

INFLUENCE OF TEACHER COMPETENCE AND AVAILABILITY OF RESOURCES ON THE APPLICATION OF ICT TO THE TEACHING OF PHYSICS IN SSS

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Abstract

The study investigated the influence of teacher competence and availability of resources on application of ICT to the teaching of physics in SSS. Simple random sampling technique was used to draw ninety two (92) physics teachers from thirty one (31) purposively selected secondary schools, in Ikot Ekpene Senatorial District of Akwa Ibom State, to participate in the study. ICT Resources Availability Questionnaire (ICTRAQ) and ICT competence Check List (ICTCL) were used for data collection. Analysis of data revealed that: Modern ICT resources were non-existent; None of the physics teachers attended some form of ICT courses on power point, data logging, flash animation, excel and software CDs, which impacts significantly on physics curriculum delivery; only 5 and 10% of the participants had satisfactory levels of skill in e-mail access and internet browsing, respectively. It was, therefore, concluded that: in the face of ICT incompetence of physics teachers, hindered by lack of ICT resources, the physics teachers in Ikot Ekpene Senatorial District of Akwa Ibom state, is not yet ready to apply ICT in the teaching of senior secondary physics. Considering the attested vast potential of ICT in optimizing the teaching and learning of physics, it is imperative to properly equip all Nigerian secondary school with relevant ICT resources, and as a matter of urgency, mass ICT in service training of physic teachers should be mounted.

Introduction

Information and Communication technology (ICT) is irrefutably the fastest growing industry in today's world. Used as engine for sustainable international development, it is the bedrock of national survival in a rapidly changing global environment. "In the 21st century, the education systems are increasingly obliged to use ICT, providing knowledge for the learners/students and exercising abilities and skills" (Peciuliauskiene & Barkauskaite, 2007). But what exactly is ICT?

ICT refers to the various technologies that enhance the creation, storage, processing, communicating and dissemination of information. It encompasses the variety of infrastructures used in these processes, their applications and the numerous services these infrastructures render; the technologies identify as elements of ICTs being: Media of communication (e.g. radio, television); Information machine (e.g. Computers); telecommunications technologies and equipments (satellites, fibre optic cables, phones, Facsimile machines) (Akudolu, 2002; Jongur, Mohammed and Abba, 2008, Ojaleye, 2002). In this paper, therefore, ICT is a generic term that includes any communication device or application, encompassing radio, television, cellular phones, computer, network hardware and softwares, satellite systems, as well as the various devices and applications associated with them, such as video conferencing and distance learning.

Why ICT for Senior Secondary Physics Education?

Sharma (2005) observed that, "the role of ICT in education and the role of the teacher in using that technology are pertinent in shaping the future of education". This according to Jongur,

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Mohammed and Abba (2008) is because ICT process is used in promoting globalization and internalization of knowledge, data and skills from which education can benefit substantially. “Students can have lessons presented with presentation software, simulate situations, build their own knowledge, improve their knowledge base, explore authentic issues, work with peers and experts across the globe, select the mode they prefer and work at their own pace” (Sadkar and Sadker, 2003).

Kwache (2007) stated that, in concrete terms, ICT enhances teaching and learning through its dynamic interactive, flexible and engaging content. It provides real opportunity for individualized instruction, accelerates, enriches and deepens skills, and engages students actively in learning”. This agrees with Lee’s (2001) opinion that, as science requires direct interaction with nature, science teaching can be enriched, be made more effective and maximized using ICT tools effectively. “Critical thinking, information handling skills, high level conceptualization, and better problem solving, have been added as factors that are importance for effective learning using ICT resources” (Olele, 2008).

A modern teacher notes that at the heart of ICT is the computer. And to the question, “what is a computer”, the answer is this: “A computer is a special multipurpose electronic device (machine) that is capable of receiving instruction (data), storing and processing it and giving a desired result as output accurately at an incredibly high speed” (Olude, 2000). Students can perform experiments on the computer in the absence of real laboratories. Micro Based Laboratories (MBL) represent these applications that are meant as tool in laboratory work. With computer, it become much easier to repeat experiments, measure variables, analyze and represent data graphically (Voogt, 1996; Nwojiobi and Nzomiwu, 2006).

It is not uncommon, for instance, to experimentally determine the acceleration of free fall, g , due to gravity using the simple pendulum method. This is typical of the numerous senior secondary Physics practicals, including many facets of the theory, that lend themselves profitably, to the use of data – logging equipments, spreadsheets and graph plotting programmes of ICTs. There is a common outline to all of these practicals; students use the data logger to measure a quantity that is related to a second variable. This variable is then changed and the students repeat the measurement. The results from each run of the experiment are recorded in a spreadsheet that is used to perform calculation.

Regan (2008) attesting to the profitability of use of ICT in physics, posited that; ICT makes physics more interesting, more enjoyable and relevant to students everyday lives; stimulates students and helps them to understand difficult concepts and become more creative; students acquire a variety of different skills when taught using ICT tools. Nevertheless, there is an issue.

Although, physics teachers in Akwa Ibom State, have agreed that ICT supports the communicating of syllabus content in a more enjoyable and engaging manner, the physics teacher suffers a setback in using ICT in classroom. Akpabio (2005), Ochoyi and Ukwumonu (2008) and Olode (2000) have identified several major hindrances to successful application of ICT in (physics) education

- Unreliable power supply, where there is no batteries or uninterruptible power supply (UPS);
- High cost of purchase of computers;
- Long duration of training requires to learn how to fully utilize computers in education;
- Virtual lack of human skills and knowledge to fully integrate ICT into secondary education;
- Acute shortage of trained personnels in application software, operating systems, network administration and local technicians to service and repair computer facilities;
- Paucity of relevant softwares;
- Limited access to internet, accompanied by gross inadequacy in the number of internet provides, high charges (and poor) internet services;

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- Quick damage or spoilage of information systems;
- Paucity of ICT teachers in-service training programmes of good quality.

From the afore-going, the challenge facing secondary school physics teachers in Akwa Ibom State, today, seem to be lack of accesses to these new technical devices, as well as being skilled and knowledgeable in the use of these devices in the teaching of physics. There is, therefore, need to find out the availability and accessibility of ICT resources for use in physics curriculum delivery. Also, there is need to investigate the ICT competence of physics teachers in order to access the level of preparedness of senior secondary physics teachers to apply the new technology in the teaching of physics.

Research Questions

To guide the research study, the following questions were raised.

- (i) What amount of ICT resources is at the disposal of the physics teachers in physics curriculum delivery?
- (iii) What is the average frequency of use of modern ICTs by physics teachers in Ikot Ekpene Senatorial District of Akwa Ibom State.
- (iii) To what extents are senior secondary physics teachers ICT competent?

Method

Survey research design was adopted for the study

Population and Sample

All the secondary school physics teachers in Ikot Ekpene Senatorial District of Akwa Ibom State constituted the population of the study. Simple random sampling technique was used to select ninety-two physics teachers from thirty one purposively selected secondary school in the Senatorial District to participate in the study.

Research Instruments

The instruments used for the study were: ICT Resources Availability Questionnaire (ICTRAQ) and ICT competence Check List (ICTCL). The ICTRAQ and ICTCL were constructed by the researcher and validated by two lecturers at the University of Uyo (one lecturer, an expert in physics education while the other is an expert in Information Technology). The research instruments were administered on the respondents by the researcher, with the aid of a research assistant. For each ICT resource, frequency counts of teachers reporting the resource availability were converted to percentage availability of resources with the following key:

70% and above -	satisfactorily available
60 - 69%	- fairly available
50 - 59%	- averagely available
30 - 49%	- poorly available
Less than 30%	- virtually not available

Results

The results of data analysis were presented in tables as shown below.

Table 1: ICT Resources Availability in school N = 92

S/N	ICT Resources	Availability	
		Available	Not available
1.	Computer	82.0 (89.1)	10.0 (10.9)
2.	Internet facility	Nil (Nil)	92.0 (100.0)
3.	CD-ROM	Nil (Nil)	92.0 (100.0)
4.	Computer Software Programmes	Nil (Nil)	92.0 (100.0)
5.	Uninterruptible Power Supply (UPS) System	75.0 (78.3)	20.0 (21.7)
6.	Functional standby electric power generating plant	27.0 (29.3)	65.0 (70.7)
7.	Support staff in the form of computer maintenance /servicing staff	Nil (Nil)	92.0 (100.0)
8.	Computer printing machine	82.0 (89.1)	10.0 (10.9)
9.	Light pen	5.0 (5.4)	87.0 (94.6)
10.	Computer Lab	8.0 (8.7)	84.0 (91.3)
11.	Standard computer text books	22.0 (23.9)	70.0 (76.1)
12.	Qualified computers (with B. Sc. Or PDD in computer studies)	10.0 (10.9)	82.0 89.1
13.	Experienced. computer Teacher / having at least 3yrs of experience)	9.0 (9.8)	83.0 (90.2)

*Value in bracket is percentage value

Table 1 reveals three (3) of the ICT resources, which could be adjudged to be satisfactorily available. These are: computer (81% available), UPS (78.3% available), computer printing machine (89.1% available); otherwise ICT resources, including qualified and experienced ICT teachers were virtually not available

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Table 2: Frequency of Use of ICTs by Physics Teachers N = 92

ICTs							
Frequency,	Computer	Word processing	E-mail	Internet	Excel	PowerPoint	Software CDs
Everyday	Nil (Nil)	Nil (Nil)	Nil (Nil)	Nil (Nil)	Nil (Nil)	Nil (Nil)	Nil (Nil)
More than once a week	9.0 (9.8)	Nil (Nil)	Nil (Nil)	Nil (Nil)	Nil (Nil)	Nil (Nil)	Nil (Nil)
Once a week	5.0 (5.4)	Nil (Nil)	9.0 (9.8)	5.0 (5.4)	Nil (Nil)	Nil (Nil)	Nil (Nil)
Rarely	37.0 (40.2)	Nil (Nil)	19.0 (20.7)	2.0 (2.2)	2.0 (2.2)	4.0 (4.3)	Nil (Nil)
Never	41.0 (44.6)	92.0 (100.0)	64.0 (69.5)	85.0 (92.4)	90.0 (97.8)	88.0 (95.7)	92 (100.0)
Total	92.0 (100.0)	92.0 (100.0)	92.0 (100.0)	92.0 (100.0)	92.0 (100.0)	92.0 (100.0)	92.0 (100.0)

*Value in bracket is critical value

Table 2 reveals that 10% of the participants used computer more than once a week; 5% used the facility once a week. Also, revealed is that 10% of the participants used internet facility once a week; otherwise, virtually none of the new technologies was used by the physics teacher.

Table 3: Level of Competence in using ICT

S/N	ICT Technologies	Level of Competence		
		Introductory	Satisfactory	Advanced
1.	Word processing	Nil (Nil)	Nil (Nil)	Nil (Nil)
2.	Internet access	28.0 (30.4)	9.0 (9.8)	Nil (Nil)
3.	Excel	Nil (Nil)	Nil (Nil)	Nil (Nil)
4.	E-mail	9.0 (9.8)	5.0 (5.4)	Nil (Nil)
5.	Power point	Nil (Nil)	Nil (Nil)	Nil (Nil)
6.	Data logging	Nil (Nil)	Nil (Nil)	Nil (Nil)
7.	Flash animation	Nil (Nil)	Nil (Nil)	Nil (Nil)

*Value in bracket is critical value

Results in Table 3 shows that only 5 and 10% of the participants had satisfactory levels of skills in e-mail and internet browsing, respectively, None of the participants attended some form of ICT courses on power point, data logging, flash animation and excel software.

Discussion of Findings

Table 1 shows high percentage (81.1%) availability of computer in schools, while Table 2 shows that 40% of the participants used computer rarely, whereas 45% never used computers. This is consistent with Ball et al's (1987) research finding that nearly three quarters of the secondary school mathematics teachers use computers either rarely, or never, at their work. This implies that in some of the privileged schools where computers may be found, these computers are merely used to advertise or promote such schools.

Table 1 reveals that modern ICT resources (such as internet connection software), including qualified and experienced ICT teachers, are not available in schools, while Table 3 reveals a sorry state of ICT incompetence of physics teachers. This finding is in agreement with Ivonne's (1998) report of an obvious lack of experience in teaching, as well as in staff qualified for teaching using computers and networks, including, lack of qualified personnels for maintaining and servicing the computers and networks in schools.

This lack of modern ICT resources, coupled with ICT – incompetence of physics teachers, has resulted in students being denied access to effective learning tool in a country where students achievement in senior secondary physics is low (WAEC, 2004).

Recommendations

Arising from the findings of the study, the following recommendations are made:

1. It is imperative to properly equip all Nigerian Secondary schools with relevant ICT resources
2. The use of ICT for instructional delivery should be incorporated into teacher training programme of pre-service physics teachers
3. As a matter of urgency, mass ICT-in-service training of physics teachers should be mounted to provide/improve their computer literacy, as well as train them in the usage of internet facilities
4. Government and other stakeholders in education industry should assist every physics teacher to possess a personal laptop computer, to motivate and quicken their readiness to apply ICT in the classroom.

Conclusion

Based on the findings of the study, it was concluded that: in the face of ICT-incompetence of physics teachers, hindered by lack of ICT resources, the physics teachers in Ikot Ekpene Senatorial District of Akwa Ibom State is not yet ready to apply ICT in the teaching of senior secondary physics.

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