

IMPEDIMENTS TO INTEGRATION OF ICT IN TEACHING AND LEARNING OF MATHEMATICS IN SECONDARY SCHOOLS

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Abstract

The study was carried out to determine the impediments to integration of ICT in teaching and learning mathematics in secondary schools in Imo state. Based on the objective of the study, two research questions and a hypothesis guided the study. A sample of 150 mathematics teachers comprising of 60 males and 90 females were used for the study. Descriptive survey research design was adopted in carrying out the research. A four point type likert questionnaire instrument with reliability coefficient of 0.77 determined through test-retest method was used in data collection. Generated data was analyzed using mean, standard deviation and t-test statistical tools tested at 0.05 level of significance. The study revealed among other factors, teachers negative attitude, competence, and confidence, poor policy implementation, lack of time, lack of personnel, etc, hindered the implementation of ICT in teaching and learning of mathematics in secondary schools. Based on the result, it was recommended among other things that, mathematics teachers should be exposed to workshops and seminars to develop positive attitude, build confidence and competence towards ICT in teaching and learning of mathematics in secondary schools in Imo State.

Introduction

Information and Communication Technologies (ICT) are electronic technologies used for information storage and retrieval. Information and communication Technology (ICT) is seen as an important tool that will support and enhance education in recent time. Dawes (2001) is of the view that new technologies have the potentials to support education across the curriculum and provide opportunities for effective communication between teachers and students in ways that have not been possible before.

The field of education has been affected by ICT's, which have undoubtedly affected teaching, learning and research (Yusuf 2003). ICTS have the potentials to accelerate, enrich and deepen skills to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthen teaching and help schools change (Davis and Tearle, 1999. Lenke and Coughling, 1998). Yelland (2001) argued that, traditional educational environments do not seem to be suitable for

preparing learners to function and be productive in the workplaces of today's society. This implies that, organization 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. Grimus (2000) pointed out that by teaching ICT skills in primary schools the pupils are prepared to face future developments based on proper understanding. What is now known about learning provides important guidelines for uses of technology that can help students and teachers develop the competences needed for the twenty-first century (Bransford, Brown and Cocking 2001).

New instructional techniques that use ICT's provider a different modality of instruments for the students, ICT use allows for increased individualization of learning. In schools where new technologies are used, students have access to tools that adjust to their attention span and provide valuable and immediate feedback for literacy enhancement, which is currently not fully implemented in the Nigerian school system (Enuku and Enuku 2000).

The Federal Government of Nigeria in the National Policy on Education (Federal Republic of Nigeria, 2004) recognizes the prominent role of ICTs in the modern world and has integrated ICTs into education in Nigerian Schools as to reap the academic benefits that may accrue from it.

One of the subjects, where the use of ICT is being done and studied at the same time is Mathematics. Since Mathematics is abstract in nature, teachers are constantly looking for ways or tools to help students understand the underlying concepts of the lesson. Numeracy becomes better when teachers use resources including ICT in order to model Mathematical ideas and methods. In addition, ICT is seen as a tool that will be able to help students with problem-solving which is basic but utterly essential skill needed in the Mathematical world. Majority of the student population has always perceived Mathematics as a difficult subject. This is the reason why many find it difficult to learn the ideas behind the subject. However, the use of ICT is promising to change the perspective of both students and teachers towards learning and teaching Mathematics.

The use of ICT in the Mathematics classroom has long been a topic for consideration by Mathematics educators. Some examples of ICT use in mathematics includes: portables, graphic calculators, computerized graphing, specialized software, spreadsheets, and database. According to Moseley and Higgins (1999) a range of portable devices exists which allow pupils to collect data and manipulate it using spreadsheets and databases for work in numeracy. Some portable equipment also, enables the study of mathematics to move out of the classroom and to incorporate fieldwork investigations. The use of graphic calculators and computerized graphics in mathematics speeds up the graphing process, freeing people to analyze and reflect on the relationships between data (Hennessy ;2000,Clements ;2000). Hennessy, Fung, and Scanlon (2001) noted that, mathematics curriculum software improve pupils' skills and understanding in algebra , allow pupils to manipulate and measure shapes leading to higher levels of learning among them. ICTs enable students to develop problem solving skills, leads them to develop higher levels of mathematical thinking, learn geometric concepts and encourage individualized learning. ICTs support constructivist pedagogy which allows students explore and reach an understanding of mathematical concepts. This approach promotes higher order thinking and better problem-solving strategies (ittigson and zewe ;2003). Becta (2003) noted that teacher can maximize the impact of ICT in mathematics teaching by using ICT as a tool in working towards learning objectives. When students work in collaborative groups while using computers to solve problems or are taught to apply the process of problem-solving and then involve ICT in the development of solutions. Higher

order thinking by students involves the transformation of information and ideas. This transformation occurs when students combine facts ideas and synthesize, generate, explain, hypothesize, or arrive at some conclusions or interpretation. Manipulating information and ideas through these processes allow students to solve problems, gain understanding and discover new meaning. ICTs are most powerful when used as a tool for problem solving, conceptual development and critical thinking. Using ICT as a tool, students spend time productively creating strategies for solving complex problems and develop a deep understanding of the subject matter.

Irrespective of the great benefits derivable from ICT in teaching and learning of mathematics, the level of integration in Nigerian schools is still very minimal Goshit (2006) observed that, most schools both private and government do not offer ICT training programmes. Okebukola (1997) noted that the computer is not part of classroom technology in more than 90 percent of Nigerian public schools. This implies that, the chalkboard and textbook continue to dominate classroom activities in most Nigeria secondary schools Adomi (2010).

Due to importance of ICTs in mathematics and 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.

Statement of the Problem

Balanskat, Blamire, and Ketala (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.

Therefore, this study was carried out to determine the perceived impediments to integration of ICTS in mathematics education in secondary schools in Imo State.

Purpose of the study

The main purpose of the study is to determine perceived impediments to integration of ICT in mathematics teaching and learning, specifically, the study was embarked upon to determine:

- The factors hindering the integration of ICT in teaching and learning of mathematics in secondary schools in Imo state,
- If any difference exists in the perception of male and female teachers on the factors hindering the integration of ICT in the teaching and learning of mathematics.

Research questions

The following research questions guided the study.

1. What are teachers perceived factors hindering the integration of ICT in teaching and learning of mathematics in secondary schools?
2. What is the difference in the mean perceptions of male and female teachers on the factors hindering the integration of ICT in teaching and learning of mathematics secondary schools?

Hypothesis

This hypothesis guided the study;

H_{01} : there is no significant difference between the mean perception of male and female teachers on the factors hindering the integration of ICT in teaching and learning mathematics in secondary schools.

Methodology

The study was carried out using the descriptive survey design. This was adopted as to determine the true perceptions of teachers on the factors hindering the integration of ICT in mathematics classroom.

The population consists of all the mathematics and science teachers in Government owned secondary schools in Education zone 1 of Imo State. Out of the lot a sample of 150 teachers was drawn for the study through simple random sampling technique. The sample consists of 60 male teachers and 90 female teachers.

The instrument for data collection was researchers' made likert four point type of questionnaire titled "Factors hindering ICT integration in mathematics classroom" (FHICTIMC) it was divided into two sections. Section A dealt with respondents demographic variables while section B dealt with teachers perceived factors hindering integration of ICT in mathematics teaching and learning in secondary schools.

The instrument was validated by experts in information and communication technology (ICT), mathematics education and measurement and evaluation. The reliability of the instrument was determined through the test-retest method within a period of two weeks. The instrument had a reliability coefficient of 0.77 which was acceptable for the study. The instrument was distributed to the selected sample of respondents who filled it out and returned to the researchers after a day.

The data generated was analyzed using mean, standard deviation and t-test statistical tools tested at 0.05 level of significance. Any item mean within 2.5 and above was accepted as a factor while any below was rejected.

Results

Research question 1: what are teachers perceived factors hindering the integration of ICT in teaching and learning of mathematics in secondary school?

Table 1: *summary of mean responses on factors hindering integration of ICT in mathematics teaching and learning*

S.NO	ITEM	MEAN	SD	DECISION
1	Inadequate ITC facilities hinder its use in teaching and learning mathematics.	3.51	1.80	Accept
2	Teachers lack of confidence hinders integration of ICT in teaching and learning mathematics.	2.90	1.20	Accept
3	Poor ICT Policy implementation constitutes an impediment in integration of ICT teaching and learning mathematics.	2.80	0.80	Accept
4	Lack of teacher competence in ICT binders its integration in teaching and learning mathematics.	2.90	1.02	Accept
5	Teachers negative attitude towards ICT binders its integration in teaching and learning mathematics.	3.01	1.00	Accept
6	Inadequate ICT personnel in schools binders its integration in teaching and learning.	3.13	1.04	Accept
7	Poor electricity system constitutes a hindrance in integration of ICT in teaching and learning.	5.21	1.10	Accept
8	High cost of ICT facilities binder the integration in mathematics teaching and learning.	3.14	1.12	Accept
9	Inadequate classroom facilities affect the integration of ICT in teaching and learning mathematics.	2.63	1.20	Accept
10	Lack of time hinders integration of ICT in teaching and learning of mathematics.	2.61	1.11	Accept
Grand mean = 3.19				

The items on table 1 above were all accepted as factors hindering the integration of ICT in teaching and learning of mathematics reason being that, they had mean above the instrument scale mean of 2.50. Also the responses had a grand mean of 3.19 which implies a high positive perception among teachers on factors hindering ICT integration in mathematics teaching and learning.

Research question 2: what is the difference in the mean perceptions of male and female teachers on factors hindering the integration of ICT in teaching and learning mathematics in secondary schools?

Table 2: *summary of more responses between male and female teachers*

TEACHERS	N	MEAN	SD	DIFF IN MEAN
Males	60	2.81	1.00	0.20
Females	90	3.01	1.20	

Table 2 shows that, a mean difference of 0.20 exist in the perception of male and female teachers on factors hindering the integration of ICT in teaching and learning mathematics. The difference though minimal was in favor of the female teachers.

H_{01} : there is no significant difference between the mean perception of male and female teachers on factors hindering the integration of ICT in teaching and learning of mathematics in secondary schools.

Table 3: *summary of T-test analysis on male and female perceptions*

Teachers	N	Mean	SD	&	df	t-comp	t- 0.05	sig
Males	60	2.81	1.0	0.05	148	1.45	1.65	.163
Females	90	3.01	1.2					

The result on table 3 shows that computed t-value (1.45) is less than the table value (1.65), also the sig(.163) is greater than the level of significance (0.05), this implies that the two means do not differ significantly.

Discussion

The result of the study revealed that, irrespective of the great contributions attributed to ICT in the teaching and learning of mathematics at the secondary school level, series of factors still hinder the its full integration. These factors includes inadequate ICT facilities, lack of teachers confidence and competence, negative attitude among teachers, inadequate ICT personnel, classroom facilities, time of integration etc. This result is agreement with the report of Snoeyink and Ertmer (2002), Jones (2004), Bingimals (2009) and Gomes (2005), who variously outlined these factors as barriers to successful integration of ICT in teaching and learning environment.

The study also revealed no statistical difference in the perceptions of male and female teachers on the factors hindering the integration of ICT in teaching and learning of mathematics. This result is supported by Agyei and Voogt (2010) whose work indicated no difference in teachers' major perceived barriers of integration of ICT in the teaching and learning environment.

Conclusion

The study was carried out to determine the impediments to integration of ICT in mathematics teaching and learning in secondary schools. It revealed that irrespective of the burning desire to integrate ICT in teaching and learning mathematics in secondary schools many barriers still hold it back. These barriers among other things, includes teachers negative attitude,

competence and confidence, lack of time for integration. These barriers are not gender biased as revealed by the study.

Recommendations

Based on the findings of the study, it is recommended that:

1. Teachers should be exposed to workshop and seminars as to develop positive attitude, competence and confidence towards use of ICT in mathematics classroom.
2. There should be constant light or stand- by generators in schools where there ICTs are available.
3. The government should match policies with action regarding ICT compliant mathematics classrooms.
4. There should be adequate manpower and ICT supply in the secondary schools through the government.

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