	20	33	15	2.54	.78	Disagree
31	Scanners and remotes	9	3	24	54	1.63	.51	Disagree
Cluster mean/SD						2.11	.46	

Table 3 shows the mean ratings of the teachers on ICT resources available for Physics teachers' utilization. Six (6) items constitute this cohort, of the six (6) items, the teachers were not favourably disposed to any of the items. The least favourably disposed items is item 31 namely scanners and remotes with a mean rating of 1.63 followed by item 28 which specifies TV screens, Projector, Monitors for recording with a mean score of 1.85 and then item 25 namely, Mouse and Keyboard accessories with a mean rating of 1.89.

Research Question Four: What e-library information services are available to update teachers' utilization?

Table 4: Responses of Physics teachers on available e-library information services

S/N	To extent is each of following e-library information service available	VHE	HE	ME	LE	mean	SD	Remark
32	Accessibility to website internet information	-	30	45	15	2.16	.69	Disagree
33	Books and knowledge sharing	-	60	30	-	1.67	.51	Disagree
34	Search tools for online study	-	30	45	-	2.16	.75	Disagree
35	Search engines to connect to relevant contents	-	15	30	45	1.67	.81	Disagree
36	Provide research materials unavailable in local libraries	-	15	45	30	1.83	.75	Disagree
37	Access to academic libraries	-	15	30	45	1.67	.81	Disagree
38	Improve online pedagogies	-	30	30	30	2.00	.89	Disagree
Cluster mean/SD						1.88	.69	

Table 4 shows the mean ratings of the respondents on e-library information services are available to update teachers' utilization. Seven (7) items formed this cohort of the seven (7) items, the respondents were not favourably disposed to any of the items in this cluster. The least favourably items are item 33 namely, Books and Knowledge sharing, item 35 namely, search engines to connect to relevant contents and item 37 namely, Access to academic libraries each with a mean rating of 1.67.

Research Question Five: What infrastructures are offered to empower Physics teachers' utilization of ICT?

Table 5: Responses of Physics teachers on infrastructures offered to equip ICT utilization

S/N	To extent is each of following information e-library service available	VHE	HE	ME	LE	mean	SD	Remark
39	ICT studios	2	12	45	31	1.83	.68	Disagreed
40	Maintenance/repairs workshop	1	4	23	62	1.37	.78	Disagreed
41	Spare parts and accessories	3	8	21	58	1.51	.76	Disagreed
42	Air conditioners/Fans	8	13	30	39	1.58	.67	Disagreed
43	PHCN/Generators electricity supply	3	5	30	52	1.54	.45	Disagreed
Cluster mean/SD						1.57	.39	

Table 5 shows the mean ratings of the respondents on infrastructures are offered to empower Physics teachers' utilization of ICT. Five (5) items formed this cohort, of the five (5) items, the

respondents were less favourably disposed to all of the items in this cluster. The least favourably items are item 40 namely, maintenance/repairs Workshop with a mean score of 1.37, followed by item 41 namely, spare parts and accessories with mean rating of 1.51 and then item 43 namely, PHCN/Generator with a mean rating of 1.54.

Hypothesis

H₀₁: There is no significant difference in the scores of male and female senior secondary school Physics teachers' perceptions on the scale.

The hypothesis was tested at a 0.05 level of significance and presented on table 6

Table 6: t-Test of the Responses of Male and Female Teachers on their perceptions on the scale

Variable	Number(N)	Mean (x)	S.D	Df	t _{cal}	t _{cri}	Inference
Male teacher	51	5.97	1.23	88	7.36	2.00	Reject H ₀
Female teacher	39	4.35	.84				

Table 6 shows that the value of $t_{cal} = 7.36$ falls outside the outside the critical region of -2.00 to 2.00. That is the null hypothesis is rejected. This implies that there is a significant difference between the perception of male and female teachers on the scale. In other words, the scale is gender sensitive.

Discussion of Results

The study investigated teachers' level of awareness on the utilization of ICT facilities for teaching Physics in senior secondary schools in federal capital territory (FCT) – Abuja.

Findings of this study on teachers awareness of the existence of ICT resources for teaching and learning of Physics revealed the respondents unanimously agree that teachers are aware of ICT resources for teaching and learning of Physics as reflected mean score of 2.84. This finding agrees with the opinions of Olapade (2019), who conducted a research on the Level of ICT Awareness among Secondary School Teachers in Sokoto State – Nigeria reveal and, found that the teachers are sufficiently aware of ICT resources for teaching and learning. Awareness of Computer set with a mean score of 3.33, and computer software with a mean score of 3.07 is a welcome development and indicates the level of seriousness school authorities are making in ensuring that every teacher is computer compliant in conformity with present day the digital age, more so that the field of education being sift by ICT.

The second findings of this study on the requisite skills possessed by Physics teachers for ICT utilization with a mean score of 1.92 leaves much of cluster mean. All the items in this cluster have their mean score below 2.50. For instance, item 20 namely, creating effective computer-based presentation with a mean score of 1.56, item 24 namely, using simulation for virtual practical activities. This is in support of Harris (2020) findings on Availability, Effectiveness and Utilization of Computer Technology among High School Mathematic Teachers in the Instructional Process

that teachers are having problems accessing computers, and a strong need for more curricular-based software exists. This finding suggests that there is need for more guidance and support to ensure of teachers in the use of computer. The researcher is cognizant that integration of ICT in Physics lesson delivery requires a move from the traditional model of teacher presentation to a learning model whereby student draw information relevant to their future profession.

The third finding of this study on ICT resources available for Physics teachers' utilization with has low mean score of 2.11. This implies that the respondents are of the opinions that there are inadequacy of ICT resources for Physics teachers' utilization. For instance, Scanners and remote controls with a mean score of 1.63 is of serious concern.

This finding indicates that teachers will not have the desired competences for required capturing images from photographic prints, posters for computer editing and display delivery of Physics lessons. Thereby making slid presentation on projector a difficulty. There is an acute shortage of computer peripherals in secondary which are responsible for quality of computer education learners receive (Carmen, 2003)

The fourth finding on e-library information services available to update teachers' utilization with a meager mean score of 1.88. This suggests that the respondents were of the views that e-library information leaves a lot to be desired. This is in support of Harris's (2020) findings which reported dissatisfaction in e-library information services because libraries were not state-of-the-art type, unavailability of such resources are additional set back in teachers' capacity building.

The fifth finding on infrastructures offered to empower Physics teachers' utilization of ICT has a negligible mean score of 1.57, indicating the opinions of the teachers on provision of infrastructures for empowering Physics teachers were nowhere near enough. This finding corroborates the arguments made by Jenkins & Springer (2020), whose findings suggest a correlation between work environment and their performance. Students may not reap the full benefits of education when teachers operate from miserable class environment.

Conclusion

Based on the results of this study, teachers' level of awareness on ICT resources subscale is the most positively favourably disposed with a mean score of 2.84 followed by availability of ICT resource subscale with a negligible mean rating of 2.11, followed by requisite skills subscale with a mean rating of 1.92, then e-library information subscale with a mean score of 1.88 while the least is infrastructural provision subscale with a mean score of 1.57. Thus, the study shows teachers are quite cognizant of the utilization of ICT facilities for teaching Physics in senior secondary schools. However other components of the study are in quandary. Our Vision 20:2030, which targets to catapult Nigeria into the league of the first global 20 economies by the year 2030 will be an exercise in futility if both schools are well as teachers are not supported. In this present era of technological revolution, a Physics lesson delivery anchored on functional ICT education can launch this country into a high-tech race of the new millennium thereby fostering the process of information organization and retrieval for sustainable educational development.

Recommendations

Based on the findings of this study and conclusion, the following recommendations were proffered

- i. All tiers of governments as well as religious organizations should make commitment to providing supports to schools.
- ii. Physics teachers should be trained on the use of ICT resource for teaching.
- iii. Computer literacy programme should be provided for both pre-service and in-service teachers.
- iv. Integration of ICT resources into Science Education programme at teacher preparatory level should be ensured.
- v. Federal government should link secondary schools to the global telecommunications network to enable teachers and students benefit Internet services.

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