

AVAILABILITY AND UTILIZATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) FACILITIES IN TEACHING SCIENCE IN SECONDARY SCHOOLS

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Abstract

The study investigated the availability and utilization of Information and Communication Technology (ICT) facilities in teaching and learning sciences in secondary schools in Owerri Municipal Council of Imo State. The descriptive survey research design was adopted in carrying out the study. A sample of 210 science teachers was used for the study. Researchers structured 4-points likert type of questionnaire was used for data collection, it had reliability of 0.81 determined using Pearson's Product Moment Correlation Coefficient(r). Data generated was analyzed using mean, standard deviation and chi-square (χ^2) statistical tools. The result of the study revealed non-availability and utilization of ICT facilities in teaching and learning of science subjects in secondary schools. Based on the result, it was recommended that government NGOs' and private organizations should aid the secondary schools by providing ICT facilities to enable the science teachers utilize them in teaching and learning of sciences.

Keyword: Availability, Utilization, Information and Communication Technology, Teaching, Science

Science teaching and learning has gone through series of innovations which includes the application of Information and Communication Technologies (ICTs) in the teaching and learning process. This has impacted on the quality and quantity of teaching and learning through its dynamic, interactive and engaging content, and it can provide real opportunities for individualized instruction (Egomo, Enyi & Tah 2012). In this period of wild explosion of knowledge the application of ICTs becomes pertinent in the education of the surging populace in the academic sector. The era of traditional “chalk and talk” approach of teaching is gradually giving way to the student-centered approaches such as the use of ICTs which are result oriented. Ajayi (2008) noted that teaching and learning has advanced beyond the teacher standing in front of a group of pupils and disseminating information to them without the students’ active participation. And with the help of ICTs teachers can take students beyond traditional limits, ensure their active participation in teaching and learning process and create conducive environments within which they can experiment and explore.

Ofodu (2007) in Apagu, and Wakili (2015) defined ICT as electronic or computerized devices, assisted by human and interactive materials that can be used for a wide range of teaching and learning as well as for personal use. It could be defined as processing and sharing of information using all kinds of technologies for the manipulation and communication of information (Apagu et al 2015). Olugbenga and Adebayo (2010) defined ICT as collection, retrieval, use and storage and communicating information through the use of computers and micro electronic system. Ayo (2001) sees ICT tools as the use of computer system and telecommunication equipment in information process. Ibe-Bassey (2011) regards ICT as a critical tool for preparing and educating students with the required skills for the global work place.

Information and Communication Technologies (ICTs) help to develop skills as it provides effective training programmes. It has capacity for stimulation, model-building and interactive adaptation and its usage applies not only to the sciences and language but also to various other professional courses (Osakwe; 2013). Information and Communication Technologies (ICTs) help to build students skills and grant them exposure to experiences outside their environment. It also enlivens the teaching and learning environment by allowing the students to learn at their own pace while the teacher moderates the learning process. Ugwu and Oboegbulem (2011) opined that effective use of ICTs in schools guarantees more access to information and experience in this era of globalization. Also Badmus in Eze and Aja (2014) stated that introduction of ICT in the school setting has a great impact in contributing to the achievement of the educational objectives, aims and goals as well as improving teaching and learning. If there is any technological development that has a very great potential for development in education and can improve educational quality, expand learning opportunities and make education accessible, it is the development of ICT. Information and Communication Technology (ICT) has the capacity to produce higher interactive potentials for users to develop individual intellectual and creative ability (Ochoyi and

Ukwumonu; 2008, Amuche, 2015). Goshit in Amuche (2015) indicated that integration of ICTs in secondary school will definitely improve Nigerian education system thereby giving students a better education that can enable them to compete favorably with products of other education systems all over the world. This will lead to the creation of a technologically advanced work force with the potential to improve military technology, telecommunication, media communication and skilled ICT professionals who will be well-equipped to solve ICT related problems where ever they find themselves. Jegede (2013) suggests the use of information and communication technology (ICT) in the teaching-learning process as its adoption will promote educational interaction between students and teachers and will also enhance effective teaching and learning. Look (2005) in Jegede (2013) noted that issues like good course organization, effective classroom management, content creation, self assessment, self study and collaborative learning, task oriented activities and effective communication between the actors of the teaching-learning process and research activities will be enhanced by the use of ICT-based technology.

The introduction of ICTs in our educational institutions will not change the students' outcome alone without the support and manipulation of the teachers who are capable of exploiting the possibilities of ICT in the teaching and learning process. This implies that, teachers should upgrade appreciate and develop a positive attitude towards application of ICT in teaching and learning.

Akuegwu, Ntukidem, Ntukidem and Jaga (2011) listed some examples of ICT tools to include computer, lap tops, video machines, multi-media projectors or power points, digital cameras, internet facilities, computer net work, telephone (GSM and land phones), e-library, television programmes, data base among others. Yusuf (2005) in Egomo et al (2012) indicated that ICT provides a variety of tools to support and facilitate teacher's professional competence, ICT transforms teaching and helps teachers to be more efficient and effective, thereby increasing their interest in teaching. ICTs increase teachers' emphasis on individualized instruction, and as such enable them spend more time with the individual students. This helps students to carry out more independent work and gives the teacher more time to focus on teaching higher level concepts in the classroom.

This time that students are losing interest in learning and the teachers are no longer committed to teaching, we need a modern way of teaching and learning so that students' academic achievement in science can improve in all the institutions. Science is dynamic, new discoveries are coming up every day both in science and in teaching method; we can only benefit from these new development when we are connected to the world through ICT (Awolaju, Akinloye & Ilorin; 2010).

Statement of the Problem

The benefits derivable from the application of ICTs in education are enough reasons to implement it in secondary schools. Ajayi (2008) in Apagu et al (2015)

indicated that the effective utilization of ICT in teaching and learning depends on the availability of these facilities and teachers competence in using them.

Therefore, the study was carried out to investigate the extent of availability and utilization of information and communication technology (ICT) facilities in teaching and learning of science in secondary schools.

Purpose of the Study

The main purpose of the study was to investigate the availability and utilization of ICT facilities in science teaching and learning in secondary schools. Specifically the study will determine whether:

- i. ICT facilities are available in secondary schools.
- ii. ICT facilities are utilized in teaching and learning of science subjects in secondary schools.
- iii. Science teachers are competent in the use of ICT facilities in teaching and learning.

Research Questions

The following research questions guided the study:

1. To what extent are ICT facilities available for teaching and learning science in secondary schools?
2. To what extent are ICT facilities utilized by teachers in teaching and learning of science in secondary schools?
3. To what extent are science teachers competent in the use of ICT facilities in teaching and learning of science in secondary schools?

Hypothesis

The following hypothesis was formulated for the study.

Ho₁: There is no significant relationship between teachers' level of competence and utilization of ICT facilities in teaching and learning of sciences in secondary schools.

Methodology

The study adopted the descriptive survey research design to determine the availability and utilization of ICT facilities in teaching and learning science in secondary schools. The population of the study consists of all the 352 science teachers in nine (9) Government owned secondary schools in Owerri Municipal Council of Imo State. Seven (7) schools were randomly selected for the study, in each of the schools selected, thirty (30) science teachers were drawn through stratified random sampling technique, this gave a total of two hundred and ten (210) science teachers consisting of one hundred and thirty (130) males and eight (80) females. The instrument for data collection was a 4-point likert type of questionnaire (weighted; strongly

agree(SA)=4points, agree(A)=3points, disagree(D)=2points, strongly disagree(SD)=1point) drawn by the researchers. It was divided into two parts. Part A dealt with respondents bio-data while part B dealt with items related to the objectives of the study. The content and face validity of the instrument was determined by a measurement and evaluation expert, information and Communication Technologist and science educationist. Their inputs guided the restructuring of the instrument. To determine the reliability of the instrument, it was administered to a group of 20 science teachers outside the study group but with the same characteristics through test-retest method within two weeks. Their responses were analyzed using the Pearson's Product Moment Correlation formula which gave a reliability coefficient(r) of 0.81 which was acceptable for the study.

In administration of the instruments, the head teachers in the selected schools aided the researchers to administer the instruments on the respondents after briefing them on the objectives of the study. A total of two hundred and ten (210) questionnaires were administered on the teachers on face-face approach the respondents filled the questionnaires and returned them on the spot as the case may be. All the copies of the administered questionnaire were retrieved.

The generated data were analyzed using mean and standard deviation to answer research questions. Any item response within and above 2.50 which is the instrument scale mean was accepted while any below it was rejected. The hypothesis was analyzed using chi-square (χ^2) statistical tool tested at 0.05 level of significance.

Result

RQ1: To what extent are ICT facilities available for teaching and learning science in secondary schools?

Table 1: Summary of teachers' responses on availability of ICT facilities

S/N	Available ICT Facilities	Mean (\bar{x})	SD	Remark
1	Computers	1.22	1.56	Rejected
2	Projectors	1.20	1.50	Rejected
3	Smart boards	1.30	1.41	Rejected
4	Internet	1.22	1.53	Rejected
5	CD-ROM	2.11	1.24	Rejected
6	Flash Drive	1.80	1.30	Rejected
7	Television	2.01	1.03	Accepted
8	Phones (GSM and Landlines)	2.72	0.98	Rejected
9	Mega-phones	1.21	1.43	Rejected
10	Public address systems	1.18	1.35	Rejected
11	Computer software	1.30	1.42	Rejected
12	Printers	1.24	1.55	Rejected
13	Photocopiers	1.21	1.52	Rejected
14	Projector screen	1.22	1.53	Rejected
15	Multi-media projector	1.25	1.55	Rejected
16	Radio cassette player	2.01	1.12	Rejected
17	Electric typewriters	1.31	1.45	Rejected
18	Manual type writer	2.51	0.85	Accept
19	Cable network	1.25	1.55	Rejected
20	e-library	1.15	1.62	Rejected
	Grand Mean (\bar{x}) = 1.52			

Table 1, shows that all the items except items 8 and 18 were rejected because they had mean responses less than 2.50 which indicates non-availability. While items 8 and 18, had mean responses greater than 2.50 and were accepted indicating availability. Also the dispersion of values as indicated in the standard deviation is in line with the mean values. The grand mean of 1.52 was indicated for all the items.

RQ2: To what extent are ICT facilities utilized by teachers in teaching and learning of science in secondary schools?

Table 2: Summary of teachers' responses on usage of ICT facilities in teaching and learning science

S/N	Available ICT Facilities	Mean (\bar{x})	SD	Remark
1	Available ICT facilities are utilized by teachers in teaching and learning.	2.21	1.80	Rejected
2	Students are allowed access to available ICT facilities in the schools.	1.82	1.56	Rejected
3	The available ICT facilities are stored in the laboratory/store.	2.53	1.01	Accepted
4	The available ICT facilities are used for administrative purposes only.	3.02	0.81	Accepted
5	Teachers are given access to available ICT facilities for research purposes.	2.31	1.62	Rejected
6	Available ICT facilities are not displayed to enable teachers and students know what they are	3.21	0.97	Accepted
Grand Mean (\bar{x}) = 2.52				

Table 2 shows that items 3, 4 and 6 were accepted as they had mean responses above 2.50 while items, 1,2 and 5 were rejected as they had mean responses less than 2.50 as the standard deviation values indicates the dispersion of mean values. The grand mean of 2.52 indicates average positive extent of utilization of available ICT facilities in teaching and learning sciences.

RQ3: To what extent are science teachers competent in the use of ICT facilities in teaching and learning of science in secondary schools?

Table 3: Summary of teachers' responses on their competence with ICT facilities

S/N	Available ICT Facilities	Mean (\bar{x})	SD	Remark
1	Most science teachers are computer literate.	2.51	1.04	Accept
2	Science teachers are competent in the use of ICT facilities.	2.63	1.01	Accept
3	Most science teachers can access the internet through phone or computers.	3.21	0.71	Accept
4	Science teachers were not also trained on using ICT facilities.	2.81	1.00	Accept
5	Science teachers do not attend retraining/training on use of ICT facilities in teaching and learning.	2.82	0.92	Accept
6	Most science teachers cannot operate ICT facilities such as projectors in the classroom.	3.11	0.68	Accept
7	Science teachers are not aware of computer softwares	3.14	0.63	Accept
8	Some science teachers cannot communicate with their colleagues through the internet.	2.41	1.24	Rejected
Grand mean (\bar{x}) = 2.83				

Table 3 shows that item 8 was rejected as it had mean response less than 2.50 while all other items were accepted as they had mean responses greater than 2.50 as the standard deviation values indicate the dispersion of mean values. The grand mean indicated an average stand of teachers' competence on ICT facilities. Most teachers are ICT competent but cannot apply some of them in classroom situations.

H₀₁: There is no significant relationship between teachers' level of competence and utilization of ICT facilities in teaching and learning of sciences in secondary schools.

Table 4: Summary of chi-square (X^2) analysis on teachers' competence and utilization of ICT facilities

No of Rows	No of Columns	df	X^2_{cal}	$X^2_{0.05}$	P-value
8	4	21	187.244	32.671	0.000

Table 4 shows that the calculated chi-square (x^2) value (187.244) is greater than the critical value (32.761) at df 21 and 0.05 level of significance and $p < 0.05$. Based on the result the null hypothesis was rejected and the alternative accepted at 0.05 level of significance. This implies that there is a significant relationship between teachers' level

of competence and utilization of ICT facilities in teaching and learning of sciences in secondary schools.

Discussion

The study revealed that all the ICT facilities listed on the questionnaire were not available in secondary schools except manual typewriters and phones suspected to be for personal use. The ICT facilities not available includes computers, projectors smart boards, internet, CD-ROM, flash drive, television, mega-phones, PAS, computer software, printers, photocopies, multimedia projector, Radio cassette, players electric typewriter, cable network and e-library. This result is in agreement with that of Apagu et al (2015), Eze and Aja (2014) and Jegede (2013) who variously noted shortage of the ICT facilities in secondary schools and higher institutions of learning.

The available ICT facilities in the schools are not used in teaching and learning science subjects as they are used for administrative purposes only. This is in agreement with Olokoba, Abidallahi and Omisidi (2014) which indicated that even when ICT facilities are available in schools, teachers do not make use of these tools.

The study also revealed that most science teachers in secondary schools are of average competence in the use of ICT facilities in teaching and learning of science subjects. The result showed a statistical significant relationship between teachers' competence and utilization of ICT facilities in teaching and learning. The result is in consonance with Goshit (2006) in Amuche (2015) who indicated inadequate manpower in schools as one of the major constraints of ICT application in schools.

Conclusion

The findings of the study revealed non availability of ICT facilities, non utilization of ICT facilities in teaching and learning of science in secondary schools and science teachers in secondary schools were averagely competent in the application of ICT facilities in teaching and learning.

Recommendation

Based on the result of the study, the following recommendations are made.

1. The Government, NGOs and private sector should aid the secondary schools in providing ICT facilities to enable teachers utilize them in teaching and learning of science subjects.
2. The Government and school managers should train and re-train science teachers on the utilization of ICT facilities in teaching and learning science subjects in secondary schools.
3. Teacher training institutions should emphasize on training teachers who are ICT competent to enable them utilize available ICT facilities in secondary schools in teaching and learning.

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