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Assessment of Teachers' Pedagogical Knowledge on the Utilization of Information and Communication Technology in Kwara State, Nigeria

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ABSTRACT

The study investigated teachers' pedagogical knowledge of utilization of Information and Communication Technology in Kwara state, Nigeria. A structured questionnaire was used to examine the availability of ICT tools, teachers' pedagogical knowledge on the utilization of ICT tools, and the frequency of utilization of ICT tools for teaching. In total, 273 out of 333 teachers responded to the questionnaire. Three research questions were raised and answered. Standard deviation and mean scores statistical measures were used to answer research questions1-3.The study revealed that most ICT tools were not available for teaching; the few available ones are not frequently used; while teachers had low pedagogical knowledge of the use ICT tools for teaching. Based on the findings, it was recommended that government and non-governmental organisations should endeavour to procure and distribute relevant Information and Communication Technologies to schools for effective teaching and learning purposes. Also, educational administrators should provide enabling environments within the school setting to aid frequent use of ICT for instruction. Similarly, specialised training should be organised to improve teachers' pedagogical knowledge of ICT tools for instructional purposes.

Keywords: *Pedagogical Knowledge Utilisation; Information and Communication Technology; Technological tools.*

INTRODUCTION

Knowledge explosion has brought a lot of development to learning through myriads of media which has led to an upgrade of human knowledge in the 21st Century. The role of Information and Communication Technologies (ICT) in sustaining education cannot be overstated due to its importance in both teaching and learning. Effective integration of ICT plays an important role in improving the quality of instruction delivery within and outside the classroom. Yusuf (2005) posited that no country can claim to be educationally advanced unless it embraces technology for its educational activities. ICT as tools within the school environment include use for school administration and management; teaching and learning of ICT related skills to enhance class work presentation; teaching/learning repetitive tasks; teaching/learning intellectual thinking and problem solving skills; stimulating creativity and imagination; for research by teachers and students, and as communication tool by teachers and students (Collis & Moonen, 2001; Derbyshire, 2003). Teachers

are professionally trained to bring about desirability, effectiveness and efficiency in instruction for the learners. Olakulehin (2007) emphasizes that the pedagogic application of ICT involves effective learning with the aid of computers and other information technologies as learning aids, which play complementary roles in the classroom, rather than supplementing the teacher. ICT, if effectively deployed can provide better access to educational resources; improve the quality of learning, and teachers' productivity (Basargekar & Singhavi, 2017).

The central role of ICT in effective teaching and learning has made its adoption imperative for teachers in teaching situations as a result of an increase in the student population. However, Eze and Aja, (2014) opined that despite the benefits derived from the use of ICT in teaching and learning, their usage especially in secondary schools is still low as teachers and school management are yet to fully embrace and utilize them for instructional purposes. Teachers' inability to adopt and utilise ICT for teaching in Nigerian secondary schools is one of the problems militating against effective implementation of the secondary education curriculum. Kabiru and Sakiyo (2013) attested to lack of teachers' awareness on the utilization of ICT and their apathy to new innovation as a contributing factor hindering the use of ICT for instructional purposes. Similarly Khan, Hassan and Clement (2012) revealed lack of knowledge and skill in using ICT by teachers as the main hindrances to the utilization of ICT in teaching. The authors further found that teachers lacked sufficient time to learn new skills, experienced a large number of student enrolment in their classes, and had an inadequate number of computers available for student use in the classroom. In addition, the lack of technical and pedagogical support and lack of collaboration among teachers were constraints to teachers' confidence and competence in the use of ICT.

According to Ajayi and Ekundayo (2009), secondary school teachers in Nigeria rely on the traditional "chalk and talk" method of teaching rather than embracing the use of ICT. However, teaching in an environment of high enrolment numbers in a class may seem difficult to handle with the "talk and chalk" approach. According to Fakeye (2010), ICT development and utilization are not well established in Nigerian secondary schools due to secondary schools teachers' poor pedagogical knowledge in the usage of ICTs. Okwudishu (2005) found that non-availability of some ICT components in schools affect teachers' use of ICTs. For Adomi and Kpangban (2010), lack of adequate search skills and access points in the schools are factors inhibiting the use of Internet by secondary school teachers.This implies that in spite of the major role played by ICT in the development of the educational system, the problem of limited utilization of ICT in teaching in most secondary schools persists. This contradicts what is operational in the developed countries that have digitalized classrooms such that teaching and learning activities are carried out using ICT resources (Cooper, 2006).This therefore called for the need for secondary school teachers to have pedagogical knowledge of utilizing ICT tools for effective instructional delivery.

Expanding the discussion further, Basargekar and Singhavi (2017) opined that inadequate ICT resource; low teacher confidence; lack of motivation; lack of competence; and teachers' attitude towards the utilisation of modern technologies for effective teaching and learning, are major barriers experienced by school teachers in facilitating successful integration of ICT for teaching purposes, especially in a developing country like Nigeria. This implies that most teachers confront pedagogical experiences with limited knowledge on effective application and use of digital technologies in their professional practice. The authors reiterated that the success or failure of ICT implementation depends on how teachers perceive their proficiency in using ICT in the classroom. Teachers' perception related to their proficiency is influenced both by non-manipulative teachers' factors (demographic characteristics of the teachers) and manipulative teachers' factors such as language of delivery, school board, and training facilities.

Bello (2000) argued that if teachers are to be convinced of the value of using ICT in their practice, their training should focus on the pedagogical issues. Pedagogy is an act or method of teaching with confidence using certain techniques, strategies, and technologies to attain pedagogical goals

within a specific environment, as well as assisting learners through interaction and activity in the on-going academic and social events of the classroom. Pedagogy is often described as the act of teaching. The pedagogy adopted by teachers facilitate shaping of their actions, judgments, and other teaching strategies by taking into consideration theories of learning; understandings of students and their needs; and the backgrounds and interests of individual students. Pedagogical practice is the way of introducing students to the application of didactic knowledge in the implementation of the educational work with learners. Pedagogical practices also enhance the connection between educational theory and practice which serves as a form of practical preparation of future teachers for high – quality education (Obradović, 2013).

Studies conducted by Player-koro (2012), Habibu, Abdullah-Almamun and Clement (2012) and Alshmrany and Wilkinson (2017) revealed that teachers' attitudes and self-computer literacy; confidence with technology; social conditions; system quality; lack of genuine software; inadequate number of computers in the classroom; low speed Internet; lack of motivation; lack of proper training skills; unavailability of the latest ICT equipment; lack of expert technical staff; poor administrative support; and poor course curriculum, as inhibitors that prevent teachers from using technology. Alshmrany and Wilkinson (2017) further asserted that appropriate deployment of ICT can facilitate solving of most problems facing students and teachers in the traditional classroom setting thereby enhancing learning outcomes.

However, regardless of the expected value, successful utilisation of ICT by teachers requires strategic planning and application of teachers' pedagogical knowledge to the instructional experience. Iwu (2006) noted that the use of ICT tools enhances the pedagogical achievement of the objectives set by the teachers at all levels of education within a short time. The integration of ICT tools for effective teaching and learning at all levels of education is a necessity rather than a luxury in facilitating economic, technological and educational advancement. Agbetuyi and Oluwatayo (2012) opined that ICT compliance encompasses not only the mastery of technical skills and techniques, but the understanding of how to apply these skills judiciously and responsibly in facilitating pedagogical experiences.The use of pedagogical knowledge of ICT for effective teaching delivery consists of two main components: application of pedagogy and the utilization of ICT. Mishra (2008) further reiterated that teachers having sound pedagogical knowledge would help to proffer solutions to some of the teaching challenges militating against teacher-student pedagogical experiences. This is because a teacher's pedagogical knowledge contributes essentially to students learning outcomes. From the foregoing, this study investigates secondary school teacher' pedagogical knowledge of utilization of ICT for effective teaching and learning in Kwara State, Nigeria. Specifically, the study examined available ICT tools for teaching, teachers' pedagogical knowledge on the available ICT tools for teaching and frequency of utilization of ICT tools for teaching.

METHOD

This study investigates secondary school teachers' pedagogical knowledge of utilization of ICT for effective teaching and learning in Kwara State, Nigeria. Specifically, the study examined available ICT tools for teaching; teachers' pedagogical knowledge on the available ICT tools for teaching; and the frequency of utilization of ICT tools for teaching.

Research Questions

The following research questions were answered in the study:

1. what are the available ICT tools for teaching in secondary schools within the Ilorin metropolis?
2. what is the level of secondary school teachers' pedagogical knowledge on the available ICT tools for teaching?

3. what is the frequency of utilization of ICT tools for teaching in secondary schools within the Ilorin metropolis?

Sample and Sampling Technique

Subjects: the population for the study consisted of all secondary school teachers in twenty-three (23) out of sixty-nine (69) schools that were randomly sampled from Ilorin West, Ilorin South and Ilorin East in Kwara State, Nigeria. This study used a descriptive research design with a cross-sectional survey. A sample of three hundred and thirty-three (333) secondary school teachers were proportionally selected from one thousand, eight hundred and fifteen (1,815) using the Israel Model (2013). Thereafter, 273 (82.0%) of the sample returned completed copies of the questionnaire which were eventually used for the study.

Instrumentation: a structured questionnaire was adapted from Eze and Aja (2014) and Cassim (2010) entitled: "Secondary School Teachers' Pedagogical Knowledge on the Utilization of Information and Communications and Technology for Teaching" in Ilorin Metropolis. The instrument was used to determine the availability of ICT tools in Nigerian secondary school, the extent of utilization of ICT tools by teachers and the level of teachers' pedagogical knowledge on the utilization of ICT tools. The instrument has four sections (A-D). Section A focused on the bio-data of the respondents; Section B contained items on the availability of ICT tools utilized by teachers; Section C asked questions about the level of teachers' pedagogical knowledge on the available ICT tools for teaching, while Section D examined the frequency of utilization of ICT tools by the secondary school teachers.

Items on the available ICT tools for teaching were classified with the response mode of Available and Not available (AV and NAV); the level of teachers' pedagogical knowledge on the use of the available ICT tools for teaching were based on Likert rating scale of High Pedagogical Knowledge (HPK), Moderate Pedagogical Knowledge (MPK) and Low Pedagogical Knowledge (LPK) of use of ICT; while 3 Likert rating scales of Frequently Used (FU), Seldom Used (SU) and Not Used (NU) were employed to elicit response on Teachers' frequency of utilizing ICT tools for teaching. The instrument was validated by experts and the reliability values of 0.96 on the availability of ICT tools, 0.82 on the frequency of use of ICT tools and 0.78 on pedagogical knowledge of the available ICT tools were obtained at 0.05 level of significance using Cronbach Alpha to measure the internal consistency of the scale items on the instrument. The data generated were collected, collated and analyzed using descriptive and inferential statistics. Research questions 1, 2, and 3 were analyzed using standard deviation and mean score.

RESULTS

Research Question One: what are the available ICT tools for teaching in secondary schools within Ilorin metropolis?

To examine the available ICT tools for teaching in Ilorin metropolis, the mean score of the respondents and the standard deviation were classified on whether they are available or not available (AV-2 or NAV-1). The results are shown in Table 1 below.

Table 1: *Responses on the availability of ICT tools for teaching*

Available ICT Resources	Std. Dev.	Mean($\bar{x}$)	Decision
Television Set	.424	1.23	Not Available
Radio Sets	.445	1.27	Not Available
Desktop Computers	.487	1.62	Available
Printers	.500	1.53	Available
Overhead Projectors	.358	1.15	Not Available
Scanner	.415	1.22	Not Available
Internet Connectivity	.435	1.25	Not Available
Video Sets	.390	1.19	Not Available
CD-ROM	.493	1.41	Not Available
Electricity	.470	1.67	Available
Radio Cassettes Players	.427	1.24	Not Available
VCD/CD/DVD	.433	1.25	Not Available
Laptop Computers	.487	1.38	Not Available
Electronic Typewriters	.449	1.28	Not Available
Manual Typewriters	.498	1.55	Available
Cameras	.368	1.16	Not Available
Generators	.485	1.63	Available
Flash drive	.493	1.41	Not Available
Telephone	.482	1.36	Not Available
Motion Camera	.289	1.09	Not Available
Tape Record Players	.335	1.13	Not Available
Audio Tape Recorders	.327	1.12	Not Available
Grand Mean ($\bar{x}$)		**1.32**	

Available (A) and Not Available (NA)

Table 1 shows the responses on the availability of ICT tools for teaching with the benchmark of the mean score taken as 1.5. Items with mean scores at 1.5 and above are considered to be available, while items with scores below the benchmark were considered not available for teaching. Table 1 therefore revealed that television sets, radio, overhead projectors, scanner, internet connectivity, video sets, CD-ROM, radio cassette players, VCD/CD/DVD, laptops computers, electronic typewriters, cameras, flash drive, telephone, motion cameras and audio tape recorder players/recorders were not available for teaching. However, desktop computers, printers, electricity, manual typewriters, and generators were available with the mean scores greater than the benchmark of 1.5.The grand mean score of the availability of ICT tools for teaching was found to be 1.32. The results show that most of the ICT tools listed were not available for teaching in secondary schools in Ilorin metropolis.

Research Question Two: what is the level of secondary school teachers' pedagogical knowledge of ICT tools for teaching in Ilorin Metropolis?

To investigate teachers' pedagogical knowledge of the available ICT tools for teaching in Ilorin Metropolis, the mean score of the respondents and the standard deviation were classified on 3 scales; High, Moderate, and Low (H-3, M-2 and L-1). The results are shown in Table 2 below.

Table 2: *Respondents' pedagogical knowledge on the available ICT tools for teaching*

Pedagogical Knowledge of the following	**Std. Dev.**	**Mean($\bar{x}$)**	Decision
Preparing lesson using internet connectivity	.726	1.63	LPK
Using computer in teaching and learning	.737	1.59	LPK
Finding resources via internet	.812	1.90	LPK
Monitoring learners progress via telephone	.661	1.42	LPK
Using projector for effective presentations	.553	1.25	LPK
Using television for practical oriented courses	.607	1.31	LPK
Using laptop computers for collaborating colleagues	.681	1.49	LPK
Installing educational software on video players for instructional delivery	.645	1.36	LPK
Installing educational software on audio recorders for teaching	.641	1.37	LPK
Using generators as alternative to power supply	.823	1.88	LPK
Using scanner for scanning documents for teaching	.680	1.41	LPK
Using radio to support learners learning	.680	1.45	LPK
Utilizing internet for research analysis	.822	1.77	LPK
Utilizing projector for teaching	.763	1.73	LPK
Using flash drive for the storage of software materials	.808	1.76	LPK
Grand Mean($\bar{x}$)		**1.55**	

High (HPK), Moderate (MPK), and Low (LPK)

The three Likert rating scales used were: *High, Moderate and Low Pedagogical Knowledge of use of ICT*. High Pedagogical Knowledge (HPK) of ICT was taken as the mean scores above the benchmark (>2.0); Moderate Pedagogical Knowledge (MPK) of ICT as mean scores (2.0); and Low Pedagogical Knowledge (LPK) of ICT was also taken as mean scores below the benchmark (<2.0).Table 2 revealed that all the numerated items were below the benchmark of 2.0 and the grand mean score was found to be 1.55.Therefore, it was inferred that the secondary school teachers had a low pedagogical knowledge of the utilization of ICT tools for teaching in Ilorin metropolis.

Research Question Three: What is the frequency of utilization of ICT tools for teaching in secondary schools within Ilorin Metropolis?

Teachers' frequency of utilizing ICT tools for teaching was determined using standard deviation and the mean score. The 3 Likert rating scale used was classified as: Frequently Used (FU), Seldom Used (SU) and Not Used (NU). The results are shown in Table 3 below.

Table 3: *Frequency of utilization of the ICT tools for teaching*

Frequency of Use	Std. Dev.	Mean($\bar{x}$)	Decision
Television Set	.627	1.32	Not Used
Radio Sets	.707	1.38	Not Used
Desktop Computers	.877	1.87	Not Used
Printers	.880	1.78	Not Used
Overhead Projectors	.563	1.22	Not Used
Scanner	.644	1.30	Not Used
Internet Connectivity	.661	1.32	Not Used
Video Sets	.610	1.28	Not Used
CD-ROM	.789	1.56	Not Used
Electricity	.914	2.08	Frequently Used
Radio Cassettes Players	.631	1.31	Not Used
VCD/CD/DVD	.711	1.37	Not Used
Laptop Computers	.808	1.54	Not Used
Electronic Typewriters	.725	1.39	Not Used
Manual Typewriters	.822	1.65	Not Used
Cameras	.548	1.21	Not Used
Generators	.826	1.92	Not Used
Flash drive	.787	1.58	Not Used
Telephone	.829	1.56	Not Used
Motion Camera	.411	1.11	Not Used
Tape Record Players	.522	1.19	Not Used
Audio Tape Recorders	.446	1.15	Not Used
Grand Mean($\bar{x}$)		**1.45**	

Frequently Used (FU), Seldom Used (SU) and Not Used (NU)

Frequently Used (FU) of ICT was taken as the mean scores above the benchmark (>2.0), Seldom Used (SU) of ICT as mean scores (2.0) and Not Used (NU) of ICT was also taken as mean scores below the benchmark (<2.0). Table 3 revealed that teachers frequently use electricity (2.08) to power available electrical/electronic ICT tools only. However, most available ICT tools were not used for teaching the students with the mean scores of less than the benchmark (<2.0). This implies that available ICT tools were ordinarily being powered by electricity without been utilised by the teachers for instruction.

DISCUSSIONS OF FINDINGS

Availability of ICT tools for teaching was examined through research question one and the result showed that most listed ICT tools were not available for teaching. Out of the 22 items listed, only 5 items were discovered to be available (desktop computers, printers, electricity, manual typewriters, and generators). The majority of the resources, including Internet facility, multimedia projectors, and laptop computers that would promote efficiency in the classroom setting were not available. This study supports the findings of Okwudishu (2005) and Amuchie (2015) which established that most teachers were not utilizing ICT tools because they were not readily available. On the other hand, this study disagrees with the findings of Aja and Eze (2014) that ICT tools are available but not adequately utilized in most of the Senior Secondary Schools covered. The implication of this is that even if teachers are adequately knowledgeable and willing to infuse ICT into their teachings, the inadequacy of the ICT resources would still hinder usage. Except the resources are provided in the right quantity, most times it becomes difficult for teachers to function effectively in the midst of a growing student population and the amount of content to be covered in the classroom. As

opined by Idoko and Ademu (2010), availability of ICT tools is the most important element that would determine whether or not ICT would be used in the instructional system.

In addition, regarding teachers' level of pedagogical knowledge of ICT tools for teaching, the result showed that all the listed items were below the benchmark which indicated low pedagogical knowledge of ICT tools by respondents. This study supports the findings of Fakeye (2010) and Khan, Hassan and Clement (2012) that low level of teachers' pedagogical knowledge and apathy to new innovations (Kabiru & Sakiyo, 2013) were contributing factors hindering the use of ICT for instructional purposes. Similarly, this study agrees with Khan, Hassan and Clement (2012) that large numbers of students enrolled in the classes; lack of teachers' confidence and competence and sufficient time to learn new skills were constraints to the use of ICT for instruction. It is implied that even if ICT tools were available for use, respondents had low pedagogical knowledge that would have assisted them in effective usage of ICT for teaching purposes.

In answering the question on frequency of utilization of ICT tools for teaching, it was discovered that one item (electricity) out of 22 others was indicated by respondents as being frequently used. The grand mean scores1.45 suggested that ICT tools were not frequently used for effective teaching by respondents. However, this is consistent with the findings of Okwudishu (2005), Idoko and Ademu (2010), Kabiru and Sakiyo (2013) and Amuchie (2015), who variously submitted that availability, teachers' pedagogical knowledge of ICT tools are critical to its use in instructional settings.

CONCLUSION

This study investigated availability and frequency of use of ICT tools for instructional purposes. It also examined secondary school teachers' pedagogical knowledge on the utilization of ICT for effective teaching in Nigerian Secondary Schools. However, findings revealed that most ICT tools were not available for teaching; teachers had low pedagogical knowledge on the use of ICT tools for teaching, and available ICT tools were not used frequently by the teachers. It is therefore recommended that government and non-governmental organisations should adequately procure relevant Information and Communication Technologies for effective teaching and learning purposes. Also, teachers should be encouraged to upgrade and update their knowledge on the use of modern ICT tools for teaching in order to enhance effective teaching and learning through retraining, seminars and conferences. Similarly, educational administrators should encourage teachers by providing enabling environments that will aid frequent use of available ICT tools for teaching purposes.

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