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Assessment of Availability and Adequacy of Information and Communication Technology (ICT) Facilities in Teaching and Learning of Physics among Technical Schools in Benue State, Nigeria

Joseph Olaiya FATOKI[1], Peter IORNYAGH[2], and John Ochinyabo OCHEDIKWU[3]

[1]Department of Science and Mathematics Education,
Benue State University, Makurdi, Nigeria
Corresponding Author: fjosepholaiya@yahoo.com

[2]Department of Educational Foundations and General Studies,
Federal University of Agriculture, Makurdi, Nigeria

[3]Department of Vocation and Technical Education,
Benue State University, Makurdi, Nigeria

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Abstract

The world of the twenty-first century can be aptly called an information age. Digital technologies have brought profound changes to all facets of life. The use of information communication technology (ICT) has become so important that it became the most significant indices in National and Economic Development. The main purpose of this study is to assess the availability and

adequacy of ICT facilities in teaching and learning of Physics among Technical Schools in Benue state, Nigeria. The study adopted survey research design. The population of the study consisted of all the Physics teachers and 9684 Part two (II) students. The instrument for data collection was ICT Availability and Adequacy Checklist. The instrument was validated by experts. The data obtained were analyzed using descriptive statistics of mean and standard deviation to answer the research questions asked. The study revealed that ICT facilities are available for teaching/learning of Physics among Technical Schools in the study area. The study also revealed that the available ICT facilities were not adequate for teaching and learning of Physics in Benue State. Recommendations were also made from the findings of the study.

Keywords: ICT Facilities, Physics, Technical Schools, Benue State

Introduction

The world of the twenty-first century can be aptly called an information age. Digital technologies have brought profound changes to all facets of life. In many countries today, the use of information communication technology has become so important that it became the most significant indices in National and Economic Development (UNESCO, 2002). Therefore, Nigeria's quest for rapid National and Economic Development cannot be achieved without available and adequate Information and Communication Technology (ICT) facilities for effective teaching and learning at all levels of educational system. The place of ICT in teaching Physics in schools cannot be overemphasized considering its promises in effective teaching and learning.

It is worthy of note that most teachers perceive ICT as very useful and makes teaching and learning easier (Hennesy, Harrison & Wamakote, 2010). This need for ICT is emphasized from the findings of (Tella, Toyobo, Adika & Adeyinka 2007) that teachers' use of ICT benefits the learners. The advent of ICT in learning process coincides with a growing need for instructional shift and adoption of alternative theories for learning. The theories of learning that hold the greatest shift today are those based on constructivist principles which posit that learning is an active process of constructing knowledge rather than acquiring knowledge and that instruction is the process by which knowledge construction is supported rather than a process of knowledge transmission (Akinola, 2011). In constructivist theories, social interactions between the learner and other individuals and learning materials are seen to play a critical role in the processes of learning and cognition (Akinola, 2011).

In recent years, ICT have been used extensively for various reasons by wide user groups. School age-children use computers for entertainment, communication, and education. Over the past few years, due to improvement in technology, computers and related technologies have become central in the teaching-learning process. Lauman (2000) stated that not only is the number of ICT facilities in education growing exponentially, but also the number of computers in the home is growing at a rapid rate. ICT has so many advantages in the learning and teaching process. According to Moore (2015) teachers who use ICT in their classrooms makes the classroom control more effortless because ICT provides materials that make the class more interesting and easy to controls. The existence of several sorts of ICT tools gives the class other support of learning especially in terms of visual and auditory learning. Classroom management will lead to organizing students' behaviour. Moore (2015) summarized the positive impact of ICT on students learning as increased students' motivation to stay on-task and drive them to behave better and produce high

quality. Besides, through ICT, students learn more independently and did more work at a fast space. Furthermore, Lim (2015) stated that the use of ICT in teaching and learning allowed students to be active in finding information and builds knowledge from information obtained by the chance to cross-line between knowledge of subjects without been restricted by time and distance.

To Pittard, Phil and Jessica (2003), ICT provides significant contribution to teaching and learning in all subjects and to all ages. They stated that ICT can motivate students and engage them in learning, besides meeting individual learning needs. Today's ICT resolution provides cheaper and better computer programs that allow students to practice what they have learned in the classroom even in the absence of the teacher (Stock and Fisman, 2010). There are countless things that can be done with ICT applications, and some of the applications have latent impacts on children's development. For instance, computer games might be considered a waste of time by some parents. However, they may have positive effects on children's cognitive development (Hamlen, 2011). By spending time with the computers, children can learn how to read and utilize the information on computer screens. Using computers can also improve children's visual attention because some applications require users to keep track of or control many activities at the same time.

The use of ICT according to Hoque and Alam (2010) raises the potential to equip students with higher order creativity, aid in problem solving, provide ready access to a world of knowledge and research and improve the quality of presentation. One of the major benefits of ICT as a teaching tool is that, there is a growing increase of evidence to suggest that the relationship between ICT in schools and students' attainment is increasing (Blaylock, 2005). Nwagbo and Ugwuanyi (2014) observed that ICT has the power to impact on the teaching and learning process. The use of ICT in teaching is becoming increasingly vital owing to the nature of the 21st century teaching and learning.

Physics forms the foundation of the scientific and technological studies. It is a core subject at the Senior Secondary School (SSS) level. Being an activity-based subject, it is required to be taught using students-centered methods of teaching in order to enable students gain scientific and technological knowledge that will enable them fit into the technologically-driven society of today. Students-centered methods are supposed to be adequately available in schools and other places of teaching and learning. This is because; there are a lot of ICT facilities that are capable of aiding and assisting effective teaching and learning of Physics. These ICT facilities include Compact Disc (CD), CD-ROM, internet, modem and computers. With availability of these facilities, Physics teaching and learning is made simple for teachers and students.

However, ICT availability and adequacy in the Technical Schools has been observed by other researchers as nothing to write home about. Researchers have discovered these problems and have since suggested ways of solving them in order to improve students' performance in Physics. Yet, the performance of students in Physics has not improved as evident from the report of chief examination officer of National Board for Technical Education (NABTEB). Hence, it is pertinent to search for new strategies that will improve students' performance. It will be a costly assumption to conclude without finding out the availability and adequacy of ICT facilities among Technical schools in the study area. It is in the light of these that this study carried out an assessment of the

availability and adequacy ICT facilities for teaching and learning of Physics among Technical Schools in Benue State in order to proffer possible solution to take care of the fluctuating poor performance.

Theoretical Framework

The study was based on the Bruner's theory of learning propounded in 1966. The theory states that instruction consists of leading the learner through a sequence of statements and restatements of a problem or body of knowledge that increases the learner's ability to grasp, transform, and transfer what he is learning. The theory is hinged on the idea that learner finds solutions to the problems by searching and experimenting. Bruner maintained that when one is able to figure out things for himself, discovery learning is promoted and memory is strengthened. The theory also advocated a learning situation which allows for retention and transfer of learning, gives insight into derivation of rules and principles, encourages intrinsic motivation, stimulates and improves reasoning and improves reasoning ability, and helps learners to acquire skills and develop self-confidence. Bruner argued that the teacher's role in learning should be to create an environment in which students can learn on their own rather than provide pre-packaged information to students. This theory further suggested that students should learn through active involvement with concepts and principles and should be encouraged to conduct experiments that allow them to acquire skills and discover principles for themselves.

Bruner (1966) in his research, proposed three modes of representation:

i. **Enactive Stage (0-1 years):** This is the action-based stage. It is the stage at which a person learns about the world through actions on objects, manipulating materials directly or by doing something. The child represents past event through motor response.
ii. **Iconic Stage (1-6 years):** This is the images-based stage. Here learning occur through pictures or diagrams, dealing with images but not manipulating directly.
iii. **Symbolic Stage (7 years on wards):** This is the language-based stage. This describes the capacity to think in abstract terms, children manipulate symbols and no longer deal with mental images of objects.

Bruner's underlying principle for teaching and learning is that, a combination of concrete, pictorial then symbolic activities will lead to a more effective learning. The progression is: start with a concrete experience then move to pictures and finally use symbolic representation. These levels are sometimes called the concrete, semi-concrete and abstract levels respectively.

This theory is relevant to this study in the sense that, Physics teachers should ensure that Physics instructions are appropriate to the level of the learners. Physics teachers should assist learners in building their knowledge. Also, students should be active learners, by this, ICT facilities should be made available and adequate for use by students alongside with other instructional materials in carrying out experiments by themselves.

Purpose of Study

The main purpose of this study was to assess the availability and adequacy of ICT facilities for teaching Physics among Technical Schools in Benue State. Specifically, the study sought to:

i. assess the availability of ICT facilities for teaching of Physics among Technical Schools in Benue State;
ii. ascertain the adequacy of ICT facilities for the teaching of Physics among Technical Schools in Benue State.

Research Questions

The following research questions guided the study

i. What are the available ICT facilities for teaching and learning of Physics among Technical Schools in Benue State?
ii. What is the adequacy level of ICT facilities available for the teaching and learning of Physics among Technical Schools in Benue State?

Methods

The study employed a descriptive survey research design. This design was considered suitable for this study because the researcher assessed availability and adequacy of ICT facilities in the teaching and learning of Physics among Technical schools and data were collected from a representative sample of the schools to generalize the findings on the entire population. The population of the study consisted of all the Physics teachers and 9684 Part two (II) students. The instrument for data collection was a checklist adopted from the Benue state ministry of Education (2016) which sought to find out availability and adequacy of ICT facilities in the schools. The checklist had 25 items with six columns indicating the number of facilities required, A (Available), NA (Not Available), AD (Adequacy), NAD (Not Adequate) and remarks.

The instrument was validated by expert in Measurement and Evaluation from Federal University of Agriculture Makurdi to ensure that the checklist measure what it purport to measure. The checklist was face-to-face used by the researcher on a visit to all the schools sampled and data was collected on the ICT facilities available. Availability of ICT facilities was checked using frequency count and percentages. The available facilities were compared with the requirement from the Benue state Ministry of Education to check for adequacy.

Results

This section presents the analysis of data collected for the study as well as the results and discussion. The result is presented in the order of the research questions raised.

Research Question One

What are the available ICT facilities for teaching and learning of Physics among Technical Schools in Benue State?

Table 1: Frequency and Percentage of Availability of ICT Facilities for Teaching and Learning of Physics

S/No	ICT facilities	Available Frequency	Percent	Not Available Frequency	Percent	Remark
1	Computer	35	87.5	5	12.5	Available
2	printer	35	87.5	5	12.5	Available
3	software (programs)	34	85.0	6	15.0	Available
4	Internet router	6	15.0	34	85.0	Not Available
5	Modem	23	57.5	17	42.5	Available
6	Television set	31	77.5	9	22.5	Available
7	Videocassettes	33	82.5	7	17.5	Available
8	Radio receiver	27	67.5	13	32.5	Available
9	Audio cassette & player	37	92.5	3	7.5	Available
10	Video projector	2	5.0	38	95.0	Not Available
11	Video player	12	30.0	28	70.0	Not Available
12	Overhead projector	9	22.5	31	77.5	Not Available
13	Transparency programs	9	22.5	31	77.5	Not Available
14	Slide projector	7	17.5	33	82.5	Not Available
15	Public address system	37	92.5	3	7.5	Available
16	Slide films/compact discs	30	75.0	10	25.0	Available
17	Film strip projector	21	52.5	19	47.5	Available
18	Film strip	21	52.5	19	47.5	Available
19	Telephone	33	82.5	7	17.5	Available
20	UPS	40	100.0	0	0.0	Available
21	Stabilizer	37	92.5	3	7.5	Available
22	Generator	26	65.0	14	35.0	Available
23	Digital camera	19	47.5	21	52.5	Not Available
24	Fax machine	2	5.0	38	95.0	Not Available
25	Scanning machine	26	65.0	14	35.0	Available
			68.0		**32.0**	

From Table 1, out of 25 ICT facilities on the checklist, items 1, 2, 3, 5, 6, 7, 8, 9, 15, 16, 17, 18, 19, 20, 21, 22 and 25 had their percentages above 50%, this is an indication that more than 50% of the schools sampled in the study have these facilities available for teaching and learning of Physics among Technical Schools in Benue State. Items 4, 10, 11, 12, 13, 14, 23 and 24 had their percentages below 50%, showing that these ICT facilities are not available in the sampled schools for teaching and learning of Physics among Technical Schools in Benue State. In general, 68.0% of these ICT facilities were available and 32.0% were not available.

Research Question Two

What is the adequacy level of ICT facilities available for the teaching and learning of Physics among Technical Schools in Benue State?

Table 2: Frequency and Percentage of Adequacy Level of ICT facilities for the Teaching and Learning of Physics

S/No	ICT Items	Adequate Frequency	Percent	Not Adequate Frequency	Percent	Remark
1	Computer	35	87.5	5	12.5	Adequate
2	Printer	30	75.0	10	25.0	Adequate
3	software (programs)	34	85.0	6	15.0	Adequate
4	Internet router	3	7.5	37	92.5	Not Adequate
5	Modem	11	27.5	29	72.5	Not Adequate
6	Television set	27	67.5	13	32.5	Adequate
7	Videocassettes	26	65.0	14	35.0	Adequate
8	Radio receiver	18	45.0	22	55.0	Not Adequate
9	Audio cassette & player	37	92.5	3	7.5	Adequate
10	Video projector	2	5.0	38	95.0	Not Adequate
11	Video player	7	17.5	33	82.5	Not Adequate
12	Overhead projector	5	12.5	35	87.5	Not Adequate
13	Transparency programs	5	12.5	35	87.5	Not Adequate
14	Slide projector	4	10.0	36	90.0	Not Adequate
15	Public address system	37	92.5	3	7.5	Adequate
16	Slide films/compact discs	27	67.5	13	32.5	Adequate
17	Film strip projector	13	32.5	27	67.5	Not Adequate
18	Film strip	11	27.5	29	72.5	Not Adequate
19	Telephone	20	50.0	20	50.0	Adequate
20	UPS	35	87.5	5	12.5	Adequate
21	Stabilizer	37	92.5	3	7.5	Adequate
22	Generator	16	40.0	24	60.0	Not Adequate
23	Digital camera	5	12.5	35	87.5	Not Adequate
24	Fax machine	0.00	0.00	40	100.0	Not Adequate
25	Scanning machine	5	12.5	35	87.5	Not Adequate
			72.0%		28.0%	

From table 2, it can be seen that, out of the available ICT facilities captured in the checklist, items 1, 2, 3, 5, 6, 7, 9, 10, 12, 13, 15, 16, 18, 20, 21, 22 and 25 had their percentages above 50%, this is an indication that all these facilities are adequate for teaching of Basic Science in Secondary Schools in Benue State. Items 8, 11, 14, 17, 19, 23 and 24 had their percentages below 50%. This shows that these ICT facilities are not adequate for teaching of Basic Science in Secondary Schools in Benue State. Checking for the adequacy level of the all the facilities put together, 72.0% of the ICT facilities were adequate for teaching of Basic Science in Secondary Schools in Benue State and 28.0% were not adequate.

Discussion

The findings of the study in table 1 revealed that ICT facilities for the teaching and learning of Basic Science in Secondary Schools in Benue State are available. Out of the twenty-five (25) ICT facilities examined, only eight (8) of them were not available for the teaching and learning of Basic Science while seventeen (17) were available and there was a significant difference in the availability

of ICT facilities between private and public schools as private school had a higher mean rating for availability. This finding is in agreement with Apagu and Bala (2015) who equally supported this assertion in his study on availability and utilization of ICT facilities for Teaching and Learning of Vocational and Technical Education in Yobe State Technical Colleges which revealed that ICT facilities are to some extent available. However, the finding is not in line with Olokoba, Abdullahi and Omosidi (2014) who maintained that many schools do not have ICT tools for effective teaching and learning process in Kwara state, Nigeria.

Conclusion

Going by the findings, it is concluded that major facilities for the implementation of the 3-year Upper Basic Science and Technology curriculum are available moderately especially in GSS. The minimum teaching qualification of Nigerian Certificate in Education (NCE) is less enforced especially in PSS. The teachers in Private Secondary Schools attend workshops and seminars for effective implementation curriculum moderately while the Government Secondary School teachers attend workshops and seminars to less extent.

Recommendations

On the basis of the findings of this study, the following recommendations are put forward:

i. Physics teachers should ensure that the available ICT gadgets/facilities are utilized in teaching the students.

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