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In-depth and systematic study of level of knowledge, skills and utilization of information and communication technologies (ICTS) among secondary school physics teachers

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Abstract
The study examined the level of knowledge, skills and utilization of Information and Communication Technologies (ICTs) among secondary school physics teachers in Bunza Zonal Education, Kebbi State, Nigeria. The population used was twenty (20) Physics teachers and sample size of twelve (12) teachers was purposively selected from the population of the schools where ICT facilities were available. The inventory was administered to the teachers in ICTs enabling environment. Data were analyzed using IBM SPSS version 22. The result indicated that most of the Physics teachers were fairly able to use Microsoft words and Internet facilities in teaching and learning. However, their level of ICTs knowledge, skills and utilization of Microsoft Excel and PowerPoint in teaching and learning were very poor. Therefore, there is need for both Federal Government and State Government to innovate more programmes that would equip the teachers to have adequate knowledge of using ICTs in and outside the classroom.

Keywords: ICT, knowledge, skills, utilization, physics teachers

1. Introduction

Information and Communication Technologies have affected the modern ways of thinking, acting, workings, learning, sending and receiving information. ICT had and is continue to penetrate all boundaries, fences, and buildings and has turned the whole world into a small village. Education and research has affected the most. The acronym "ICT" simply stands for information and communication technology. ICT is seen by Kola (2013) [15] as an umbrella term that includes any communication device or application. He added that it comprises of radio, television, cellular phones, computers, networks, hardware and software and services and applications associated with them. Pelgrum and Law (2003) [20] narrated the history that near the end of the 1980's, the term computer was replaced by "IT" (Information Technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term "ICT" around 1992, when e-mail started to become available to the general public.

Today, ICT has become an inevitably integral part of the instructional process. ICT as a strategy can make teaching and learning easy, interesting and students centered also enhances student - teacher relationship. Therefore, In 2003, at the African Summit of the world economic forum held in Durban the new partnership for African Development (NEPAD) launched the e-schools initiative, intended to equip all African high schools with ICTs equipments including computers, radio and television sets, phones and fax machines communication equipments, scanners, digital cameras, and copiers, among other things (Aginam, 2006) [4]. In a similar effort, in 2004 the federal ministry of education launched an ICT-driven project known as school Net (FGN, 2006) [9] which intended to equip all schools in Nigeria with computers and communication gadgets. Also, the Nigeria federal government has commissioned a Mobile Internet Unit (MIU) operated by the Nigerian National Information Technology Development Agency (NITDA). The MIU is a locally made that has been converted into mobile training and cyber centre equipped with ICT tools such as VSAT internet service, printers, electric generators and many more facilities. The target was to take internet service to various schools, explained (Ajayi, 2003) [5].

Furthermore, Nigeria government through National policy on education (FGN, 2014; 28) [10] committed herself in providing necessary infrastructure and training for the integration of ICT in the schools system in recognition of the role of ICT in advancing knowledge and skill in the modern world. Shedd (2004) [21] stressed that physics teachers should incorporate technology in physics classes since teaching has gone beyond traditional method. Consequently, Information and Communication Technologies (particularly, Microsoft words, Microsoft excel and Microsoft PowerPoint and Internet facilities) should therefore be integrated into the teaching and learning of physics. It is against this background that the study set to examining the level of knowledge, skills and utilization of Microsoft Words, Microsoft Excel, Microsoft PowerPoint and Internet facilities among secondary school physics teachers.

ICTs have an increasingly significant impact on all aspects of human life. ICT provides an avenue for people in all aspects of life to access and profit from the power of computer as a personal tool, to collaborate in groups and to disseminate information locally and globally. An ICT instructional method makes class interesting, lively and students centered. Zubairu (2012) [24] had this to write; there is no doubt that ICT provides productive teaching and learning in order to increase people's creative and intellectual resources especially in today's information society. In addition, Yusuf and Yusuf (2009) [23] contributed that the application of ICT in physics education had the potential for enhancing the tools and environment for physics learning since it allows

materials to be presented in multiple media.

However, despite the numerous applications of ICTs in teaching and learning, still there are some challenges militating against the proper full – scale integration of ICT in secondary schools in Nigeria. Some of the challenges include poor policies, inadequate funding, training and re-training, lack of maintenance culture, interrupted power, inadequate supply of ICT tools and corruption among others.

2. Literature Review

Integration of ICT in Physics Class

ICTs can be useful in all works of life ranging from medicine, academics, engineering, transport and so forth. However, teaching/learning is the most privileged of all fields to have found ICT applicable in solving problems (Adepoju, 2013) [1]. A great deal of research has confirmed the benefits to the quality of education, said Al-Ansari (2006) [6]. In their research on effort of ICT on education Adigun, Ajayi and Bamisile (2013) opined that there is an emerging broad contentious worldwide about the benefits that can be brought to learning institution through the appropriate use of ICTs which includes the internet, wireless network, cell phones and other communication medium. Pearson and Naylor (2006) reported that the windows of opportunity that ICT offers for the development of knowledge, economy and societies are also for education. The role of ICT in classroom is becoming prominent (Hong & Songan, 2011) [13]. Oldham (2003) [17] argued that ICT in Physics class can be interpreted under four main categories. These include finding new discoveries about physics using internet; collecting, handling and interpreting/analyzing data involved in physics using software e.g spread sheet and graphics; aiding understanding/ explanation of physics concepts by using models, simulation games, digital video and multimedia adventures; and communicating ideas through the use of presentation software such as power point, digital video, desktop publishing etc.

Unfortunately, despite all these numerous applications of ICTs in classroom, some Nigerian school teachers have remained practically stiffed to their conventional methods of curriculum delivery which reveal doubts in their efforts to gain the benefit of ICTs in education thereby improving the performance of students in physics.

Review of Related Empirical Studies

All over the world, researchers, educators and scientists have conducted ample of researches on the use, utilization, and application of ICT (as a tool or teaching strategy) by the science teachers at secondary schools level. Some of the relevant literatures are:

Utibe-Abasi (2013) [22] investigated the availability, accessibility and utilization of ICT in teaching physics in Akwa Ibom State, Nigeria. For the purpose of this study 378 physics teachers were randomly sampled from eight educational zones in the state. A structured questionnaire was constructed and used by the researcher for collection of data. The result of the study revealed that 80% of the teachers are computer literate; it also revealed that there is 90.8% availability of ICT to physics teachers for teaching. Though, the study further revealed that only 29% of respondents had little knowledge of computer software prackages (Microsoft Word, Microsoft Excel, Microsoft PowerPoint and Corel Draw). In addition to that the findings discovered that none of computer software packages was used by the teachers, indicating poor level of ICT utilization in physics curriculum delivery.

Adeuji, Balogun and Kupolati (2013) [2], investigated the utilization of ICT among trainee science teachers in Lagos State, Nigeria. The sample of the study made up 300 trainee science teachers and 100 students. Questionnaire on ICT utilization was designed and administered. Data collected were analyzed at 0.05 level of significance, the result of the study revealed that the level of ICT utilization among science teachers trainee was high, there is a positive multiple correlation among the four independent variables being measured i.e. age, gender, course and institution. Onasanya, Shehu, Ogunlade, and Adefuye (2011) [19], assessed the teachers' awareness and extent of utilization of ICT for effective science and health education in Nigeria. The research subjects were 240 science and health education teachers drawn from 40 secondary schools, randomly selected from 10 local government areas of Oyo State. Two instruments were designed by the researchers and used for the study. There are 40 items computer literacy test with reliability coefficient of 0.77 and the 20 item questionnaire on teachers' level of utilization of ICTs with Cronbach alpha measured of 0.82. Data were analyzed using weighed means scores, standard deviation and t-test. The analyses revealed that the level of computer literacy of the science teachers is low. The level of utilization of ICT resources was also found to be very low. The result of the study also showed that there was significant difference between the mean scores for male and female science teachers in their level of computer literacy and communication, and utilization of ICTs. It indicated that the males outperformed their female counterpart in both instances, although their level is very low.

Gulbahar and Guven (2008) [12] carried a research survey on ICT usage and the perception of Social studies teachers in Turkey. A survey was completed with 326 teachers who teach fourth and fifth grade at primary level. The result showed that although teachers are willing to use ICT resources, they are facing problems in relation to accessibility to ICT resources and lack of in - service training opportunities. The method employed by the researcher is convenience sampling to reach participants in the study. On the question of the relationship between teachers' use of computer related tools in the classroom and level of expertise, correlation analysis was conducted to evaluate the relationship between the level of expertise and computer related tools usage of social studies in the classroom. The result suggests that the use of ICT under the right circumstances improves educational outcomes in social studies at primary schools in Turkey.

Olokoba, Adullahi and Omosidi (2014), investigated the impact of ICT on the management and performance of secondary school teachers in Kwara State, Nigeria. 300 teachers were sampled from three Senatorial Zones in the State. Questionnaire was distributed to the sampled teachers and mean score were used to test the hypotheses. The results showed that the level of ICT utilization by teachers is very low (i.e. Teachers do not use ICT tools in their instructional activities). It also revealed that ICT training teachers received do not have desired impact on instructional usage.

3. Methodology

This study used a descriptive survey, precisely cross-sectional survey design in which quantitative methods of data collection was employed. The target population was

secondary schools Physics teachers in Bunza Zonal Education, Kebbi State, Nigeria. By considering the nature of the study, purposive sampling technique was used to select participating schools. This is in line with suggestion made by Adeyemo (2010) [3] that research on ICT should necessarily be conducted in schools where ICT facilities are available and where the users are Computer literate.

Table 1: Number of Schools and Teachers

S/N	Name of School	School Type	Teachers
1.	Government Day Secondary School, Kende	Girls	1
2.	Government Girls Secondary School, Zagga	Girls	2
3.	Government Secondary School, Bagudo	Boys	1
4.	Government Day Secondary School, Fana	Boys	1
5.	Nana Asmau Government Girls College, Kamba	Girls	2
6.	Government Girls Secondary School, Bunza	Girls	1
7.	Government Secondary school, Bunza	Boys	2
8.	Government Secondary School, Kamba	Boys	2
Total			12

Source: Secondary Schools Management Board, (SSMB), Kebbi State. (2017).

However, eight of the twenty six senior secondary schools in the selected zone offer Physics and are equipped with the needed ICT facilities. Twelve Physics teachers were purposively selected and participated fully in this research. To carry out this study, an inventory titled Information and Communication Technology **(**ICT**)** Skill Inventory **(**ICT-SI**)** developed by the researchers was administered to teachers for data collection. The structured inventory featured section A and B. Section A was used to collect information on respondents' bio data (gender, age, type of school, and name of school. Section B contains twenty five (25) items that were used to assess level of ICT knowledge skills, and utilization. The following numerical values were assigned to five categories of responses: Very Good, Good, Fair, Poor and Very Poor. The inventory was subjected to pilot test and the Cronbach's alpha coefficient of 0.79 was obtained. This inventory was administered to the teachers in ICTs enabling environment. The researchers monitored and evaluated the respondents' level of knowledge, skills and utilization of ICT demonstrated practically on Computer system, that is hands-on- activities' approach. The data collected was analyzed using statistical package for social science (SPSS) vision 22.

4. Results

Table 2: Descriptive statistics of teachers' responses

Type of ICT tool	Status of knowledge, skills and utilization	Teachers' Count	Percentage (%)
Microsoft Word (Word processing)	Very poor	2	16.67
	Poor	1	8.33
	Fair	4	33.33
	Good	4	33.33
	Very good	1	8.33
Total		12	100%
Microsoft Excel (Spread sheet)	Very poor	8	66.67
	Poor	1	8.33
	Fair	1	8.33
	Good	2	16.67
	Very good	0	0.00
Total		12	100%
Microsoft PowerPoint	Very poor	7	58.33
	Poor	1	8.33
	Fair	1	8.33
	Good	2	16.67
	Very good	1	8.33
Total		12	100%
Internet Facilities	Very poor	1	8.33
	Poor	1	8.33
	Fair	3	25.00
	Good	5	41.67
	Very good	2	16.67
Total		12	100%

Source: Field work (2018)

The table above indicated that very few Physics teachers (8.33%) had possessed good knowledge and skills of using Microsoft Words. More than one-third of the teachers (33%) were having sound knowledge, skills and could be able to utilize Microsoft Word. However, the result showed that some of the teachers had inadequate knowledge and skills to operate Microsoft Word. In the case of Microsoft Excel, the result indicated majority of the teachers (66.67%) had insufficient knowledge and skills; they could not use Excel in teaching and learning. Very few teachers possessed the good

knowledge, skills and know how to use Microsoft Excel. Similarly, majority of the teachers (58.33%) had poor knowledge and skills of Microsoft PowerPoint. The level of utilizing PowerPoint was very discouraging; in addition, the result confirmed that very few teachers could be able to enjoy the benefit of using Microsoft PowerPoint in teaching Physics. With regard to using Internet facilities, more than half of the teachers demonstrated that could utilize Internet facilities. Their levels of knowledge and skills in terms of Internet facilities are quite fair. In summary, the findings explained that Physics teachers were able to exploit Microsoft Word and Internet facilities in teaching and learning. However, the teachers had inadequate knowledge and skills to employ Microsoft Excel and Microsoft PowerPoint in teaching and learning.

5. Discussion of the Study

This study examined the level of teachers' knowledge, skills and utilization of ICT tools for effective teaching of Physics in secondary schools in Kebbi State. The investigation revealed that Physics teachers possessed fair knowledge and skills of using ICTs in teaching and particularly Microsoft Word and Internet facilities. This finding is in conformity with the findings of Beatrice, 2014 [7] and Chinwe, 2010 who found that teachers in Kenya are good on the use of word processing and Internet. However, there is need for both Federal Government and State Government to innovate more programmes that would enable the teachers to have adequate knowledge of using ICTs in and outside the classroom. This would surely help both teachers and students to have updated information; it would also increase the quality of teaching and learning. Moreover, having equipped teachers with modern ICTs knowledge and skills would certainly affect the students to have a good training that might allow them to compete with their counterparts.

Furthermore, it is unfortunate the result indicated that most of the teachers have had possessed very little knowledge and skills of Microsoft Excel and Microsoft PowerPoint. The level of utilization was very low, limited and inadequate training have blocked teachers from integrating these packages into teaching and learning. This result is similar with the findings of Okwo (2006) [16], Chief Examiners WAEC report (2009) [8] and Utibe-Abasi (2013) [22] who reported that Physics teachers in Nigeria lack technical knowledge of computers and consequently lack of appropriate skills in the use of modern ICT resources. Having understood Microsoft Excel and Microsoft PowerPoint are important application in computers that need to be used in the classroom and education. Both teachers and students can become good and proficient in any school/college subjects by using Microsoft Excel and Microsoft PowerPoint. Therefore, stakeholders need to give extensive training in the application of ICTs in teaching and learning particularly in the field of Microsoft Excel and Microsoft PowerPoint application.

6. Conclusion and Future Research

This study employed a new strategy of using inventory to systematically investigate the level of knowledge, skills and utilization of Information and Communication Technologies (ICTs) among secondary school Physics teachers. However, the results revealed that most of the secondary schools Physics teachers in Kebbi State possessed ICT knowledge, skills and could use word processing application and Internet facilities, whereas, majority of them lack adequate ICT knowledge and skills to integrate Microsoft Excel and Microsoft PowerPoint into teaching and learning. Therefore, based on these findings, the researchers recommended that government should encourage individual, group of persons private organizations to contribute on ICT related projects in secondary schools; modern ICTs facilities should be supplied frequently; teachers that are not ICT compliance should be given extensive training in order to meet up with the demand of digital era. Congruently, there is need to conduct further research due to limitation of this study. More schools and teachers need to be included; if possible the research should be extended to science teachers instead of Physics teachers alone. The quality and quantity of inventory need to be improved.

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