Physics Teachers' Perception and Utilization of ICT Tools for Teaching Senior School Physics in Sokoto, Nigeria

***Afees Akanni Amuda and **Ridwan Enuwa Mohammed Ph.D**
**Department of Science and Vocational Education, Faculty of Education and Extension Services, Usmanu Danfodiyo University, Sokoto*
***Department of Science Education, University of Ilorin, Ilorin, Nigeria*

Abstract
This study investigated Physics teachers' perception and utilization of ICT tools for teaching senior school Physics in Sokoto, Nigeria. The survey design was adopted in the study. The target population comprised all physics teachers in Sokoto metropolis. 50 physics teachers were random selected for the study. Physics Teachers ICT Utilization Questionnaire(r=0.86) was used in data collection. The data collected during the study were analysed using mean, standard deviation and Pearson Product Moment Correlation (PPMC) with the aid of Statistical Package for Social Sciences (SPSS). The findings of the study indicated that there was a significant relationship between Physics teachers' perception and ICT Utilization for teaching physic and there was a significant relationship between Physics teachers' perception and their competence in utilizing ICT tools for teaching Physics. It was recommended that Physics teachers should make use of ICT tools in their lessons to enhance learners understanding of concepts thereby improving students' achievement in Physics, amongst others.

Keywords: Information and Communication Technology (ICT), Perception, Utilization, Teaching Physics.

Introduction

Physics is a branch of natural science which is concern with the study of matter in relation to energy (Omosewo, 2009). It is the most basic of the sciences because its concepts and techniques corroborate the progress of all branches of science (Ekee, 2010). Physics is a cross-cutting discipline that has been implemented in many sectors of economic advancement which includes health, agriculture, water, energy, technology and information and communication technology. In medicine, X-rays, radioisotope and resonance imaging are used. In addition, the design of machines and electronics all depend on advances made from physics in technology (Mankilik & Ofodile, 2015).

Physics is crucial for effective living in the modern age of science and technology. Given its application in industry and many other professions, it is necessary that every student is given an opportunity to acquire some of its concepts, principles and skills. The importance of physics to human society makes it to be included in the senior school curriculum. The objectives of physics teaching at secondary school level of education according to the NERDC (2009) are to;

- Provide basic literacy in Physics for functional living in the society;
- Acquire basic concept and principles of Physics as a preparation for further study;
- Acquire essential skills and attitude as a preparation for technological application of Physics; and
- Stimulate and enhance creativity

The availability and effective use of teaching and learning resources are key determinant to the quality of science and Mathematical education in any country. The use of Information and Communication Technology (ICT) in teaching and learning can be a relevant and functional way of providing education to learners that will equip them with skills and knowledge required to function in the 21st century. The fast advancement of information and communication technology (ICT) in recent times has correspondingly revolutionized the educational sector making teaching and learning flexible.

Despite the challenges associated with ICT integration in education, ICT has provided flexibilities in teaching and learning for instance, with the use of ICT remote students can learn and collaborate with each other for the purpose of attaining good academic performance. Nigeria promulgated a national ICT policy in the year 2016. The goal of this national ICT policy therefore is to provide a framework for streamlining the ICT sector, and enhancing its ability to catalyze and sustain socio-economic development critical to Nigerian's vision of becoming a top 20 economy by the year 2020.

Information and Communication Technology (ICT) is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer, network hardware, software and satellite system as well as the various services and application associated with them, such as video conferencing and distance learning. In addition, use of new technology will motivate the learners and hence develop favorable attitude towards science subject. The use of computers in education dates to 1924 when Sidney Presley tried out the so called teaching machine for revision and however, use of technology in education was generally slow until the coming of computers (Kavagi 2010). Integrating technology into curricula with the sole aim of influencing positively the teaching and learning process has been evolving since 1980 when a number of countries in the world introduced computers in their education system (Wakhaya 2010). The role and importance of attitude and beliefs in education is a very well documented area in education research. This is also true when it comes to studying the relationship between perception and the usefulness of ICT in education (Ertmer 1999 and Jegede 2008).

Teachers' perception determines the extent of ICT use in the teaching and learning process as revealed by a number of studies, how people perceive

and react to technologies is far more important than technical obstacle in influencing ICT implementation and use. The roles and importance of attitude and beliefs in education is a very well documented area in educational research. This is also true when it comes to studying the relationship between attitudes and the utilization of ICT in education (Ertmer, 1999). Teachers determines the extents of ICT usefulness in the teaching and learning process as related by number of studies, how students perceived and react to technology is far more important than technical obstacle influencing ICT implementation and uses.

Review of Related Literature

The term information communication technology (ICT) includes any communication device or application, encompassing: radio, television, cellular phones, computer, network hardware, software and satellite systems as well as the various services and applications associated with them, such as video conferencing and distance learning. The use of computers in education dates back to 1924 when Sidney Presley tried out the so called 'teaching machine' for revision and testing at Ohio University in the United States of America. However, technology in education was generally slow until the coming of computers (Kavagi, 2010). Integrating technology into curricula with the sole aim of influencing positively the teaching and learning process has been evolving since 1980 when a number of countries in the world introduced computers in their education systems (Wakhaya, 2016). This change was mainly as a result of hardware and software evolution, computer accessibility in educational settings and popular instructional technology trends.

Technology integration cover a wide area ranging from instruction on programming skills, self-directed drill, testing, instructional delivery, and Internet based accessibility to information and communication. It has been argued by certain scholars that the use of new technologies in the classroom is essential for providing opportunities for students to acquire knowledge and skills that will enable them to function in an information age (Bingimlas, 2019). It is therefore evidence as Yelland, (2018) argued that, traditional educational environments do not seem to equip the learner with adequate skills to be productive in their places of work in today's society. She asserts that organizations which do not integrate the use of new technologies in schools cannot claim to prepare the learners for life in the modern technological age. There are several roles that ICT can play in the teaching and learning process.

First, ICT has a great potential to enhance learner achievement (Bransford *et* al., 2016). A number of theorists and scholars assert that the use of computers can make the learners to become knowledgeable, reduce the amount of direct instruction given to them and provide a learning environment where teachers can assist learners with special needs. In addition, use of new technology will motivate the learners and hence develop favorable attitude towards science specifically physics.

The study of Akinfolarin, & Rufai (2017) investigated the extent of information and communication technology (ICT) utilization for students' learning in Ondo State tertiary institutions. The research design was a descriptive survey. The target population comprises all students in tertiary institutions of learning in Ondo State. A sample of two hundred (200) undergraduate students from Adekunle Ajasin University, Akungba-Akoko was used for this study. A stratified random sampling technique was used to select the sample across the six faculties in the university based on proportion. Data were carefully collected through a questionnaire and were analyzed using mean, standard deviation and T-test to test the null hypothesis. The findings of the study revealed that facilities like computer systems, email accounts, projectors, Public Address System (P.A.S), E-Library, printers for print out of learning materials by students and Social-Media Platforms are available for students' learning in Ondo State tertiary institutions, ICT facilities like internet, the computer training centre for students on campus and stored lecture notes on CD-ROM were not available to students for learning, Computer training classes and projectors for academic activities are not accessed by students on campus, female students have the highest level of utilization of ICT facilities compared to male students in Ondo State tertiary institutions. It was recommended that school management should continue to provide ICT facilities like internet, projector, E-Library facilities, computer printers and social-media platforms to broaden students' knowledge and improves their overall learning experience.

Adeyemo (2010) investigated the impact of information and communication technology on the teaching and learning physics in Lagos State, Nigeria. The sample for the study were one hundred and fifty-seven (157) physics students and two (2) physics teachers drawn randomly from two senior secondary schools from each of the five educational districts out of the six educational districts available in Lagos State, Nigeria. The instruments used for the study were information and communication technology impact on teaching and learning questionnaire (ICTIT LQ). The data collected were analyzed using simple percentages and chi-square. The findings indicated that ICT has a great impact on the teaching and learning of physics. Also, the introduction of ICT makes learning of physics so interesting for the students. It was recommended that ICT equipment and facilities should be made available to all secondary schools and the teachers that are not in ICT compliance should be encouraged to study further in order to meet up with the new demand.

Ezen (2013) conducted a study on teachers' perception and the availability on technical equipment and achievement of students in basic science and technology. The study was conducted to find out how effective teachers of basic science and technology are in using technical equipment provided in lesson to

students, to enable them improve and archived their lesson, to compare the achievements of students taught with technical equipment and students taught without technical equipment and also to find out the opinion of teachers and students on whether the introduction of practical test in basics science and technology will enhance students' achievements. 260 students and 20 teachers were randomly selected for the study from 25 secondary schools. The data collected were analyzed using frequency table, means, percentage, standard deviation, t-score and Pearson product moment correlation coefficient. The major findings of the study were that technical equipment provided are presently not been effectively utilized to develop the skill of the students and that the teaching of basic science and technology generally were theoretical in nature.

Ekanayake (2009) argues that due to a wide range of attributes such as spontaneous, personal, informal, contextual, portable, and pervasive and the functions such as talk, text, still camera, video, radio and the Internet, mobile phones could add a completely new dimension to the teaching and learning process. Despite the potential benefits cell phones have in the teaching of science particularly physics, their use in the secondary schools for learning could be hampered due to the fact that students are not allowed to carry cell phones to school (MOE, Sokoto, 2008). However, schools could buy some cell phones that could be used solely for learning purposes just like the conventional practical equipment. Also qualified and professional physics teachers, ICT tools availability, teachers' competence in utilizing the tools and teachers' perception are keys in to the achievements of senior secondary school physics. Most of the research finding revealed that teachers' perception of new technology is influenced by learning experience while some of the studies found otherwise (Ekanayake, 2009).

Udoh (2010) 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, participant 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 physics teachers should be mounted.

Ghozi, Yuniar, and Respati (2017) investigated Teachers ICT Application Competencies: A Case Study of Vocational High School in East Kalimantan Province. The study is a qualitative research based on a community service activity to enhance ICT application competencies of mathematics teachers in Vocational High School in Penajam Paser Utara (PPU) district, East Kalimantan Province (Indonesia), utilizing GeoGebra and Autograph. The study consisted of five phases: Situation analysis; Training and workshops for GeoGebra and Autograph utilization; Implementation of lesson study (LS); Data analysis and presentation; and Discussion. It was revealed from the study that, students became more motivated to learn mathematics by using GeoGebra. It was also revealed that teachers found that GeoGebra can develop students understanding of mathematics concepts easier, and that ICT competencies in teaching in vocational high school in PPU, especially in the utilization of GeoGebra and Autograph increased. It was recommended that LS should be continued to improve the effectiveness of GeoGebra and Autograph utilization in other mathematics topics.

Michael, Maithya, and Cheloti, (2016) investigated the influence of teachers' competency on the integration of ICT in teaching and learning in public secondary schools in Machakos County. The sample of twenty-one (21) secondary school head teachers and one hundred and twenty-six (126) teachers was used in the study. Questionnaire was used in collecting data for the study. The data collected were analyzed using descriptive and inferential statistics. The study established that majority of the head teachers and teachers had basic ICT literacy while only a few head teachers and teachers integrate ICT in teaching and learning due to their limited competency in ICT skills. The study findings showed a significant relationship between teacher competency and ICT integration. The study recommended that there is need for secondary school teachers to be trained in ICT integration in their subject areas in teaching and learning. The study also recommended that the Ministry of Education should ensure that all teachers train in ICT so as to acquire skills for teaching and learning.

Luambano and Nawe, (2004) found that the major barriers to efficient Internet use by students include slowness of the server and payment for the access time. Luambo and Nawe (2004) also observed that the slow Internet connections attributable to small bandwidth was a major factor hindering Internet access and use in Africa. Aguolu and Aguolu (2002) therefore identified five major possible types of inaccessibility which include conceptual, linguistic, critical, bibliographic, and physical inaccessibility. However, the availability of information does not imply that such information is readily accessible for utilization by users who need them. Under these circumstances, it could be

necessary to examine the perception of physics teachers toward utilization of ICT tools in senior secondary schools.

Statement of the Problem

The important role that ICT plays in education in enhancing access, equity, relevance and quality of education cannot be over emphasized. The act of integrating information and communication technology in teaching and learning is a complex process, which depends on a number of factors, amongst which include teachers perception, teachers' competence in the use of ICT tools, the extent to which teachers utilized ICT tools for teaching and learning physics amongst others. Furthermore, most of the researches have been conducted in developed countries and not much has been done in Nigeria and Sokoto in particular. Few correlational studies were reported in the study area. Thus this study will help in filling the above gaps by focusing on physics teachers' perception and utilization of ICT tools for teaching and learning senior school physics in Sokoto metropolis.

Objectives of the Study

The main objectives of this study was to determined physics teachers' perception and utilization of ICT tools for teaching and learning senior school physics in Sokoto Metropolis. Specifically the study investigated:

1. the relationship between teacher's perception and ICT utilization for teaching and learning physics.
2. the relationship between teachers' competence level and ICT utilization for teaching and learning physics.
3. the relationship between teachers' competence level and teachers' perceived usefulness of ICT tools for teaching physics

Research Questions

The following research questions were raised and answered in this study:

1. What is the relationship between teachers' perception and ICT utilization for teaching and learning physics?
2. What is the relationship between teachers' competence level and ICT utilization for teaching and learning physics?
3. What is the relationship between teachers' competence level and teachers' perceived usefulness of ICT tools for teaching and learning physics?

Methodology

The survey design was employed in this study. The population of this study comprises all secondary schools teachers in Sokoto metropolis (public and private schools). Fifty (50) physics teachers were sampled for this study across all the secondary schools within the metropolis. Physics Teachers ICT Utilization Questionnaire (r=0.86) was used to collect information from physics teachers. During the study, the researcher requested for permission to assess the computer laboratory in order to note the availability of computers present, the ICT tools available. The Physics Teachers ICT Utilization Questionnaire (PTUQ) was administered to Physics teachers on the same day of the visit. The resulting data collected were analyzed using Pearson Product Moment Correlation at 0.05 level of significance.

Results

Demographic Data of Respondents'

Research Question 1: What is the relationship between teacher's perception (TP) and ICT Utilization (ICTU) for teaching and learning physics?

Table 1: Relationship between TP and ICTU in physics

Variables	N	Mean	R	*p*-value	Decision
Teacher Perception	50	66.37			
			0.07	0.65	Not rejected
ICT Utilization	50	52.30			

p > .05

Since the p-value is 0.65, which is greater than .05 therefore hypothesis one was not rejected. Hence there was a significance relationship between teachers' perception and ICT utilization for teaching senior school physics.

Research Question 2: What is the relationship between teachers' competence (TC) and ICT Utilization (ICTU) for teaching physics?

Table 2: Relationship between teachers' competence and ICT utilization for teaching and learning physics

Variables	N	Mean	R	*p*-value	Decision
TC	50	67.44			
			0.52	0.00	Rejected
ICTU	50	52.30			

$p<.05$

Since *p*-value is 0.00 which is less than 0.05, therefore hypothesis was rejected. Hence there is significance relationship between teachers' competence and ICT utilization for teaching Physics.

Research Question 3: There is no significance relationship between teachers' perception and their competence in utilizing ICT tools?

Table 3: Relationship between teachers' perception and their competence in utilizing ICT tools for teaching physics.

Variables	N	Mean	R	*p*-value	Decision
TP	50	66.37			
			0.40	0.00	Rejected
TC	50	67.44			

$p<.05$

Since p-value is 0.004 which is less than 0.05, the hypothesis is rejected. Hence there is significance relationship between teachers' competence and teachers' perception in the usefulness of ICT tool for teaching and learning of physics.

Discussion of Findings

The study found that physics teachers in Sokoto metropolis have good perception towards utilization of ICT tools for teaching physics. This could be as a result of the importance of ICT, and emphasis to integrate it for teaching and learning. Teachers use of mobile phones such as android and i-Phone which have user friendly applications and software could also improved their competency in the use of ICT. Also, the necessity to integrate the virtual classroom teaching during the COVID-19 pandemic era has forced physics teacher to acquire adequate competency in the use of ICT tools. Hence, there was no significance relationship between teachers' perception and utilization of ICT tools for teaching Physics. This may hold for the sample of this study but may likely be debunked by other sample. This finding is in agreement with the finding of (Ekanayake 2009) that teachers' of new technology has influenced their use.

With regard to physics teachers' competence in the use of ICT tools for teaching and learning secondary school physics, the study found out that physics teachers in the Sokoto metropolis are competent in the use of ICT tools for teaching senior school Physics. The frequent use of ICT tools for personal and teaching activities could have improved teachers' competency in ICT use. The availability of ICT and e-library facilities in most secondary schools could be a challenge to the physics teacher to continually seek for knowledge of ICT tools for teaching. This contradicted the finding of Udoh (2010).

The study found that physics teachers with good perception also have good competence utilization of ICT tools for teaching senior school Physics. It is obvious that when you concept useful you build positive interest acquiring more knowledge on the concept. The global demand of the integration of ICT and its evident of positive influence on teaching and learning could have established the good relationship of teachers' perception and their competence of use. Hence, teachers' perception has a relationship with teachers' competence in utilizing ICT tools for teaching senior school Physics. This result was due to the facts that the sample teachers were provided with ICT tools by Sokoto State Government. This finding is similar to the finding of Michael, Maithya, and Cheloti, (2016).

Conclusion

The study investigated the physics teachers' perception and utilization of ICT tools for teaching of senior school physics in Sokoto metropolis. The study concluded that teachers' perception and teachers' competence significantly influenced ICT utilization.

Recommendations

The following recommendations were put forward:

1. Physics teachers should develop positive perception towards ICT tool utilization for teaching senior school Physics.
2. Physics teachers should have knowledge of know-how to utilized ICT tools for teaching senior school physics.
3. There should be provision of good ICT tools needed by the school administrator for teaching senior school Physics.

References

Adeyemo, S. A. (2010). The impact of information and communication technology (ICT) on teaching and learning of physics. *International Journal of Educational Research and Technology (IJERT), 1* (2), 48–59.

Akinfolarin, A. V., & Rufai, R. B. (2017). Extent of information and communication technology (ICT) utilization for students' learning in tertiary institutions in Ondo State, Nigeria. *IJARIIE, 3*(3), 2369-2376.

Bransford, J., Brown, A., L., and Cocking, R. (2000). *How people learn: brain, mind, experience and school (2nd ed.)*: National Academy press. Washington, D. C.

Ekanayake, T. M. S. (2009). *Mobile phones for learning science*: Retrieved on 4th April 2009.

Ekee, P. (2010). *The importance of physics to man and society*. Retrieved from

Ertmer, P. A. (1999). Behaviourism, cognitivism, and constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 6*(4), 50-72. Retrieved from

Ghozi, S., Yuniar, R. J. & Respati, S. W. (2017). Improving teachers ICT application competencies: A case study of Vocational High School in East Kalimantan Province. *Southeast Asian Mathematics Education Journal*, *7*(2), 81- 90.

Jegede, S. A. (2008). Enriching physics education in Nigeria towards enhancing a sustainable technological development. *Greener Journal of Educational Research, 3*(2), 80-84.

Luambano, I., & Nawe, J. (2004). Internet use by students of the University of Dares Salaam. *Library Hi Tech News, 10*(1), 13-17.

Mankilik, M. & Ofodile, U. C. (2015). Effects of hybrid active learning strategy on secondary school students' understanding of direct current electricity concepts in Nigeria. *International Journal of Learning, Teaching and Educational Research, 3*(2), 77-87.

Michael, F. M., Maithya, R., & Cheloti, S. K. (2016). Influence of teacher competency on integration of ICT in teaching and learning in public secondary schools in Machakos County. *Journal of Education and e-Learning Research, 3*(4), 143-149.

Nigerian Educational Research and Development Council, (2009). Senior secondary school Physics curriculum: for SS1-3. Lagos: *NERDC Publisher.*

Omosewo, E. O. (2009). Views of Physics teachers on the need to train and retrain Physics teachers in Nigeria. *An International Multi-Disciplinary Journal, 3*(1), 314-325.

Sokoto State Ministry of Education (SSMOE), (2008). Analysis of Education Sector, Sokoto State Ministry of Education.

Udoh, O. A. (2010). Influence of teacher competence and availability of resources on the application of ICT to the teaching of Physics in Senior Secondary Schools in Akwa Ibom. *Multidisciplinary Journal of Research Development*, *15*(4), 1-8.