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TEACHERS' AWARENESS AND UTILIZATION OF ICT IN TEACHING AND LEARNING MATHEMATICS IN SECONDARY SCHOOLS IN IGBO-EZE SOUTH LOCAL GOVERNMENT AREA, ENUGU STATE

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Abstract

This study investigated teachers' awareness and utilization of ICT in teaching and learning Mathematics in secondary schools in Igbo-Eze South Local Government Area, Enugu State. The study adopted a descriptive survey research design.The population of the study was 31 Mathematics teachers in Igbo-Eze South Local Government Area. The sample of the study was 31 because the population is small. The instrument for data collection was Teachers' Awareness and utilization of ICT in mathematics instruction Questionnaire (TAUIMIQ) in clusters, A,B,C., The instruments were properly validated. The reliability of the instrument was ascertained using Cronbach alpha. The reliability indices were 0.79 for cluster A, 0.77 for cluster B, and 0.71 for cluster C while the entire clusters of the instrument yielded 0.80. Research questions were answered using mean and standard deviation while hypothesis was tested using t-test of independent mean. The findings of the research revealed that Mathematics teachers are aware of the use of ICT resources such as PowerPoint, videotape, computer games, audio tapes, and others in teaching and learning of mathematics. A greater percentage of Mathematics teachers do not use ICT resources in the teaching and learning of mathematics because of the associated challenges. Gender has no significant influence on Mathematics teachers' level of awareness and utilization of ICT resources for teaching and learning of Mathematics at 0.05 level of significance. The study also revealed that an insufficient number of computers in schools, poor knowledge of the use of ICT in mathematics instruction, among others, are the challenges of the utilization of ICT in teaching and learning Mathematics. Based on these findings, the researchers recommend the provision of alternative power supply among others, in schools.

Keywords: Awareness, utilization, information and communication technology, mathematics

Introduction

In Nigeria, the national policy on education (Federal Republic of Nigeria, 2014) stated that in recognition of the prominent role of Information and Communication Technology (ICT) in advancing knowledge and skills necessary for effective functioning in the modern world, there is an urgent need to integrate ICT into education in Nigeria. Technology has been touted as a potentially dominant tool for educational change and reform. Technology education involves the use of various hardware and software in the process of teaching and learning. Digital education could make students more effective and efficient in the learning process. The use of ICT could bring novelty into instructional delivery. This is because ICT can be used as a tool by carrying out calculations, drawing graphs and solving problems. ICT can also be used as a tutor (when a computer takes the teaching role of a teacher) and as a tutee (when a computer takes the role of a learner by providing answers to questions). Nowadays, there appears to be a sudden increase in the demand for the use of ICT tools in the teaching and learning process in schools. The increasingly

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important role of ICT in our lives and the numerous and good prospects of the use of ICT in teaching and learning cannot be overemphasized. Hence, technology awareness and utilization become critical in all aspects of curriculum, including mathematics. The introduction of ICT tools could significantly improve the teaching and learning of mathematics.

Mathematics occupies an important position in school curriculum. It provides us with inductive and deductive knowledge to enrich our imagination and modes of thinking and even behaviour to excel in life. Joseph (2011) observed that nearly every part of our lives involves mathematics. It plays an essential role in the development of modern technology, the tools, materials, techniques and sources of power that makes our lives and work easy. Mathematics has made a great progress over the years such as using an application that scans and solves mathematics questions, and the development of applications that teach mathematics. Therefore, the study of mathematics can be seen as the process of acquiring knowledge on the fundamental principles of numbers, quality, structure, space, and change and to show how mathematics is applied in the real world outside the school classroom. However, students' achievement in mathematics is generally poor. For instance, Nigerian students' performance in WAEC 2023 mathematics examinations shows that students who scored D7 to F9 were 54.6%. Many reasons have been attributed to poor academic achievement of students in Mathematics such as attitudes of the learners towards the subject, lack of teaching experiences, lack of teaching resources, non-use of concrete examples while teaching, lack of appropriate teaching methods and low motivation of teachers and attitudes (Paula & Davison, 2020). A lot remains to be done in the area of improving students' achievement such as the use of innovative strategies like the use of the internet and Information and Communication Technology (ICT) in teaching and learning of mathematics.

Information and communication technology (ICT) has become one of the basic building blocks of the present society. Many developing countries now regard the understanding of ICT and mastering the basic skills and concepts of ICT as part of the core of education. Ifueko (2011) sees ICT as the digital processing and utilization of information by the use of electronic computers. It comprises the storage, retrieval, conversion and transmission of information. The report of Gutterman (2022) observes that Information and Communication Technology (ICT) can be an extremely powerful enabler in efforts to bring positive and sustainable development to countries around the globe. Digital education could make students more effective and efficient than the traditional education system. The traditional chalk and talk method should give way for more interactive teaching methods and schools are increasingly adopting digital solutions to keep themselves side by side with technological changes. Teachers have a key role in the whole process, whereas, in the case of ICT based education, various ICT tools are used to make the teaching learning process effective. ICT when applied in teaching and learning of mathematics may help to improve students' achievement in mathematics. However, in using ICT in mathematics classroom, are there some challenges that teachers may face like inadequate supply of light, lack of knowledge on how to use ICT in teaching, lack of computers in schools? Jude and Dankaro (2012) carried out a study on the use of ICT by teachers in College of Education Katsina-Ala, Benue. The findings revealed that 87.5% of the teachers had no facility in terms of computers or Laptops for PowerPoint presentations during lessons.

The central role of ICT in effective teaching and learning of mathematics has made its adoption imperative in mathematics classroom instruction. However, a lot remains to

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be done in the areas concerning mathematics teachers' awareness and utilization of Information and Communication Technology in the teaching and learning of mathematics. Utilization of ICT in this context is the use of ICT resources to improve mathematics teaching and learning. Thus, utilization of ICT in teaching could enhance students' achievement in mathematics if teachers have the capacity to use them. Kabiru and Sakiyo (2013) opined that 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 implication of this is that male and female teachers' inability to adopt and utilize Information and Communication Technology in teaching and learning of mathematics could be one of the problems mitigating against effective implementation of mathematics curriculum. Gender of mathematics teachers is an important variable in this study.

Gender refers to the social attributes and opportunities associated with being male and female, the relationships between women and men and girls and boys, and the relations between women and between men. These attributes, opportunities and relationships are socially constructed and learned through the socialization processes. The gender of a mathematics teacher is being considered here to ascertain if the gender of a teacher may have any effect on his or her ability to utilize ICT in the teaching of mathematics. Unegbu, Ogugua, Nnadimele and Nse (2019) carried out a study on the use of information and communication technology by lecturers in South-East and South-South zones of Nigeria and found that both male and female lecturers do not use ICT. Onasanya, Shehu, Ogunlade and Adefuye (2011) conducted a study on teacher's awareness and extent of utilization of information communication technologies for effective science education in Oyo state, and found a significant difference between the male and female science teachers in their level of utilization of ICTs, with the male out-performing their female counterparts with higher mean scores. This contrasts with the finding of Toyin (2018) who found both genders being aware of skills needed to develop self-reliance for self-development and employment creation. This can be compared to the present study since both measures the level of utilization of ICT resources by secondary school teachers. From the foregoing' previous studies have shown that ICT utilization in classroom instruction enhances the understanding of concepts among students. Thus, if applied in mathematics, instruction could promote students' achievement. But there are concerns whether mathematics teachers are aware of this development and whether they can utilize them in mathematics instructions especially, when gender is considered. Therefore, this study investigated secondary school teachers' awareness and utilization of ICT in the teaching and learning of mathematics and the concomitant challenges in Igbo-Eze South Local Government Area, Enugu State.

Statement of Problem

The academic achievement of Nigeria students in mathematics has been a source of concern to researchers, educators, government and parents. With accusing fingers being pointed on non-use of innovative teaching strategies like ICT and others. Utilization of ICT by teachers requires strategic planning and application of teachers' knowledge to the instructional experience. Although previous studies have shown the usefulness of ICT in classroom instruction, teachers' awareness and use of it in mathematics instructions remains a contemporary issue in education. Previous studies focused only on the use of ICT without considering the challenges associated with its utilization. Hence, this study focused on the teacher's level of awareness and utilization of ICT in teaching and learning

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of mathematics in Igbo-Eze South Local Government Area, Enugu state.

Purpose of the study

The major purpose of this study was to determine;

1. The mathematics teachers' level of awareness of the use of ICT in the teaching and learning of mathematics.
2. The mathematics teachers' level of utilization of ICT in the teaching and learning of Mathematics.
3. The challenges of mathematics teachers' effective utilization of ICT in the teaching and learning of mathematics.

Research Questions

The following research questions were posed for the study;

1. What is the level of mathematics teachers' awareness of the use of ICT in the teaching and learning of Mathematics?
2. What is the level of mathematics teachers' utilization of ICT in the teaching and learning of Mathematics?
3. What are the challenges of teachers' effective utilization of ICT in the teaching and learning of mathematics?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

H_{O1}: There is no significant influence of gender on mathematics teachers' level of awareness of ICT in teaching and learning of Mathematics.

H_{02}: There is no significant influence of gender on mathematics teachers' level of utilization of ICT in teaching and learning of Mathematics.

Methods

The study adopted descriptive survey research design. Descriptive survey research is a type of research design in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group (Nworgu, 2015) . This study was carried out in Igbo-Eze South Local Government area in Obollo-Afor education zone of Enugu state. The population of the study comprised all the 31 Mathematics teachers in the Eleven (11) Secondary Schools in Igbo-Eze South Local Government Area. Because the population of the study was small, all the 31 mathematics teachers formed the sample of the study. The sample of the study was 31 because the population is small. The instrument for data collection was Teachers' Awareness and utilization of ICT in mathematics instruction Questionnaire (TAUIMIQ), in two parts I and II. part I is made up of the demographic information of the respondents. Part II is made of three clusters, A, B, and C. Cluster A is Teachers' level of Awareness of the use of ICT in mathematics instruction (TLAUIMI). Cluster B is Teachers' level of Utilization of ICT in the mathematics instruction (TLUIMI). Cluster C challenges of utilization of ICT in the teaching and learning of mathematics (CUIMI). Cluster A was measured on a 4-point scale of HighlyAware (HA) (4), Moderately Aware (A) (3), Slightly Aware (SA) (2), and Not Aware (NA) (1). Cluster B was measured on a four 4-point scale of Always(A)(4), Often(O) (3), Occasionally (OC) (2), and Never(N) (1). Cluster C was measured on a four 4-point scale of Strongly Agree (SA) (4), Agree (A) (3), Disagree (D) (2), and Strongly Disagree (SD)(1). The instrument of data collection was validated by two experts from the mathematics unit and Measurement and Evaluation unit all from the Department of Science Education, University of Nigeria, Nsukka and the

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validators advice was used in modifying the instrument. The reliability of the instrument was ascertained through trial testing involving twenty mathematics teachers from 10 Secondary schools in Nsukka Local Government Area of Enugu State. Cronbach Alpha formula was used to determine the internal consistency of the instrument. The use of Cronbach alpha was because the items of the instrument were polytomously scored Reliability coefficient were 0.79 for cluster A, 0.77 for cluster B, and 0.71 for Cluster C while the entire clusters of the instrument yielded 0.80. Mean and standard deviation was used to answer all the research questions while hypotheses were tested using t-test of independent samples at 0.005 level of significance. A mean of 2.50 and above was the benchmark for acceptance of item statements. Items with means below 2.50 were rejected.

Results

Research Question One: What is the level of Mathematics teachers' awareness of ICT in the teaching and learning of Mathematics?

Table 1: Mean and Standard Deviation of Mathematics Teachers' Awareness of ICT in Teaching and Learning of Mathematics

S/N	ICT Resource	HA	MA	A	NA	Mean	SD	Remark
1	Email	17	6	3	2	3.36	0.95	HA
2	Overhead Projector	19	9	-	-	3.68	0.48	HA
3	PowerPoint	11	12	4	1	3.18	0.82	HA
4	Video Tape	11	13	4	-	3.25	0.70	HA
5	Computer Games	18	6	3	1	3.46	0.84	HA
6	Audio Tape	10	13	4	1	3.14	0.80	HA
7	YouTube	9	15	-	4	3.04	0.96	HA
8	Smart Board	8	11	4	5	2.79	1.07	HA
9	Cassette	16	7	3	2	3.32	0.94	HA
10	Television	15	7	4	2	3.25	0.97	HA
	Cluster mean and SD					**3.25**	**0.85**	**HA**

Table 1 shows the mean and standard deviation of Mathematics teachers' awareness of ICT resources used in teaching and learning of mathematics. The mean responses for the items ranged from 2.79 to 3. 68 with standard deviation ratings that ranged from 0.48 to 1.07. It can be seen that all the item means are far above the benchmark mean value of 2.5 stated for answering the research question. It was therefore agreed that mathematics teachers have high awareness of ICT resources used for teaching and learning of Mathematics. This is further supported by the cluster mean value of 3.25 and standard deviation of 0.85. The teachers are mostly aware of overhead projector with a (mean = 3.68 and SD = 0.48). However, the teachers have the least awareness of smart boards (mean = 2.79, SD = 1.07) as ICT resources for teaching mathematics.

Research Question Two: What is the level of mathematics teachers' utilization of ICT in teaching and learning of mathematics?

Table 2: Mean and Standard Deviation of Mathematics Teachers' Utilization of ICT in Teaching and Learning of Mathematics

S/N	ICT Resource	A	Of	O	N	Mean	SD	Remark
1	I give homework in Mathematics to Students through Email.	1	5	8	14	1.75	0.89	Low
2	I use an overhead projector while	-	-	15	13	1.54	0.51	Low

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	teaching mathematics to show prepared illustrations on the screen.							
3	I use PowerPoint to prepare presentations for mathematics lessons.	-	5	12	11	1.79	0.74	Low
4	I play video tapes for my students during mathematics classes.	3	5	10	10	2.04	1.00	Low
5	I play computer games to enhance students' computational strategies in mathematics.	-	3	19	6	1.89	0.57	Low
6	I play audio tapes to my students during mathematics classes.	-	-	15	13	1.54	0.51	Low
7	I watch mathematics videos and lessons using YouTube.	2	4	17	5	2.11	0.79	Low
8	I use smart boards to display images from my computer screen to the classroom board while teaching mathematics	1	2	14	11	1.75	0.75	Low
9	I record or playback audio or video in a tape recorder using cassette in my mathematics lessons.	-	5	13	9	1.93	0.81	Low
10	I display mathematical problems to my students using television	-	3	16	9	1.79	0.63	Low
	Cluster mean and SD					**1.81**	**0.72**	**Low**

Table 2 shows the mean and standard deviation of Mathematics teachers' utilization of ICT resources in teaching mathematics. The mean responses for the items ranged from 1.54 to 2.11 with standard deviations that ranged from 0.51 to 1.00. It can be seen that all the item means are far below the mean benchmark value of 2.5 stated for answering the research question. All the items are therefore rejected which implies that mathematics teachers agreed that they do not utilize the listed ICT resources in teaching mathematics in Igbo-Eze South Local Government Area. This is further supported by the cluster mean value of 1.81 and standard deviation of 0.72. The teachers agreed that they record, store and playback audio, video and other data in digital form using YouTube in Mathematics lessons (Mean = 2.11, SD = 1.00) most.

Hypothesis One: There is no significant influence of gender on mathematics teachers' awareness of the use of ICT in teaching and learning of mathematics.

Table 3: t-test Result of the Influence of Gender on Teachers' Awareness of the use of ICT in Teaching and of Learning of Mathematics

Group	N	Mean	SD	T	df	sig	Remark
Male	17	33.71	2.93	3.05	26	0.005	
Female	11	30.36	2.66				

Table 3 shows that the mean awareness of male Mathematics teachers on the use of ICT resources for teaching of Mathematics (M=33.71, SD=2.93) is not statistically significant at (t = 3.05, df = 26, p = 0.05) and female Mathematics teachers (M = 30.36, SD = 2.66). Therefore, the null hypothesis that gender has no significant effect on teachers' awareness of ICT resources for teaching Mathematics is not rejected.

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Hypothesis Two: there is no significant influence of gender on mathematics teachers' utilization of ICT in teaching and learning Mathematics

Table 4: A t-test Result of the Influence of Gender on Teachers' Utilization of ICT in Teaching and Learning Mathematics

Group	N	Mean	SD	t	Df	sig	Remark
Male	17	18.65	3.81	0.96	26	0.35	
Female	11	17.27	3.50				

Table 4 shows that the mean utilization of ICT resources by male Mathematics teachers for teaching of Mathematics (M=18.65, SD=3.81) is not statistically significant at (t =0.96, df = 26, p = 0.35) higher than female Mathematics teachers (M = 17.27, SD =3.50). Therefore, the null hypothesis that gender has no significant effect on teachers' utilization of ICT resources for teaching Mathematics is not rejected.

Research Question Three: What are the Challenges against effective utilization of ICT in teaching and learning of mathematics?

Table 5: Mean and Standard Deviation of Ratings of Mathematics Teachers Challenges against Effective Utilization of ICT in Teaching and Learning of Mathematics

S/N	Item Statement	SA	A	D	SD	Mean	SD	Remark
1	Insufficient number of computers in schools.	16	9	3	-	3.46	0.69	Accepted
2	Poor knowledge of the use of ICT	15	7	3	3	3.21	1.03	Accepted
3	Difficult in integrating ICT into Mathematics instruction	14	9	3	2	3.25	0.93	Accepted
4	Lack of power supply	15	9	3	1	3.36	0.83	Accepted
5	Poor network connection.	18	6	3	1	3.39	0.83	Accepted
6	ICT gadgets too expensive to procure	18	6	3	1	3.46	0.84	Accepted
7	Limited assigned class time	16	12	-	-	3.57	0.50	Accepted
8	Poor administrative support	15	9	3	1	3.36	0.83	Accepted
	Cluster mean and SD					3.38	0.81	Accepted

Table 5 shows the mean and standard deviation of Mathematics teachers' perception of challenges against effective utilization of ICT resources in teaching Mathematics. The mean responses for the items 1-8 ranged from 3.21 to 3.57 with standard deviation ratings that ranged from 0.51 to 1.03. It can be seen that all the item means are far above the mean benchmark value of 2.50 stated for answering the research question. It therefore accepted that Mathematics teachers are of the opinion that all the items constitute challenges to the teaching and learning of Mathematics. This is further supported by the cluster mean value of 3.38 and standard deviation of 0.81. The teachers are of the opinion that one of most challenges facing effective utilization of ICT resources in teaching Mathematics is item 7 (limited assigned class time).

Discussion

From the results obtained, mathematics teachers have a high level of awareness of the use of ICT resources for teaching of Mathematics at secondary schools. However, mathematics teachers' level of utilization of ICT in instruction is very low. Thus, mathematics teachers are aware of the use of ICT in classroom instruction but utilization is an issue to the teachers. This may be because mathematics teachers, among other factors, lack the skills to use the technology in instruction. This is in agreement with Jude and

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Dankaro (2012), who found that 87.5% of teachers in Katsina-Ala College of Education in Benue state lack some facilities like computers and laptops, including poor knowledge of using ICT resources for instructional purposes. Collaborating the above finding is the finding of Khan, Hassan and Clement (2013), who found that lack of knowledge and skills for using ICT by teachers is the main hindrance to the utilization of ICT in teaching and learning. This finding is in tandem with those of Onasanya, Shehu, Ogunlade and Adefunye (2011), who found that teachers' utilization of ICT resources for teaching science subjects in Oyo state is very poor.

The findings of this study further show that there is no significant difference in mathematics teachers' awareness and utilization of ICT in mathematics instruction based on gender at 5% level of significance. This may be because both male and female lecturers are at the same level of development as far as technology education is concerned. This is in agreement with Unegbu, Ogugua, Nnadimele and Nse (2019), who found that both male and female lecturers in South-Ease and South-South Nigeria do not use ICT in delivering lectures because of their level of literacy on technology education. This finding affirms that of Toyin (2018) who found that both male and female teachers are aware of the skills needed to develop self-reliance for self-development and employment creation but could not use them due to certain inadequacies like inadequate computers, among others. However, this finding contrasts with those of Onasanya, Shehu, Ogunlade and Adefuye (2011), who found that male teachers outclassed their female counterparts in terms of utilization of technology driven instructional strategy. The study highlighted major challenges hindering ICT utilization in mathematics classroom to include poor network connectivity, inadequate knowledge on integration of ICT in mathematics instruction and limited assigned class time among others.

Conclusion

The conclusion was drawn that Mathematics teachers have high level of awareness of ICT resources for teaching of Mathematics have low level of utilization of those ICT resources because of such challenges like insufficient number of computers in schools, poor knowledge of the use of ICT, lack of power supply, Poor network connection, ICT gadgets too expensive to procure and limited assigned class time among others. Also, gender has no significant effect on Mathematics teachers' awareness and utilization of ICT resources for teaching and learning of Mathematics.

Recommendations

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

1. There should be training and re-training of mathematics teachers in ICT for enhanced productivity.
2. The Federal Ministry of Education should make ICT a pre-requisite for employment of secondary school teachers.
3. There should be provision of necessary ICT facilities to enhance teaching activities.

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