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The Availability of Electronic Courses Using ICT Infrastructure in Teaching and Learning among Teachers in Nigeria's TVET Institutions

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ABSTRACT

As information and communication technology becomes a regular feature of the educational environment, it may be difficult for teaching and learning activities especially in TVET institutions to remain unchallenged. However, ICT application as a pedagogical tool in Nigerian TVET institutions is not a common practice, and it also remains unclear how utilisation of ICT enhances pedagogy. This study is interested in the availability of electronic courses using ICT infrastructure in teaching and learning. Using activity theory as a guide, multiple case studies are conducted. The Qualitative Case Study Methodology is used in this research. Five TVET institutions and 20 participants are selected using maximum variation and homogeneous purposive sampling strategies, respectively. During the visits to the institutions, classroom observation is carried out, documents such as the curriculum and teacher's lecture materials are reviewed for triangulation. Semi-structured interviews are conducted with 20 selected participants as the primary data collection method. At the data analysis stage, the inductive and deductive methods are used to analyse the data, and two strategies of grounded theory as open and axial coding are employed. The coding process is achieved through the use of an inherent feature of NViVO10. The findings show that four themes: availability of infrastructure, computer specifications, educational software and connectivity.

Keywords: Availability, ICT infrastructure, qualitative research, TVET Institution

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INTRODUCTION

The governments of various nations, non-governmental organisations and academic institutions around the world have made

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significant investments in computer-based information technology to support the teaching and learning process (Webb, 2007). Such investments are made to enhance the quality of education and learning, which in turn gives students a better chance of participating in the 21st-century learning environment. Information and communication technology (ICT) makes available valuable tools for achieving excellence in the teaching and learning process (Intel Corporation, 2007). ICT include computers, LCD projectors, software and the Internet, among others. Osakwe (2010) believed that such facilities are the most significant tools in teaching and learning.

This study intended to examine and understand how teacher's utilisation of ICT influences pedagogical practice within the four walls of the classroom. This research focussed only on the teaching and learning of electronic courses to keep the study manageable. Pedagogical practices signify numerous strategies used in different combinations for improving student learning outcomes. According to Jaji (2008), no one approach is appropriate for all teaching situations. The term 'influence of ICT' in this research work refers to the effect of technology on pedagogy to enhance teaching practices as well as the learning process. The teachers' role is of paramount importance because they are the ones who ensure that lesson objectives are met (Farhat, 2008).

It is the teacher who decides on the appropriate software to be used to achieve the lesson objectives. Teachers need technological skills and the commitment to ensure effective teaching and learning using ICT in educational institutions (Almadhour, 2010). Thus, it is essential for teachers to understand issues concerning ICT and their effect on pedagogical activities so that they will be able to utilise ICT as a pedagogical tool. Hence, the need to explore and understand in detail how ICT influences pedagogy in the teaching of electronic courses is necessary.

In view of the tremendous effort by the federal government of Nigeria towards the successful use of ICT in teaching and learning, the government formulated several policies with lofty goals. One was to encourage teachers to develop a sense of confidence in using the computer to solve teaching and learning challenges. Between the year 2007 and 2013, the federal government of Nigeria tripled the allocation for education from N224 billion to N634 billion. As a result, the government was able to distribute and install computers in some schools and establish ICT centres in all Nigerian universities (Jegede, 2009). This effort was intended to change pedagogical practice in TVET institutions.

The implementation of ICT in Nigerian TVET institutions, especially in the field of electronics, is necessary if teachers and their students are to participate in the learning environment of the present century. According to Jaji (2008), ICT has impacted teaching and research in Nigerian schools. However, one strident complaint is that the development of ICT has not been

accompanied by growth of ICT integration in the classroom (Jaji & Abubakar, 2012). Consequently, teachers cannot implement ICT in education as a pedagogical tool because they are not competent in basic computer operation (Igbuzor, 2008). It is evident that there has been little application of ICT in the TVET sub-sector in 52 African countries including Nigeria (Farrell et al, 2007).

The types of ICT facility available in Nigerian TVET institutions, how teachers access and utilise the available facilities and how the use of ICT enhances their pedagogy also remains unclear. This signifies that the use of ICT, particularly in the teaching of electronic courses, is minimal. However, the reasons for this low use of ICT in electronic courses are not well established by research. As a result of the shortcomings in the Nigerian education system and the discrepancies in various research findings, there is doubt as to whether the existing TVET institutions in Nigeria are utilising ICTs as a pedagogical tool. It may be said, therefore, that such important issues have not been given due attention by researchers as study in this area is limited. In the same vein, it makes sense to state that the use of ICT as a pedagogical tool in Nigerian TVET institutions, particularly in the field of electronics, is not a common practice. Perhaps, this strongly suggests that current pedagogical practices using information and communication technology in Nigerian TVET institutions need complete revision.

ICT AND EDUCATION

Almost 20 years into the 21st century, established academic institutions struggle to keep up with different challenges as a result of new technology (Webb, 2007), signalling the need for students to learn how to seek out new information to meet the challenges of today's dynamic learning environment. New technology has potential for knowledge distribution (Baskin & Williams, 2006). As pedagogical content differs from one subject to the other, the choice and use of ICT resources will differ for the educational practices of the different subjects, which have different concepts. However, teacher beliefs and attitudes and their confidence in using ICT remain relevant in the pedagogical adoption of ICT. Teacher use of ICT in the teaching process depends on the organisational contexts in which teachers live. There is a need for pedagogical reasoning that provides teachers opportunities to connect with their schools through constant access to ICT infrastructure. According to Barakabitze (2014), students' perceptions change when they are exposed consistently to the capabilities of ICT.

Teacher beliefs include the understanding that ICT is an important foundation stone for expressing concepts of the teaching process (Barakabitze, 2014). One participant in a study stated that once teachers use ICT, it is possible for students to develop better skills in ICT, and that most teachers perceive ICT as being beneficial

because it makes the teaching process easier. Hennessy, Harrison and Wamakote (2010) reported that there are a lot of factors hindering teachers' successful use of ICT in the teaching process. Among others were lack of expertise in using ICT, lack of technical support in schools and lack of incentives and support for teachers.

The situation is the same in the Nigerian context. Among the barriers to ICT integration in Nigerian universities were low confidence among teachers in using ICT and low teacher competency due to lack of time for training (Yusuf, 2005a). Education institutions cannot survive in the face of such challenges. According to Hennessy, Harrison and Wamakote (2010), it is necessary for teachers to determine which ICT applications specifically have additional value for their pedagogical practices.

Understanding Pedagogy

Pedagogy is a structured process in which a culturally more experienced teacher uses helpful tools to mediate or guide a learner into reliable ways (Hardman, 2007). Hardman stressed that pedagogy refers to any conscious activity designed by one person to bring about learning in another and which is capable of providing motivation and ensuring a successful student journey to a particular productive end. However, no common approach suits all teaching and learning situations. Competent teachers must use different strategies in various combination to teach a diverse group of learners to improve their learning outcome (Bhowmik, Banerjee, & Banerjee, 2013). There is a need to develop active pedagogy by creating a student-centred learning environment that will encourage and ensure students support as they take control of their learning (Ruthven, Hennessy, & Deaney, 2005).

It is also the teacher's responsibility to ensure that all students are engaged intellectually regardless of their background. Using a balanced theoretical framework teachers will be able to reflect critically on their work with colleagues; this is termed 'productive pedagogy'. According to Bhowmik et al. (2013), pedagogy should incorporate strategies that support intellectual engagement, recognise learner differences and support classroom environment across subjects and key learning areas. Therefore, pedagogical practices should be a concern for teachers, school administrators, education systems and local communities.

ICT IN THE TEACHING OF ELECTRONICS

If teachers in technical and vocational education are to be part of today's dynamic learning environment, then training and retraining in ICT skills is inevitable (Hooker et al., 2011). ICT helps in lesson delivery and makes education and information accessible to whomever needs it. Considering several disciplines within the TVET programme, ICT facilities should be used to support the teaching and learning process (Chukwuedo & Omofonmwan, 2013). These include electrical/electronic

technology, semiconductor devices, circuit theory analysis, electrical installation, digital logic circuits, electrical devices and machines and electronic communication, among others.

Teaching and learning in the TVET programme cannot be restricted to the traditional classroom setting, especially in the teaching of electrical/electronics, but should adopt acceptable technological dynamism to become productive in the teaching process through the use of ICT (Chukwuedo & Omofonmwan, 2013). In the process of ICT utilisation, one study found that the student participated actively and paid maximum attention and their interest rose rapidly in the learning process (Ambikairajah, Sheng, Celler, & Che, 2005). Considering the abstract nature of notions such as frequency, voltage and electrical current, students needed animation simulation and measurements to be able to observe these concepts as processes in order to be able to explain and describe the abstract content for deep understanding (Fedak & Bauer, 2005). There are different types of simulation software. Multisim is one of the most commonly used.

METHODOLOGY

The Qualitative Case Study Methodology was used in this research. Five TVET institutions and 20 participants were selected using the maximum variation and homogeneous purposive sampling strategies, respectively. All the participants were lecturers. During the visits to the institutions, classroom observation was carried out and documents such as the curriculum and teachers' lecture materials were reviewed for triangulation. Semi-structured interviews were conducted with the 20 participants as the primary data collection method. At the data analysis stage, the inductive and deductive methods were used to analyse the data and two strategies of grounded theory as open and axial coding were employed. The coding process was achieved through the use of an inherent feature of NVivo10. Despite the positive influence of ICT on pedagogical practices, the cross cases highlighted that ICT has an adverse impact on student ethics. ICT enables teachers to have greater control over their lesson preparation and delivery through the use of simulation software, helping teachers to make abstract concepts more concrete for students to understand more easily.

A technical and vocational institution was the first visited in the course of this research. The institution is one of the two technical and vocational colleges in Northeastern Nigeria. It is an institution located just one 198 km away from a town where the researcher is based. The institution is situated in a prime location of the state capital and is accessible by road. The students of the institution are admitted from different parts of Nigeria. The institution was first visited on 23 April, 2014. The institution has four different schools, specialising in technical education, vocational education, business education and science education. Therefore, the institution provides skills training in several

disciplines based on the needs of individual students, their parents and the community as a whole. The School of Technical Education has five departments, including electrical/electronic studies, mechanical metalwork and carpentry. The institution issues the National Certificate in Education (NCE); four of the participants comprising two academic staff and two students were from the electrical/electronic department.

The first participant to be interviewed was 49 years old and had been teaching for 20 years. He had taught electrical courses for 12 years as an NCE graduate and eight years in the present institution, where he was teaching NCE I, NCE II and NCE III. The participant had been using ICT facilities as a pedagogical tool for almost four years. In the current semester, he was teaching one NCE course, TED 123, which was on magnetism and electromagnetism. Among the ICT tools he used in teaching activities were a laptop, an LCD projector and PowerPoint presentations.

The second teacher who was interviewed was 38 years old and had been teaching electrical courses for 12 years as an NCE graduate. The teacher worked at the secondary school level for almost two years before working at the present institution, where he had been teaching NCE I, II and III. In the current semester, he was teaching a course on semiconductor materials in the NCE II programme. He had been using ICT as a pedagogical tool to teach for almost six years. The students who were interviewed were from two classes of the NCE I and II programmes.

RESULTS AND DISCUSSION

During the semi-structured interview, a good number of issues regarding ICT and its utilisation as a pedagogical tool in the teaching of electronic courses emerged. These issues are presented below.

Availability of infrastructure

Availability of ICT infrastructure in this institution was considered a prerequisite for the efficient utilisation of ICT as a pedagogical tool; hence, the need to pay maximum attention to the availability of ICT facilities in this institution was emphasised. Data obtained from both the interviews and observation conducted in this institution show that both teachers and students are in favour of using ICT. The first teacher interviewed stated that the institution has four different centres equipped with ICT and the management restricted computer labs for use by the computer department, but teachers from other schools sometimes used the computer labs as well. The participants stated that the ICT centre as well as the Centre for Educational Technology (CET) were for general use. The institution also has a virtual library that allows lecturers to use a smart board. In addition, all academic staff were given a laptop for office use.

> Using ICT facilities is actually encouraging because of the multimedia involved; if you are teaching abstract concept there is need to try using various technologies to make it more concrete to the student. So when I am teaching a concept, I try as much

> as I can to make it three dimensional using ICT. Though the institution has scheduled the computer lab for the computer department only, we also sometime make arrangements to use it, while the ICT Centre is for general use and the Centre for Educational technology is also scheduled for general use.

The participant further revealed that using ICT made his lesson on electronic concepts interesting and allowed him to make abstract concepts more concrete for students helped them understand the concepts better. Using ICT to teach also allowed him to get his students to understand concepts more quickly. He added that previously, before he had started to use ICT in his teaching, it had been difficult to get students to grasp these abstract concepts quickly. With the help of ICT, teachers could make some of the concepts three-dimensional so that students could capture the main idea. Another teacher was also in favour of using ICT as a pedagogical tool, and confirmed that the institution had several ICT centres.

Computer specifications

According to one interviewee, ICT centres were not specifically for the institution's electronic department. The participant added that one of the centres belongs to the computer department while the remaining four were for the whole institution. When lecturers conducted practical sessions, they made arrangements with the computer department. Indeed, such access to the available ICT facilities suggested to the researchers that there was no ICT centre in the electrical/electronic department. The participant further revealed that teachers sometimes used their personal ICT resources such as laptop and LCD projector to teach:

> I use a digital projector, laptop, and at times my galaxy note to show students in the class. Mostly, I use to come along with my equipment, including generator if I do anything of such because of the nature of our national grid that is not steady. I used to come with my personal ICT equipment, I come with my projector for the teaching purpose.

According to the participant, to successfully achieve his lesson plan, he went to class with his personal ICT equipment such as LCD projector, laptop and electric generator. He also had the required software installed on his computer. Oviawe and Oshio (2006) reported that educational institutions in Nigeria lack computers and other related ICT facilities for effective teaching and learning.

Educational software

One participant stated that educational software has a category of resistors, capacitors transistors and integrated circuits (IC). During practical lessons, lecturers picked components available on the software. Most of the time they used the electronic work bench and designed and simulated circuits; if there were problems they would try to fix it immediately. The teacher revealed that they used simulation

software to make designs using categories of components featured on the software.

> We use the electronics software to teach the students, such as software featuring an electronic work bench to design and simulate circuits. I install it on my system, and I usually project it on the white board to make the designs, using categories of resistors, capacitors, transistors, IC etc. Then, we pick and draw with it, for the students to see the circuit diagram and then we stimulate it and test run it on the board. If there's any problem or any error somewhere, we then try to fix the problem immediately.

As the interview was the main source of data gathering in this study, students were also interviewed. Among other things discussed was the issue of ICT infrastructure available in their institutions. The first student interviewed pointed out that the institution has two ICT centres, one computer laboratory and one digital library that has two different sections. The participant added that each section of the virtual library has 25 computers.

During observation, some of the ICT centres were visited. The presence of suitable hardware and software is a pre-requisite for the utilisation of ICT in teaching and learning. The first centre visited was a computer lab, and it was noted that there were 22 Asus brand computers in the lab that were each installed with Windows XP operating system and had a 500-MHZ processor, a 10-GB hard drive, 64-MB RAM and a 14-inch flat screen monitor. The second centre was an ICT centre that was equipped with 30 HP brand computers that were each installed with Windows 7 and had a 500-GB hard drive, a 2-GB Ram, a 2.4-GHz processor, a wireless card and an MM Card Reader. The computers were also equipped with CD/DVD-Combo hardware, a 17-inch flat screen monitor, an HP mouse and a USB extended keyboard. The centre's virtual library accommodated a total of 40 computers in its two sections.

The institution also had an educational technology centre that had 20 computers. During the interviews, participants stated that all the facilities were found in various computer centres within the institution. It was noted during observation that none of the classrooms were equipped with computers. Of the computers in the institution that were shown to the researchers, 19 desktop computers were not in good working condition.

Connectivity

One participant stated that there was no computer in the classroom and during lessons, teachers would use their laptop and LCD projectors. This was indeed noted during a classroom observation.

> We have two ICT centres, one computer centre and a virtual library with two sections. All the computers are in the computer centre; our teachers always come along with their laptop and LCD projectors to the class because in my class there are no ICT facilities fixed because other courses might not require the use of ICT. But we have centres

> where these facilities are fixed for us to use.

The participants added that their institutions had two centres that had 40 computers, and these computers were connected to the Internet, while an additional 50 were connected to the local area network (LAN). During observation, it was noted that peripheral devices were located at various places in the institution such as the head of department's office, the computer centres, the ICT centres and the educational technology centres. The devices included a scanner and printer. Yusuf (2005) reported that one of the challenges inhibiting successful use of ICT in education was limited infrastructure such as poor Internet connectivity and inconsistent power supply. Photocopiers were located in either the Dean's office or the Examination Office, while equipment such as LCD projectors were permanently fixed in the major halls and also in various ICT and computer centres.

The interviews revealed that some of the teachers were making use of software such as the electronic workbench for simulation and design, which enabled them to design circuits using components available in the software that allowed them to simulate the circuit. They did not use educational software to replace the workshop, but rather they used it to turn assignments into lab procedure in order to encourage students to continue learning after class hours. Participants further elaborated that they used an LCD projector and whiteboard. According to one of the participating teachers, different circuit designs were done to help students to better understand the concepts. The following was stated by the second teacher interviewed:

> So we use electronics software to teach the students. I use it in practical lessons. I have it installed on my system and project it on a whiteboard to show the circuit designs we have made. The software has different categories of resistors, capacitors, transistors and ICs. We pick any component to draw with it. They see the circuit diagram when we simulate it. Then we test run it on the board using the software. If there are any problems or any errors somewhere we can see them and then we try to fix them.

It was obvious during classroom observation that teachers used LCD projectors, laptops, mutism, circuit makers and MS-Excel for design to teach their students. The courses taught using these included TED 123, titled Magnetism and Electromagnetism, which was a course for NCE I students, and TED 223, titled Electronic Devices, which was a course for NCE II students. The teachers delivered their lessons using PowerPoint presentations and used LCD projectors and laptops. Ndibalema (2014) stressed that there is a lack of supporting materials for each learning unit. The participants appreciated the use of ICT in teaching and learning. They further revealed that their teachers had been using these facilities for instructional delivery and would display everything on the whiteboard and instruct

students to use the facilities to teach their course-mates. The students learnt better when they had to teach their course-mates. One of the students who was interviewed said:

> We were taught digital electronics, in which we learnt about the principle of operation of flip-flops, we were taught using PowerPoint slides, which the teachers used to present the lessons. This allowed us to see the operational principle of how flip-flops operated. This was done last year. In the present semester, we learnt about magnetism and electromagnetism.

The participant further explained that the students faced challenges that included inadequate ICT facilities, especially computers. Secondly, they lacked a strong and reliable Internet service that could support new information search.

CONCLUSION

This paper discussed briefly the availability of ICT infrastructure in Nigeria's TVET institutions. It looked at the use of ICT in the teaching and learning of electronic courses. The study revealed four themes as discussed above: availability of infrastructure, computer specifications, educational software and connectivity.

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REFERENCES

Almadhour, B. (2010). *The integration of information and communication technology into secondary technology teachers' pedagogy in New Zealand.* (Doctoral thesis). Auckland University of Technology, New Zealand.

Ambikairajah, E., Epps, J., Sheng, M., Celler, B., & Chen, P. (2005, March). Experiences with an electronic whiteboard teaching laboratory and tablet PC based lecture presentations [DSP courses]. In *Acoustics, Speech, and Signal Processing, 2005. Proceedings.(ICASSP'05). IEEE International Conference on* (Vol. 5, pp. v-565). IEEE.

Barakabitze, A. A. (2014). The context of education initiatives, importance and inhibitors of ICTs towards improving teaching and learning in Tanzania: A critical literature review. *Information and Knowledge Management, 4*(10), 83–97.

Baskin, C., & Williams, M. (2006). ICT integration in schools: Where are we now and what comes next. *Australasian Journal of Educational Technology, 22*(4).

Bhowmik, M., Banerjee, B., & Banerjee, J. (2013). Role of pedagogy in effective teaching. *Basic Res J Educ Res Rev, 2*(1), 1–5.

Chukwuedo, S. O., & Omofonmwan, G. O. (2013). Information and communication technology: The pivot of teaching and learning of skills in electrical and electronics technology programme in Nigeria. *International Journal of Vocational and Technical Education, 5*(6), 117–123.

Farhat, N. (2008). *The impact of technology on teaching and learning in high schools in the United Arab Emirates*. (Doctoral thesis). University of Leicester, United Kingdom.

Farrell, G., Isaacs, S., Trucano, M., Hamdy, A., Hare, H., Tetang Tchinda, J., & Fall, B. (2007). Survey of ICT in education in Africa. *Country Reports, 2*(53). Retrieved from http://www.infodev.org/en/Publication.353.html

Fedak, V., & Bauer, P. (2005, September). E-learning in education of electrical drives and power electronics: Opportunities and challenges. *International Conference on Electrical Drives and Power Electronics*, 26–28.

Hardman, J. (2007). An activity theory approach to surfacing the pedagogical object in a primary school mathematics classroom. Outlines. *Critical Practice Studies, 9*(1), 53–69.

Hennessy, S., Harrison, D., & Wamakote, L. (2010). Teacher factors influencing classroom use of ICT in sub-Saharan Africa. *Itupale Online Journal of African Studies, 2*(1), 39–54.

Hooker, M., Mwiyeria, E., & Verma, A. (2011). ICT competency framework for teachers in Nigeria. World Bank and GESCI initiative.

Igbuzor, O. (2008). The state of education in Nigeria. *A keynote address delivered at a round table organized by civil society action coalition on education for all* (CSACEFA).

Intel Corporation (2007). *White paper bridging the digital divide in Nigeria*. All rights reserved. Retrieved on 2014, June 18 from www.intel.com/worldahead.

Jaji. (2008). Trends and barriers on the integration information and communication in the Nigerian school system, *Nigerian Journal of Technology Teacher Education, 1*(1), 101–110.

Jaji & Abubakar (2012). The effect of instructional technology on teaching and learning in Nigerian secondary schools. *Nigerian Journal of Technology Teacher Education, 3*(1), 137–143.

Jegede, P. O. (2009). Assessment of Nigerian teacher educators' ICT training. *Issues in Informing Science and Information Technology, 6*, 415–420.

Ndibalema, P. (2014). Teachers' attitudes towards the use of information communication technology (ICT) as a pedagogical tool in secondary schools in Tanzania: The case of Kondoa district. *International Journal of Education and Research, 2*(2), 1–16.

Osakwe, N. R. (2010). The influence of information and communication technology (ICT) on teacher education and professional development in delta state, Nigeria. *Asian Journal of Information Technology, 9*(5), 280–285.

Oviawe, J. I., & Oshio, L. E. (2011). Impact of information and communication technology on teaching and learning ability of education students in universities in Edo State, Nigeria. *International Review of Social Sciences and Humanities, 2*(1), 126–133.

Ruthven, K., Hennessy, S., & Deaney, R. (2005). Incorporating Internet resources into classroom practice: Pedagogical perspectives and strategies of secondary school subject teachers. *Computers and Education, 44*(1), 1–34.

Webb, I. (2007). *Key factors in the use of ICT in primary classroom*. Doctoral thesis. University of Tasmania, Australia.

Yusuf, M. O. (2005a). Information and communication technology and education: Analysing the Nigerian national policy for information technology. *International Education Journal, 6*(3), 316–321.

Yusuf, M. O. (2005b). An investigation into teachers' self-efficacy in implementing computer education in Nigerian secondary schools. Meridian: A middle school. *Computer Technologies Journal, 8*(2), 4.