

THE BARRIERS OF USING INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) IN TEACHING AND LEARNING OF MATHEMATICS IN TERTIARY INSTITUTIONS OF KATSINA STATE

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Abstract

In this paper we examine the barriers to using ICT of tertiary institutions teachers in the classroom. The sample contained 46 mathematics lecturers from 4 tertiary institutions in Katsina state. Questionnaire was used to collect data based on the research questions. The questionnaire was found valid and reliable having 0.84 reliability coefficient. Simple percentage and descriptive statistics were used to answer the research questions while, t- test analysis of significance was used to test the hypothesis at 0.05 level of significance. The study identified some barriers hindering teachers' usage of ICT include lack of adequate computer, internet access and laboratory; lack of motivation, confidence and attitude towards ICT usage among others. The study recommended that lecturers need to be trained on the ICT usage in their teaching and adequate provision of ICT tools is necessary to allow usage by both teachers and students for effective performance in mathematics.

Keywords: Teaching-Learning Activities, ICT, Tertiary Education, Mathematics, Katsina State.

Introduction

The Nigeria society seems to be influenced by the scientific and technological development. It is quite clear that if technological development is to be achieved, proficiency in mathematics must be achieved. And for this to be achieved, all problems confronting mathematics teaching and learning in secondary schools that cause poor performance of students should be addressed. One way of doing this is through the use of information and communications technology (ICT). Batiku (2002) is of view that mathematics is a useful tool in the society, more so in the present technology age. Anibueze (2015) stated that mathematics plays important roles in the following areas; mathematics as core skill for life, mathematics as key to economic prosperity, and mathematics full of beauty and mathematics education.

Several studies argue that the use of new technologies in the classroom is essential for providing opportunities for students to learn to operate in an information age. It is evident, as Yelland (2001) argued, that traditional educational environments do not seem to be suitable for preparing learners to function or be productive in the work places of today's society. She claimed that organisations that do not incorporate the use of new technologies in schools cannot seriously claim to prepare their students for life in the twenty-first century.

Due to ICT's importance in society and possibly in the future of education, identifying the possible obstacles to the integration of these technologies in schools would be an important step in improving the quality of teaching and learning. Balanskat, Blamire, and Kefala (2006) argue that although educators appear to acknowledge the value of ICT in schools, difficulties continue to be encountered during the processes of adopting these technologies.

Modern technology offers many means of improving teaching and learning in the classroom (Lefebvre, Deaudelin & Loisele, 2006). Dawes (2001) is of the view that new technologies have the potential to support education across the curriculum and provide opportunities for effective communication between teachers and students in ways that have not been possible before. ICT in education has the potential to be influential in bringing about changes in ways of teaching.

According to Becta (2004), although there is a reasonable amount of research literature on the barriers to ICT in general, there are few studies that look at barriers which exist in specific subject areas. Becta (2004) asserts that focusing on the barriers that particularly affect practitioners in specific roles may be helpful. According to Becta (2003, p. 10), five factors influence the likelihood that good ICT learning opportunities will develop in schools: ICT resourcing, ICT leadership, ICT teaching, school leadership, and general teaching. Becta (2003) also indicated that the success of the integration of new technology into education varies from curriculum to curriculum, place to place, and class to class, depending on the ways in which it is applied. In science education, there are some areas where ICT has been shown to have a positive impact. While new technologies can help teachers enhance their pedagogical practice, they can also assist students in their learning. According to Grabe and Grabe (2007), technologies can play a role in student skills, motivation, and knowledge. They claim that ICT can be used to present information to students and help them complete learning tasks.

Kumar et al (2008) found attitude, motivation, gender, age and computer training have effects on the actual usage of computers by teachers. According to Sang et al (2009) and Zhao & Czik (2001), teachers' educational beliefs impact on their use of ICT. Besides, Richardson (2009) claimed that the ICT integration in teaching is still difficult for some teachers due to lack of training and practice.

Jones (2004) and Keong et al (2005) determined that lack of technical support was a barrier to the successful integration of ICT in teaching. Lack of technical support discourages teachers from adopting and integrating technology in classrooms (Korte & Husing, 2007). Becta (2004) also agreed that lack of technical support available in schools and technical maintenance is the main problem in integrating ICT in classrooms. Thus, there are still several factors hindering the integration of ICT into lessons. Hare (2007) also stated that lack of policy framework, inadequate infrastructure and high cost, and inadequate in-service training on ICT integration in education.

Ittigson & Zewe (2003) cited that technology is essential in teaching and learning mathematics. ICT improves the way mathematics should be taught and enhances student understanding of basic concepts. Many researchers have carried out studies to evaluate the benefits of using ICT in mathematics. Becta (2003) summarized the key benefits – ICT promotes greater collaboration among students and encourages communication and the sharing of knowledge. ICT gives rapid and accurate feedback to students and this contributes towards positive motivation. It also allows them to focus on strategies and interpretations of answers rather than spend time on tedious computational calculations. ICT also supports constructivist pedagogy, wherein students use technology to explore and reach an understanding of mathematical concepts. This approach promotes higher order thinking and better problem-solving strategies which are in line with the recommendations forwarded by the National Council of Teachers of Mathematics (NCTM); students would then use technology to concentrate on problem-solving processes rather than on calculations related to the problems (Ittigson & Zewe, 2003).

Chenoby, (2014) highlighted several factors influencing mathematics teachers' integration of ICT into their lessons. Contextual factors such as the school context, departmental ethos and the availability of and accessibility to ICT facilities, key persons promoting the ICT use within the department, teacher ICT skills, ICT professional development and the presence of ICT within the mathematics scheme of work. Furthermore, she found that the most frequently adopted activities by mathematics teachers in her research study were 'exercise to practice skills or procedures', 'teacher lectures' and 'discovering mathematics concepts and principles'. Although, reported change in pedagogical approach by teachers when ICT was being used, the more conventional and traditional pedagogical approaches still prevailed, especially in some countries (e.g., Hong Kong, Singapore and Taiwan). Teachers in the above-mentioned countries were reported to value a more traditionally oriented curriculum, as compared to curriculum goals that focused on lifelong learning and connectedness.

Chenoby, (2014) also examined teachers' attitudes towards the use of computers in teaching mathematics in the primary school classroom. Positive attitudes of teachers towards the use of ICT in teaching and the availability of the necessary resources would facilitate the use of computers in teaching mathematics in the primary classroom. The computers could be used as a students' learning as well as a tool for teaching.

Statement of the Problem

Integration is an art of combining or adding parts to make a unified whole (Drake and Burns, 2012). Non-integration and poor access to Information Communication Technology (ICT) in Nigerian schools and some developing countries in Africa seem to be affecting students' ICT utilization level thereby influencing achievement and competitiveness globally (Adenuga, Owoyele and Adenuga, 2011). Aduwa-Ogiegbbean and Iyamu (2005) noted that many developing countries, especially in Africa, are still low in ICT application and utilization.

Considering the huge benefits that are derived from the implementation of ICT in Nigeria educational system (tertiary Institutions), the tertiary institution experience some obstacles in the area of passing information and knowledge in the communication process which can be overcome by the use of ICT. This research work is entirely concerned with the sole aim of

examining an investigation into the barriers of ICT usage in teaching and learning of mathematics in tertiary institution in Katsina state.

Purpose of the Study

This study is aimed at finding the barriers in the use of ICT in teaching and learning of mathematics in tertiary institutions of Katsina state. The following objectives are hereby stated to aid achievement of the aim:

1. To determine the extent of teachers' awareness and usage of ICT in teaching mathematics in tertiary institutions.
2. To determine the barriers hindering teachers' usage of ICT in mathematics teaching at tertiary institutions.
3. To identify ways of removing the barriers hindering the integration of ICT into teaching and learning of mathematics in tertiary institutions.

Research Questions

1. What is the extent of teachers' awareness and usage of ICT in teaching mathematics in tertiary institutions?
2. What are the barriers hindering teachers' usage of ICT in mathematics teaching at tertiary institutions?
3. What are the ways of removing the barriers hindering the integration of ICT into teaching and learning of mathematics in tertiary institutions?

Significance of the Study

The study focuses on the extent to which ICT is used by the lecturers in tertiary institution in the teaching and learning of mathematics processes, the study will be highly significant to the lecturers, staff of the school and students. It can be a useful guide because the study will create awareness on the need to engage the use and practice of ICT in the teaching and learning process in Katsina state. The use of ICT has brought tremendous progress in the field of education in developed and developing countries and it has also brought revolution in teaching-learning process by changing the roles of teachers and learners. In developed countries ICT is being used successfully, but in developing countries, like Nigeria, its use is limited due to the cost and scarce resources.

Curriculum planners as well as stakeholders in mathematics education will also find areas where ICT can be incorporated in the mathematics curriculum and prescribe to the government the need to train lecturers in the computer and ICT tools as well as provide the necessary tools for use in schools in teaching and learning mathematics for better student achievement.

Methodology

The research design adopted is descriptive survey research which uses questionnaires to find out the opinion of the subjects. The study seeks information from the lecturers of the tertiary institutions in Katsina State on the perception of the research topic and its effect on mathematics instruction.

The target population is all the tertiary institutions in Katsina state which comprised of 3 universities, 3 colleges of education and 1 polytechnic. This comprises of mathematics

lecturers amounting to 100 in the study area. However, four tertiary institutions have been randomly selected. All the schools in the population have been awarding certification in mathematics and mathematics education for at least three (3) years. In addition, all the schools within the study area have graduated numerous students with varying certified grades. The lecturers are qualified with varying experiences in their profession.

The sample of this study consisted of 46 lecturers of mathematics which were randomly selected from four (4) tertiary institutions within Katsina state. The simple random sampling technique was adopted to give equal chance of selecting the subjects to avoid being bias.

The instruments for data collection used in this research are self-designed questionnaires titled the “Teachers’ Research Questionnaire” (TRQ). The questionnaires were scored based on the Lickert scale used on the items contained in the questionnaires.

For the purpose of this study, the content validity of the instrument has been ascertained and measured. In light of this, the content validity of instrument was established by three (3) experts from Mathematics Department of Federal College of Education, Katsina. The suggestions and corrections observed by the experts was duly considered before arriving at the updated version of the questionnaires and used for the study.

The Cronbach Split-half method was used to find the correlation coefficients of the instruments and the reliability coefficient obtained was 0.82. This showed that both instruments are found reliable for the study.

Data Analysis

The simple percentage and descriptive statistics for the research questions: The t-test for test of significance was used to test the hypothesis using the level of significance of 0.05. The hypothesis is accepted if t-calculated is less than the t-critical (table value) otherwise it is rejected.

Research Question 1: What is the extent of teachers’ awareness and usage of ICT in teaching mathematics in tertiary institutions?

Table 1.0. Teachers’ awareness and usage of ICT in teaching mathematics.

No. of teachers	Mean	Std dev	Max score	Mean (%)
46	26.5	2.21	40	66.2

Table 1.0 indicated that the mean score of teachers’ awareness and usage of ICT in teaching mathematics in tertiary institution is 26.5 which accounts for 66.2% with standard deviation of 2.21. This shows that teachers are aware of usage of ICT usage in teaching mathematics at tertiary institution level and the extent is good.

Research question 2: What are the barriers hindering teachers' usage of ICT in mathematics teaching at tertiary institutions?

Table 1.1. Barriers hindering teachers' usage of ICT in teaching mathematics.

SN	Items	Agree	%	Disagree	%
1	Access to computer, internet and computer Labs	46	0	-	0
2	Teachers' attitudes and motivation to use ICT.	45	97.8	1	2.2
3	Classroom management in using computers.	42	91.3	4	8.7
4	Lack of technology support.	30	65.2	16	34.8
5	Lack of time to undergo training.	33	71.7	13	38.3
6	Compatibility of software and hardware.	42	91.3	4	8.7
7	Lack of confidence in using software.	29	63.0	17	37.0
8	Lack of knowledge of teaching using computer.	27	68.7	19	30.4
9	Inability to trouble- shoot problems with computer.	32	91.3	14	30.4
10	Lack of lesson plan using computer in mathematics.	32	91.3	14	30.4

From table 1.1, the barriers hindering teachers' usage of ICT in teaching mathematics in tertiary institutions include: the teachers attitude and motivation to use ICT (97.8%), classroom management in using computers, compatibility of software and hardware, inability to trouble-shoot problems with computers and lack of lesson plans using computers in mathematics (all with 91.3% each), lack of knowledge of teaching strategies using computers (68.7%), lack of technology support (65.2%) and lack of confidence in using software (63.0%).

Research question 3. What are the ways of removing the barriers hindering the integration of ICT into teaching and learning of mathematics in tertiary institution?

The results from table 1.2. showed that the ways of removing the barriers hindering the ICT integration into teaching mathematics include: provision of computers internet and labs (100%), improve classroom management in using computer and workshop to train and instill confidence in using software (all having 98.7% each), creating time for teachers to undergo training (95.7%), employments of experts to provide technology support (91.3%), provision of up-to-date software and hardware, adequate training of teachers on strategies using ICT tools and change of attitude and motivation of teachers towards use of ICT (all have 89.1% each) and lesson plans and preparation using ICT tools in mathematics (71.7%).

Table 1.2. Ways of removing barriers hindering the integration of ICT in teaching and learning.

SN	Items	Agree	%	Disagree	%
1	Provision of computers, internet and computer labs.	46	100	-	0
2	Change of attitude and motivation of teachers towards use of ICT.	41	89.1	5	10.9
3	Improve classroom management in using computers.	45	97.8	1	02.2
4	Employment of expert to provide technology support.	42	91.3	4	08.7
5	Creating time for teachers to undergo training.	44	95.5	2	04.3
6	Provision of up-to-date software and hardware.	41	89.1	5	10.9

7	Workshop to train and instill confidence in using the software.	45	97.8	1	02.2
8	Adequate training of teachers on strategies using ICT tools.	41	89.1	5	10.9
9	Inability to trouble-shoot problems with computers.	39	84.8	7	15.2
10	Lessons plans and preparations using ICT tools in mathematics.	33	71.7	13	28.3

Conclusion

The use of ICT in teaching mathematics can make the teaching process more effective as well as enhance the students' capabilities in understanding basic concepts. Nevertheless, implementing its use in teaching is not without problems as numerous barriers may arise. The types of barriers and ways to overcome them have been identified in the study.

Recommendations

The following recommendations are put forward as a part of the measures that could boost the lecturers' usage of ICT in the teaching of mathematics in tertiary institutions of Katsina state.

1. Government should make provision and maintenance of ICT facilities for teaching and learning mathematics.
2. Provision of adequate resources such as internet access, computer and laboratories which are up-to-date for teaching and learning of mathematics. Also, provide new technologies in terms of software and hardware components of ICT tools for use in schools.
3. Government should train lecturers through Seminars and Workshops on the need to acquire skills and create a conducive atmosphere for the usage of ICT to teach mathematics.

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