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Effect of Information and Communication Technology (Ict) on Learning Mathematics in Secondary Schools in Sokoto Metropolis

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ABSTRACT
This study investigated the effect of information and communication technology (ICT) on learning mathematics in secondary schools in sokoto metropolis. The objectives of the study are; to determine the effect ICT of Microsoft mathematics software on learning mathematics, to find out the effect of traditional method of teaching on learning mathematics and to compare the effect of use of ICT Microsoft mathematics software and traditional method on learning mathematics in secondary schools in sokoto metropolis. The study use two groups Pre-Test Post-Test quasi-experimental and Total number of 240 'O' level SS III students in secondary schools in Sokoto Metropolis the schools are Shehu Shagari College Of Education Staff Secondary School Sokoto, Sultan Bello Secondary School Sokoto and Giginya Memorial Secondary School Sokoto. Mathematics Competence Achievement Test (OLMCAT) is the instrument used to measure academic achievements of the sample students in the subject of mathematics. Which was constructed based on the mathematics teaching curriculum and objectives of the study. The collected data to analyze using descriptive statistics and the hypotheses will test using paired sample T-Test and independent sample T-Test. The study also will use paired t-test statistic Hence, traditional teaching is effective in improving the learning of mathematics among the students in secondary schools in sokoto metropolis. The study which would be completed in 12 months hopes to find positive effect of Information And Communication Technology(ICT) On Learning Mathematics In Secondary Schools In Sokoto Metropolis.The study used two groups Pre-Test Post-Test quasi-experimental design and a total number of 240 'O' level SS III students as The reliability was established through the use of cronbach's coefficient alpha with a value of 0.82 and content validity index (CVI) of 0.83. Ordinary Level Mathematics Competence Achievement Test (OLMCAT) was the instrument used to measure academic achievements of the sample students in the subject of mathematics. Which was constructed based on the mathematics teaching curriculum and objectives of the study. The collected data was analyzed using descriptive statistics and the hypotheses were tested using paired sample T-Test and independent sample T-Test. The result was found significant in favour of experimental group, since the calculated value of $t = -46.894$, $p < 0.05$). Therefore, the null hypothesis was rejected. Hence, ICT is effective in improving the learning scores of learning mathematics. This illustrated the effect of post-Test against pre-Test of learning in the academic achievements in mathematics at secondary schools of sokoto metropolis. The study also has show that The paired t-test statistic in table 4.6 reveals that there is a statistically significant difference between pre and post intervention scores of learning mathematics. $t = -49.228$, $p < 0.05$). Therefore, the null hypothesis was rejected. Hence, traditional teaching is effective in improving the learning of mathematics among the students. In senior secondary of sokoto metropolis. The study also found that the result of independent t-test in table 4.8 $t = -6.258$, $P < 0.05$), the null hypothesis was rejected. Therefore, there is statistically significant difference in learning scores of students

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in experimental and traditional teaching method after the intervention. Meaning the experimental group perform better than the traditional group which shows ICT has more effect after the intervention. The study concluded that ICT has more effect on learning mathematics at senior secondary of sokoto metropolis. Therefore, the researcher recommends application of ICT for learning mathematics at secondary level. To make its application more effective in education, students read should be trained in ICT from the grass root level. Therefore, it is recommended that Information and communication technology (ICT)

I. INTRODUCTION

Many instructional materials such as Paper, pen, and pencil have been the standard means in the teaching and learning of mathematics for many years in different schools the world over. However, technology has changed this traditional way of teaching and many difficult problems can now be solved by pressing a few keystrokes, when using the appropriate technology. Computers allow mathematical problem for example, use of matrices, set and statistics opportunity in teaching and learning of many subjects such as mathematics to solve easily. Such technology provides accurate and drawing, graphing and computation (National centre for teachers of mathematics NCTM, 2003) This helps students to solve the would be too tedious and time consuming learning and teaching of mathematics problems paper, pen, and pencil techniques more simpler.? The use of information and communication technology in teaching and learning in schools in has gradually but steadily taken centre stage.

The term information and communication technology (ICT) was first used in 1997 in a report by Denis Stevenson to the UK government and promoted by the new national curriculum documents for the UK in 2001 (Walsh 2001). Education system around the world are under increasing pressure let to teach students the knowledge and skills needed in the 21st century. Development and application of information and communication technology (ICT) in African. schools, colleges, and universities is critical (Nyombi, 2011).

Interesting to know is that nowadays there is an increasing use of computer technologies in schools, colleges and universities to help improve students' learning of mathematics. Technologies affect the teaching and learning of mathematics in areas of matrices, set and statistics. In the same vein they argue that use of technology at all levels of mathematics instruction. In teaching and

be introduced as a separate discipline in the curricula of Uganda from primary level. Application of ICT as a teaching strategy in mathematics was found effective as compared to traditional method of teaching. So to enhance its use in other disciplines of education, ICT be taught as a subject and its integration in all other subjects of the curricula at secondary and higher secondary levels. Considering the slight improvement on student learning after traditional teaching signifies students can learn also trough traditional teaching however the researcher recommends combination of the two methods to ensure maximum learning.
learning process in this regard helps students improve on their learning (NCTM 1989) advocates extensive use of computers to transform the mathematics curriculum. There has been effort to implement and utilize ICT in teaching and learning.

In an effort to improve the learning and teaching in schools. To aid the effect ICT into educational curriculum to provide ICT skills to teachers to improve their competence and confidence in using information and communication technology (ICT) effectively in classroom teaching and learning.(Attahiru 2021).

In Nigeria mathematics is one of the compulsory subjects taught in secondary schools according to National Curriculum Development centre (NCDC, 2008). However Nigeria education system has became more of subject matter centered than experience centred. Due to the system of experience-based rather than symbol-based mathematics education, Nigeria students have been facing the problem of formal education that is 'abstract', 'artificial 'and 'bookish' (Baale, 2014).

Similarly at sokoto state secondary School the mathematics content is taught using the traditional method of teaching such as talk and chalk. Thus the students encounter many difficulties in acquiring what is taught, and more important, causing them to memorize most of the mathematical concepts without understandingConfrey, (1992). The problems arise in the students' post-secondary education, when the new mathematics concepts are being constructed. In those grade levels, the basic knowledge of mathematics, which is thought to be acquired in the former grades is surprisingly missing and/or misunderstood (Attahiru 2021). This creates problems for both teachers and students in achieving their goals when new subjects are being thought.

Presently, the highly changed and technology dependent world, education at sokoto state secondary Schools has its share of modern technological challenges. Traditional teaching

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method such as use of chalk and talk in the teaching and learning of mathematics; teachers use a blackboard to provide examples or illustrations in giving way to new strategies to students in learning mathematics. Traditional methods of teaching have been undergoing changes influenced by new techniques and technologies since the spread and development of electronics and computers, computer based instruction (CBI) is an initiative that has been investigated as a means to close achievement gaps (Baale, 2014).

In sokoto metropolis the use of technology when studying mathematics is a new issue, since school management has always been looking for solution to solve difficulties students face in learning mathematics that has existed overtime in the school. There is no favourable learning environment to give students opportunity to construct their own understanding while learning mathematics, rather they rely on the teachers explanations. Use of technology such as calculators, projector and computers in teaching and learning affect students understanding and educational activities. This study investigates the effect of using ICT on learning mathematics.

Statement of the Problem

Information communication technology in learning mathematics has became an important aspect of successful teaching. This is because it allows students learn more in less time and allows schools, colleges and universities to focus on global learning mathematics if used appropriately. In addition it could be an effective teaching mathematics tool when used to engage all students in learning process (Almeklafi, 2006a, 2006b).

At sokoto metropolis the most commonly used methods of teaching are traditional methods where mathematics concepts are taught using abstract examples and words (Attahiru, 2013) including sokoto Metropolis.

At O level and A level, students are exposed mainly to subject content matter when they generally cannot understand why they learn such subjects especially when they are not interested in them, or when they know that such knowledge will never be of any use to them throughout their lives. In addition, the proportion of students reaching acceptable ability levels in mathematics decrease with the increase in mathematics fear among learners in Nigeria secondary schools (MOE 2021). It seems such fear is prevalent at sokoto metropolis : the researcher established that the mathematics results of senior secondary II (SS. II) students were significantly low compared to other subjects like history English for the last two years (Ministry of education sokoto, 2021).

Similarly, the term one and term two mathematics results of SS. I, SS.II, and SS. III In secondary schools in sokoto metropolis. decline in mathematics proficiency level (Ministry of education sokoto, 2021). due to the mathematical fear and lack of using technology in teaching and learning mathematics. In the pilot study conducted by the researchers.According to heads of mathematics department, in secondary schools in sokoto metropolis. Teachers do not use mathematics software in teaching and learning mathematics as frequently In addition it is observed that teachers in the department of mathematicsin secondary schools in sokoto metropolis are not using ICT for mathematics during delivery of contents. Hence both teachers and students are not exposed to global mathematics learning environment which make teaching and learning mathematics boring, less effective and time consuming. Therefore understanding the effect of information and communication technologies on learning mathematics in secondary schools in sokoto metropolis is very vital. This study hope to close this gap.

General Objective

The general objective or purpose of the study is to investigate the effect of ICT on learning Mathematics in secondary schools in Sokoto Metropolis

Objectives. **The research is informed by the following specific objectives:**

(i) To determine the effect of ICT Microsoft mathematics software on learning mathematics in in secondary schools in Sokoto Metropolis.
(ii) To find out the effect of traditional method on learning mathematics in secondary schools in sokoto metropolis.
(iii) To compare the effect of ICT Microsoft mathematics software and traditional method on learning mathematics in secondary schools in sokoto Metropolis

Hypothesis

(i) There is no statistically Significant Difference between Pre and Post test Scores of the experimental group in learning mathematics insecondary schools sokoto metropolis
(ii) There is no statistically Significant Difference between Pre and Post test Scores of the group using Traditional method in learning mathematics in secondary schools in sokoto metropolis.

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(iii) There is no statistically Significant Difference between Post test Scores of the Experimental group and control group on learning mathematics in secondary schools in sokoto metropolis

II. METHODOLOGY

Research Design

The Quasi-experimental design; two groups pre-test post-test designwas implemented in this study. This quasi-experimental research design involving two groups; the experimental and control groups (Creswell, 2012). In this design the experimenter tested the mathematics competence of the students before the treatment and divided the class as experimental group that studied using ICT and control group that studied mathematics using traditional method of teaching. The difference if any, between the two groups (Eg-Cg) is computed and is ascribed to the manipulation of ICT. Table 3.1 summarizes the design of the study:

Table 3.1 Research Design of the Study

Group	Pre-Test (Ya)	Treatment	Post-Test (Yb)
Experimental Group (EG)	OLMCAT	Student centered dynamic experiential learning environment using ICT equipment for learning mathematics	OLMCAT
Control Group (CG)	OLMCAT	Student centered dynamic experiential learning environment using Traditional method of learning mathematics i.e paper and pencils	OLMCAT

Source: (Primary data, 2022)

Research Design

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Population and Sample

Mathematics is a compulsory subject for all SS III students in secondary schools in Sokoto Metropolis the schools are Shehu Shagari College Of Education Staff Secondary School Sokoto, Sultan Bello Secondary School Sokoto and Giginya Memorial Secondary School Sokoto. and also said to be the time when students are expect to learn Mathematics (MOE, 2021). Therefore, the target population 650 of this study would be all O level students of Three secondary schools in Sokoto Metropolis . However the study strictly focused on Senior Secondary (SS III) Students.

Sampling Techniques

Sample random sampling Was used to select respondents of this study hope to give information regarding effect of information and communication technology (ICT) on Learning Mathematics in Sokoto Metropolis This is simple sample where by all the members of the population stands equal chance to be chosen (Amin 2005).

Sample size

(Krejcie & Morgan, 1970) Formula had been used to determine the sample size of the population which is 240, as follows:

$$S = X^2 NP (1 – P) \div d^2 (N – 1) + X^2 P (1 – P)$$

Now the sample size of the population of 240 but due to the factors of accuracy, cost, and homogeneity of the accessible population, type of sampling as well as the experimental nature of the study a adopted(Gay L. R, 2000).

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Research procedure

The researcher and their computer teacher gave the students of experiment group three days orientation and hands on opportunity on use of computer in their break time before starting the experiment. Since the students were already computer literate, they were made to familiarize with the requirement of the experiment by the use of e-mail, chatting, and Microsoft Mathematics software. The e-mail addresses of all the students of these groups were made and shared between all of them including their teacher. They were also trained on composing mathematical questions, assignments, sending, replying and receiving e-mail messages of teachers, fellow students, and to get link on-line with tutors. Also during the orientation they were given the demonstration and opportunities to acquire different resources of mathematics teaching around the world. At the end of their orientation researcher and the concerned teachers were satisfied by asking oral questions about their learning of using the computer and Microsoft Mathematics software.

III. DATA COLLECTION

At the end of the experiment, i.e. after six weeks, Ordinary Level Mathematics Competence Achievement Test (OLMCAT)was administered for both the groups and on the same date and time. The scores achieved by the students of both the groups of the were recorded separately, and were treated as academic achievement of the students for statistical analysis, to accomplish the objectives of the study.

Validity and Reliability

The reliability of the instruments used in this research had been tested by many researchers and are found to be reliable**(SAFDAR, 2013)**, but due to some modification by researcher to match the context and scope of the study. The reliability and validity of the instruments were tested as follows:

Content validity

Content validity was used to determine the validity of the mathematics competent achievement test. The researcher distributed copies of the OLMCAT to the experts competent in the field of Mathematics for their contribution. The advantage of this validity type is to determine the extent to which the items of the construct represent the concept to be measured (Creswell, 2012). The validity of OLMCAT was tested and confirmed by measuring it with the standard outlined by National curriculum development centre and Uganda National examination board 2008. The researcher examines the validity of the questions in all scales by computing content validity index (CVI).

CVI can be obtained by computing $CVI = \frac{\text{Number of items rated as relevant}}{\text{Total number of items in the scale}} = \frac{40}{48}$

= **0.83**

Content Validity Index (CVI) of the construct determined the validity of the instrument. The content validity index was 0.83 implying that the questionnaire was 83 % valid.

Construct Reliability

A pilot test was conducted to determine the reliability of the instrument. Together with the Microsoft mathematics learning software, 48 of Ordinary Level Mathematics Competence Achievement Test (OLMCAT) were randomly distributed to all senior secondary school in sokoto metropolis. All related items were transformed to have a single variable. The new variables were then tested by the use of Cronbach alpha in the SPSS software to determine the reliability of each construct. The purpose of Cronbach alpha is to test for internal consistency of an instrument (Cronbach, 1984). The tables below (table 3.2) indicate the total reliability of the instrument and the reliability of each construct. The tested reliability of the instrument was calculated to be 0.82, which scientifically equivalent to 82%, for OLMCAT. It was also found that each construct of the instrument was reliable and no item needs to be deleted (Cronbach's Alpha if item Deleted <.93).

Table 3.4 Reliability Statistics

Cronbachs Alpha	Scientific	N of Items
.82	**82%**	**40**

(Source: Field Data)

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Procedure for Data Analysis

After collection of the data from the participants, data from quantitative method was edited, coded and scored in the SPSS software. The quantitative data was analyzed in four sections. The first section of the analysis was done to justify the demographic features of the participants. This involved percentage. The Second section of the analysis involved the analysis of theOrdinary Level Mathematics Competence Achievement Test (OLMCAT). Independent Sample T-test was used to analyze the data for mathematics competent achievement test which formed the specific objectives and hypothesis of the study. The purpose of using Independent-sample T-Test was to compare the mean scores of continuous variables, for two groups (Pagalee, 2001). In the context of this study, the Independent-sample t-test was considered appropriate because the study involved two groups of students experimental and control group. All this was computed using Statistical Package for Social Sciences (SPSS) version 23.

IV. DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

Introduction

This chapter presents analyses and discusses the study findings. The findings are presented Based on research questions and objectives of the study after elaboration of the descriptive data of the effect of ICT on learning mathematics students: all the findings are discussed in contrast with what other researchers established in various studies. This chapter is divided into three sections. The first section presents descriptive statistics of the data. The second section present quantitative result, the last one summarizes and discusses the research findings. The focus of this study was to explore effect of Information and Communication Technology (ICT) on learning mathematics in secondary Schools in Sokoto Metropolis level in the subject of mathematics in contrast to traditional method of teaching .The means scores of the experimental and control group on the basis of post-test taken immediately after the completion of the experiment was recorded. Equivalence of experimental and control groups were cited on the basis of scores obtained from the previous achievements test of the students of class IV in the subject of mathematics by applying t-test. Significance of difference between the means scores of experimental and control groups was investigated by applying independent sample t-test.

Demographic Data of The Students

This section analyzed demographic data of the students who participated in the study which comprised their sex and age.

Table 4.1 Showing the Sex of the Students

Sex Of Respondents'

GENDER

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MALE	210	87.5	87.5	87.5
	FEMALE	30	12.5	12.5	100.0
	Total	240	100.0	100.0	

(Source: Field Data)

The table 4.1 above reveals that the highest number of students involved in this study were female with 30 representing (12.5%), this was followed by male who were 210 (87.5%), the difference between the male and female was quite negligible and this implied that both the male and female respondents responded positively towards the mathematics learning.

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Figure 2 Pie chart showing the sex of respondent at SSSM

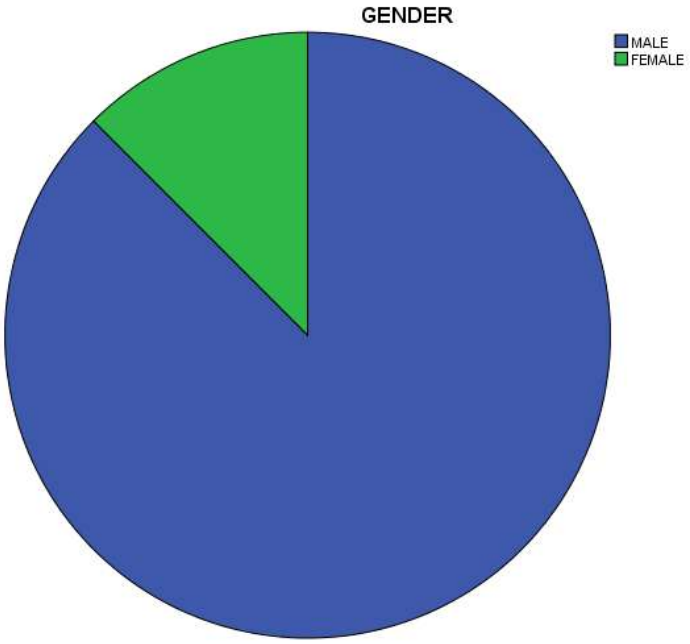

Table 4.2 Showing the Age Distribution of the Students

AGES

AGES	Frequency	Percent	Valid Percent	Cumulative Percent
15-17YEARS	90	37.5	37.5	37.5
18-20YEARS	105	43.8	43.8	81.3
21-23YEARS	25	10.4	10.4	91.7
24-ABOVEYEARS	20	8.3	8.3	100.0
Total	240	100.0	100.0	

Based on the result presented in table 4.2, it was indicated that 90 (37.5%) of the students were 15- 17years of age this was followed by 105 (43.8%) of the students were in the range of 18-20 years. 25 (10.4%) of the students were 21-23 years of age while 20 (8.3%) of the students were in the range of 18-20 years. Given the fact that majority of the students were of age, it suggested the fact that data were collected from true representatives of secondary schools in Sokoto Metropolis. This is in line with the demographic analysis of Ibrahim (2015) who reported that majority of secondary school students insecondary schools in Sokoto Metropolis were between the ages of 18-20 years.

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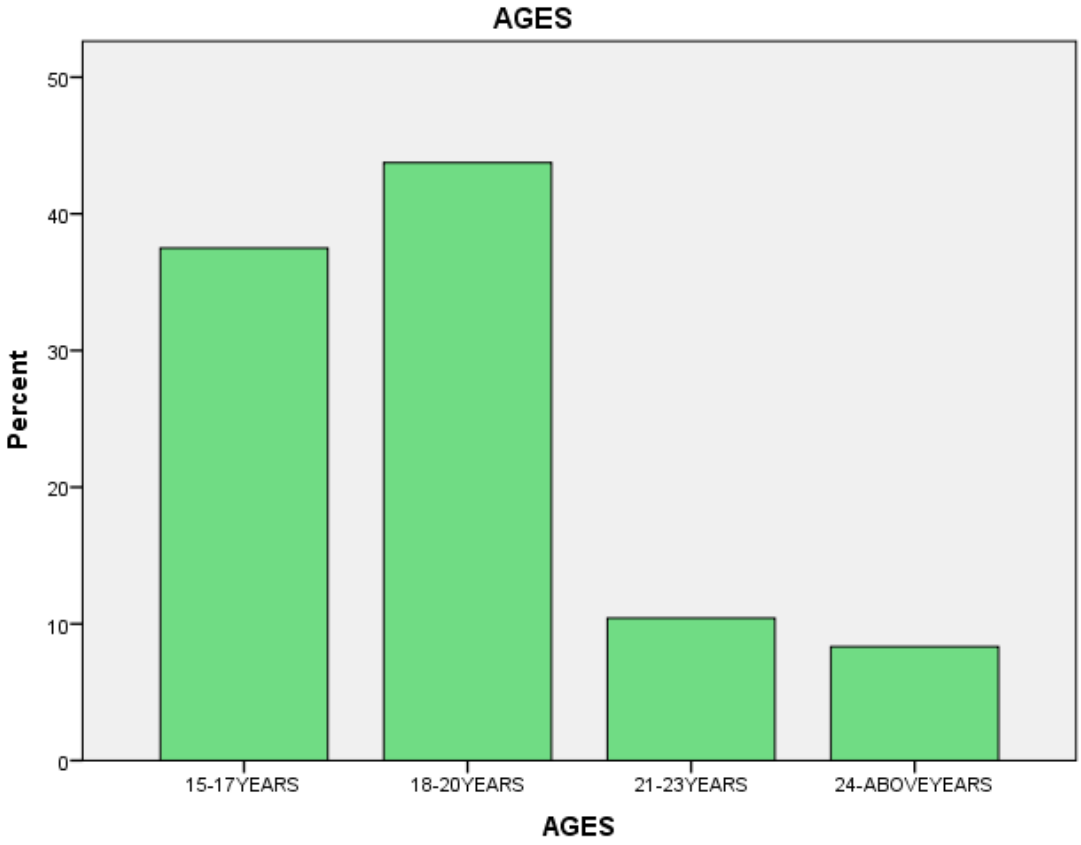
Figure 3 Bar chart shows the age of respondents at SSSM.



4.2 presentation of Research Hypotheses
The analysis is guided by the research hypothesis one:

Research Hypotheses One: There is no Significant Difference between Pre and Post intervention Scores on learning mathematics of experimental group at secondary schools in sokoto Metropolis

In order to test the above hypothesis, the collected data was analyzed using paired t- test to determine the effect of ICT learning mathematics.

Table 4.3: T-Test Effect of ICT of Microsoft mathematics software on learning in SSSM mathematics (Paired Samples Statistics)

GROUPS	N	Mean	Std. Deviation
PRE TEST EXPERIMENAL GROUP	120	12.92	3.939
POST TEST EXPERIMENTAL GROUP	120	45.07	6.292
VALID N	120		

Source: Field data, 2022

As indicated in table 4.3 the mean score of students in experimental group before the intervention was 12.92 and SD 3.939 compared to mean knowledge score of students after the intervention 45.07 and SD 6.292, the students score was higher after the intervention.. The descriptive statistics highlight that Effect of ICT on learning mathematics in secondary schools in sokoto Metropolis. improved significantly after the intervention.

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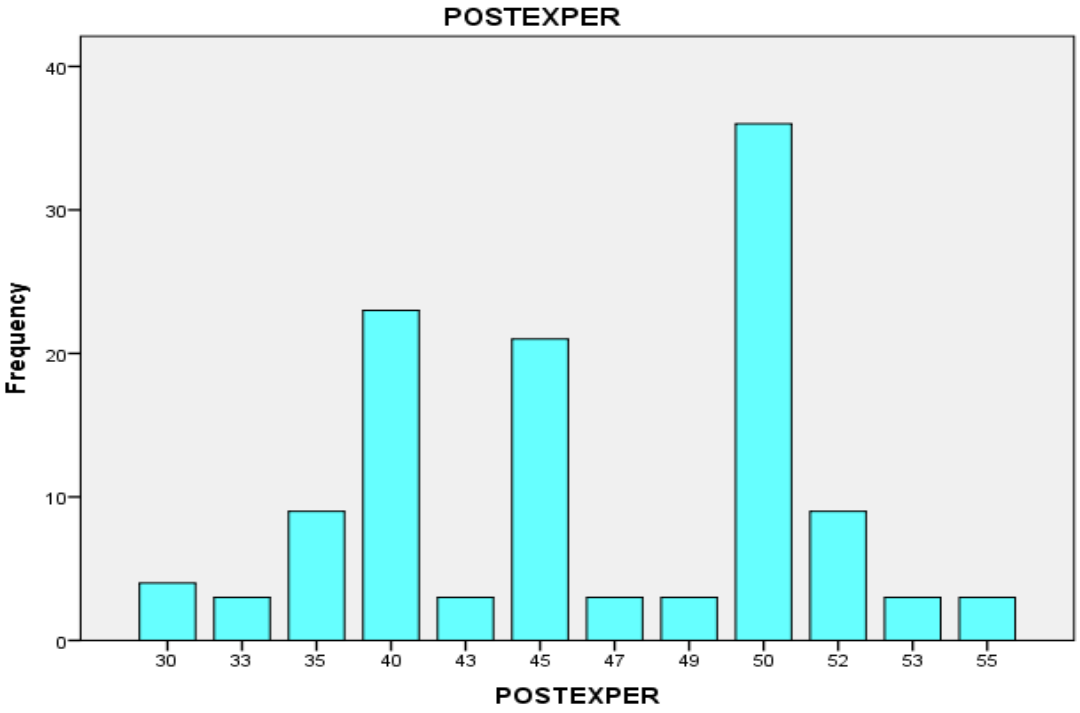
Figure 4 Barchart shows the performance of students during pre-Test of experimental group



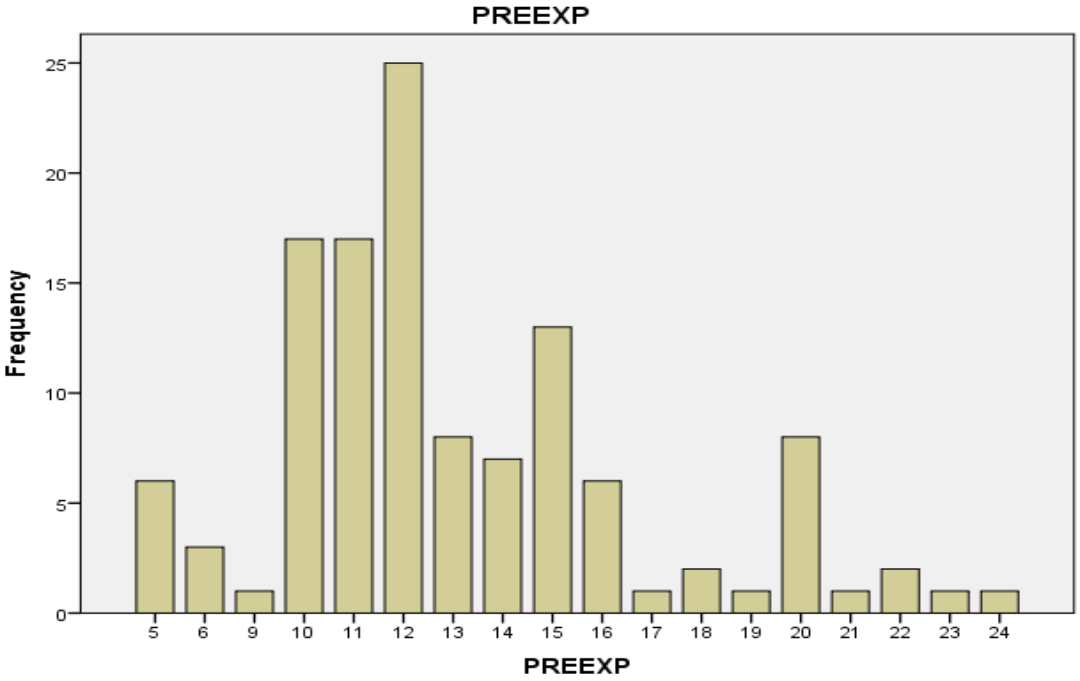


Figure 5 Bar chart shows the performance of students during Post-Test of experimental group

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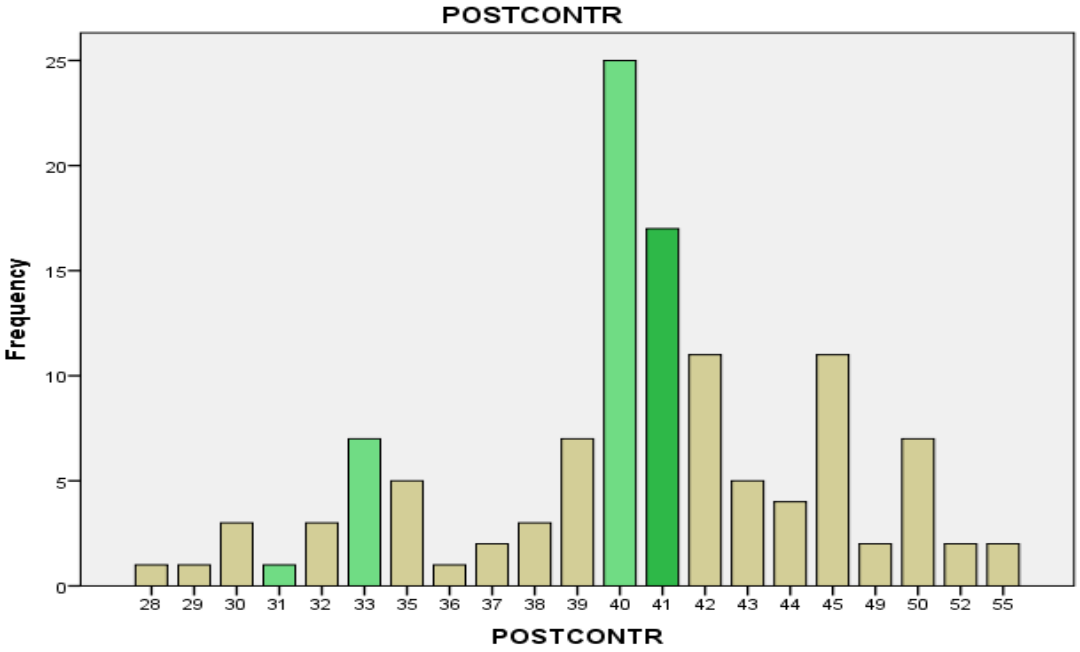

Table 4.4: T-Test Effect of ICT of Microsoft mathematics software on learning mathematics Paired Samples Statistics

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PREEXP – POSTEXP	-32.142	7.508	.685	-33.499	-30.784	-46.894	119	.000

The paired t-test statistic in table 4.4 reveals that there is a statistically significant difference between pre and post intervention scores of learning. T = -46.894, $p < 0.05$). Therefore, the null hypothesis was rejected. Hence, ICT is effective in improving the learning scores mathematics students. The eta squared statistics (97%) indicated a large effect size. (cohen ,1988) considering this, it was therefore conclude that ICT of Microsoft mathematics software on learning mathematics positively affect students academic achievement in mathematics at secondary schools in sokoto Metropolis.

The finding of this study is in agreement with the views of Golgenberg (2000:1) who points out that one of the strongest forces in the contemporary growth and evolution of mathematics and mathematics teaching is the power of new technologies.

The finding of this study is also in agreement with findings of Hennessy et al., (2001) Technological tools allow students to learn matrices, set and statistics more easily, quickly and accurately; to manipulate the graphs; and to develop generalizations about the functions. More time can be spent on analyzing the graphs and less time on the actual development of the graphs. Students build deeper understanding of functions and the graphs of the functions since less time is spent performing calculations. In the study of comparison of knowledge gain for Pomerant (in Dreiling, 2007:2) notes that "By reducing the time that, in the past, was spent on learning and performing tedious paper-and-pencil matrices, set theory and statistics calculator use today allows

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students and teachers to spend more time developing mathematical understanding, reasoning, number sense, and applications.

The finding of this study is also in agreement with findings of NCTM (2003), technological tools can increase both the scope of the mathematical content and the range of the problem situations that are within students' reach. Powerful tools for computation, construction and visual representation offer students access to mathematical content and contexts that would otherwise be too complex for them to explore.

The finding of this study is also in agreement with findings of Technology can enable students to explore relevant mathematical ideas through constructivist methods (Pugalee, 2001). It serves students as an information resource, a learning tool or a storage device that can support students to construct their own mathematical knowledge.

The finding of this study is also in agreement with findings of (Nicaise& Barnes, 1996:207) and allows students to actively participate and be responsible for their own learning. Technology supports exploration, which helps students set achievable goals, form and test hypotheses and makes discoveries of their own (Collins, 1991). In an environment where technologies are available, students might be involved in running experiments, testing conjectures, solving and posing problems and exchanging ideas.

In summary the findings on the study effect of ICT in learning mathematics scores significantly improved after treatment, the test statistics revealed statistically significant difference that leads to rejection of the hypothesis and conclude there is significant difference in effect of ICT on learning mathematics scores of SSSM students after the ICT Microsoft mathematics software intervention.

Effect of Traditional Method on learning mathematics

The analysis is guided by the research hypothesis two:

Research Hypotheses Two: There is no Significant Difference between Pre and Post test Scores of the control group in learning mathematics in SSSMS.

Table 4.5 T-Test effect of traditional method on learning mathematics (Paired Samples Statistics)

Descriptive Statistics

GROUPS	N	Mean	Std. Deviation
PRETEST CONTROL GROUP	120	12.83	3.419
POST TEST CONTROL GROUP	120	40.70	5.302
Valid N	120		

Source: Field Data, 2015

As indicated in table 4.5 the mean knowledge score of students in traditional group before the intervention was 12.83 and SD 3.419 compared to mean score of learning students after the 40.70 and SD 5.302, the students learning score was higher after the intervention. The mean of the post test is high than the mean of the pre test The descriptive statistics highlight that Effect of Traditional method on learning mathematics improved significantly after the intervention.

Table 4.6 T-Test effect of traditional method on learning mathematics (Paired Samples Test)

Paired Samples Test

	Paired Differences					T	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
PRETESTCOPOSTCONTR	-27.867	6.201	.566	-28.988	-26.746	-49.228	119	.000

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The paired t-test statistic in table 4.6 reveals that there is a statistically significant difference between pre and post test scores of the control group, T =-49.228 p < 0.05). Therefore, the null hypothesis was rejected. Hence, traditional teaching is effective in improving the learning of mathematics among the students. . The eta squared statstics (94%) indicated a large effect size. (cohen ,1988) considering this, it was therefore conclude that traditional method on learning mathematicspositively affect students academic achievement in mathematics at secondary schools in sokoto Metropolis.

The finding of this study is in agreement with the views of Goldenberg 2000). Discourse not only promotes the development of shared understandings and new insights but also contributes to deeper analyses of mathematics on the part of the teacher as well as the student.

The finding of this study is also in agreement with the views of (NCTM, 1989, 1991, 2000). Mathematics instruction should provide students opportunities to engage in mathematical inquiry and meaning making through discourse, and teachers should encourage this process by remaining flexible and responsive to students' response and feedback (NCTM, 2000). A crucial aspect of a classroom in which students are actively engaged, is to focus on classroom discourse. Discourse is defined as "purposeful talk on a mathematics subject in which there are genuine contributions and interaction.

The finding of this study is also in agreement with the views of connell (2001), reform-based mathematics is focused on the idea that mathematics should be taught in a way that encourages students to use "mathematical discourse to make conjectures, talk, question, and agree or disagree about problems in order to discover important mathematical concepts" (p. 285). According to Jabr (2006) participating in a mathematical community through discourse is an important step for learning mathematics and for conceptual understanding. They note that mathematical communication is necessary for ideas to become objects of reflection, refinement, discussion, and amendment.

In summary the findings of study Traditional Method on learning mathematics scores significantly improved after treatment, the test statistics revealed statistically significant difference that leads to rejection of the hypothesis and conclude there is significant difference in effect of Traditional Method on learning mathematics scores of SSSM students after the effect Traditional Method intervention.

Figure 6 Bar chart shows the performance of students during Pre-Test of traditional group

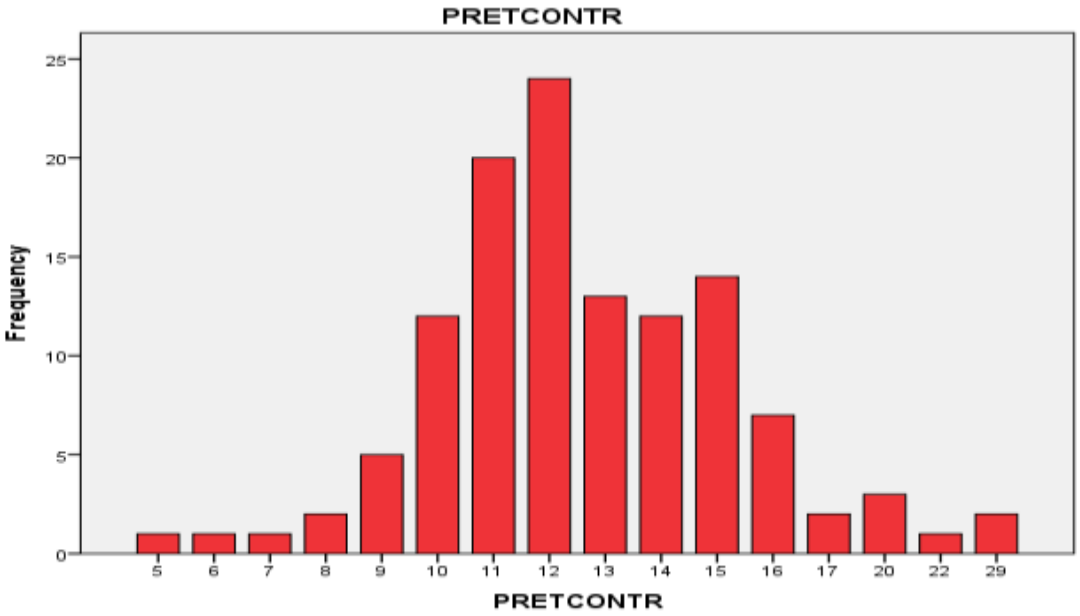

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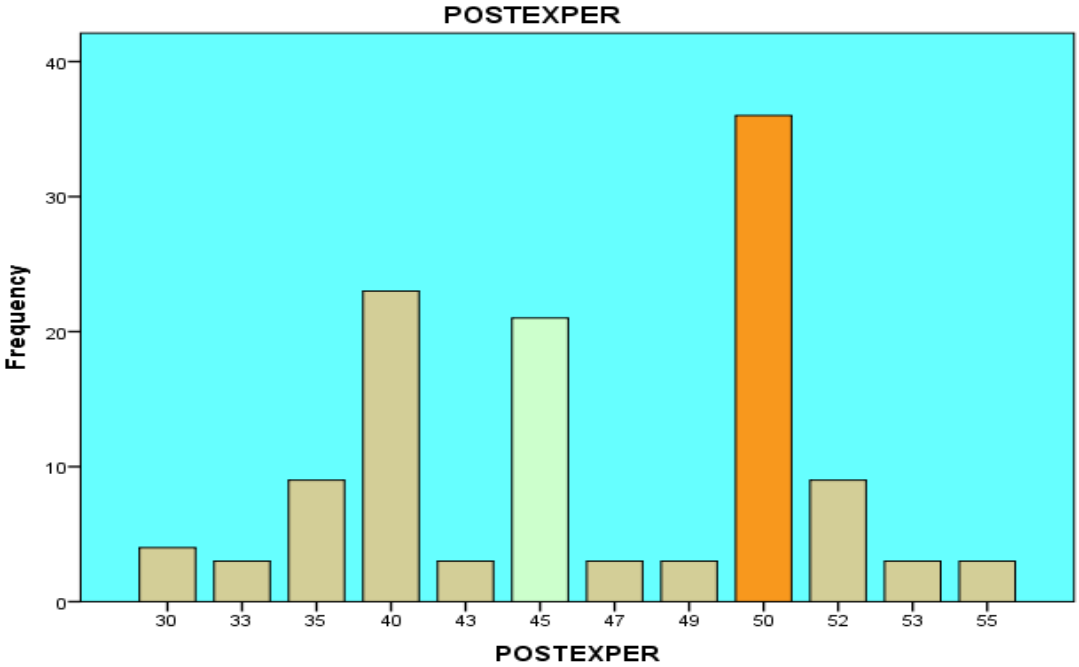
Figure 7 Bar chart shows the performance of students during Post-Test of traditional group



The analysis is guided by the research hypothesis Three:

Research Hypotheses Three: There is no Significant Difference between Post Scores on Experimental group and Traditional method on learning mathematics in SSSM.

In order to test the above hypothesis, the collected data was analyzed using Independent sample T-Test to determine the effect of ICT learning mathematics.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
POSTCONT	120	28	55	40.70	5.302
POSTEXP	120	30	55	45.07	6.292
Valid N	120				

Table 4.7: T-Test Effect of ICT of Microsoft mathematics software and Traditional method on learning in SSSM mathematics (Independent Samples Statistics)

As indicated in table 4.7 independent sample T-Test was used to determine if the post Test scores of SSSM students in experimental and control groups differed significantly. The results as illustrated in table 4.7 above show the mean scores and standard deviation of the mean scores and standard deviation of 40.70 ± 5.302 and 45.07 ± 6.292 for experimental group and control group respectively. The mean of the experimental post test is higher than the mean standard error of the control post test

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Table 4.8 T-Test There is no Significant Difference between Post Scores on Experimental group and control group on learning mathematics in SSSM

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Post	POSTCONT POSTEXP	-4.367	7.644	.698	-5.748	-2.985	-6.258	119	.000

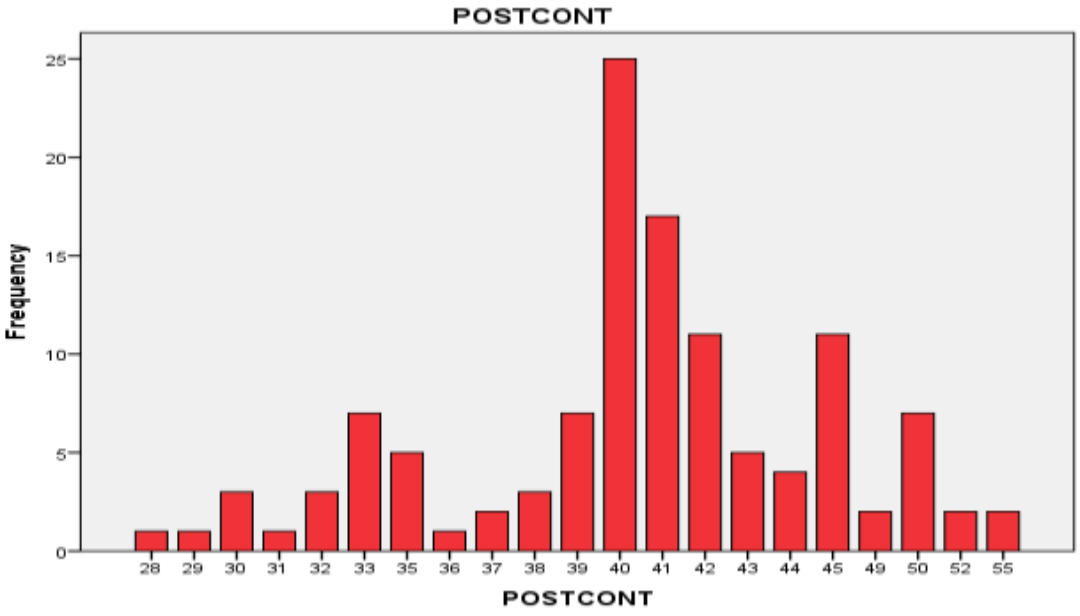
Considering the result of independent t-test in table 4.8 T = 6.258 P < 0.05), the null hypothesis was rejected. Therefore, there is statistically significant difference in mean scores of students in experimental and traditional teaching method after the intervention. Meaning the experimental group performed better than the control group which shows ICT has more effect after the intervention. . The eta squared statistics (83%) indicated a large effect size. (cohen ,1988) considering this, it was therefore conclude that Post Scores on Experimental group and control group on learning mathematics positively affect students academic achievement in mathematics at secondary schools in sokoto Metropolis.

The finding of this study is in agreement with the views of generalizations (Wiest, 2000). Wertheimer (1990) contends that technology motivates students to become more interested in exploring, investigating, conjecturing, creating, and discovering principles and making generalizations; it helps students in becoming mathematical problem-solvers, and in enhancing their conceptual understanding of mathematics.

The finding of this study is also agreement with the views of (Dossey, Mullis, Linquist, & Chambers, 1988). Fortunately, this picture of a traditional mathematics classroom is changing. Encouraged by the National Council of Teachers of Mathematics, use of technology in the mathematics classroom has increased, and technology-enhanced classrooms are becoming more prevalent.

The finding of this study is also agreement with the views of (NCTM, 2000). Therefore, the teachers may develop this skill when they learn how to use technology during pre-service education. The main purpose of using technology in teacher education is to enhance teacher‘s effectiveness and improve student‘s learning. Thus, appropriate training of teachers is very important.

Figure 8 Bar chart shows the performance of students during Post-Test of traditional and experimental groups.



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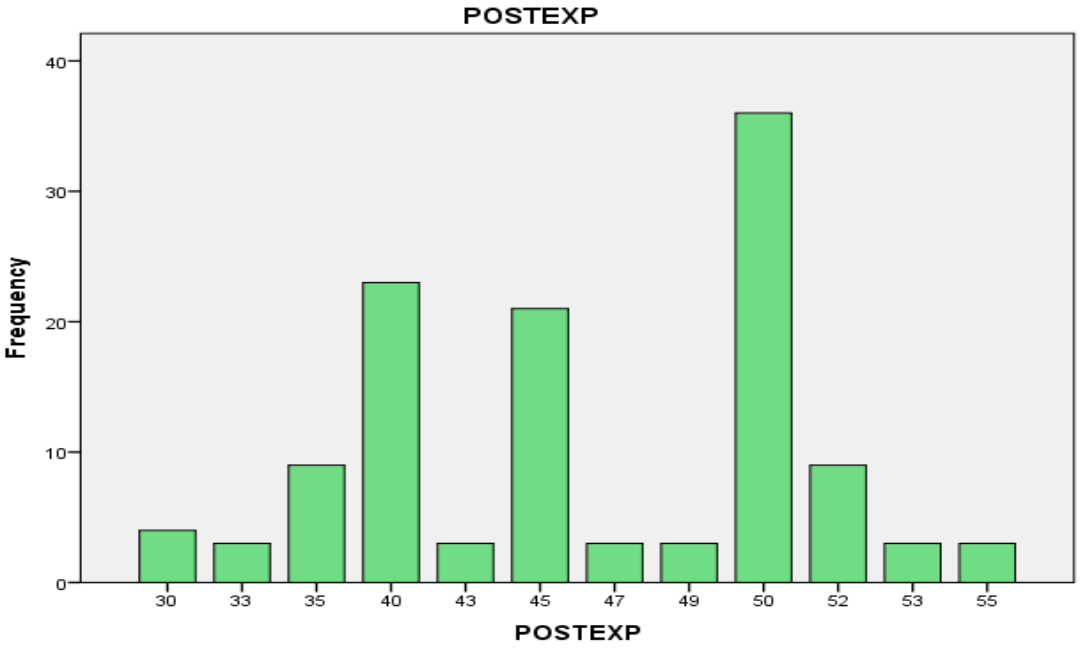

V. CONCLUSIONS AND RECOMMENDATIONS

Objective one: Effect of ICT On Learning Mathematics

Considering the scores in learning mathematics of students after conducted pre-test and post test. Post-test of ICT is more effective in improving the scores of learning mathematics. in SSSM.

Objective two: Effect of Traditional method on learning mathematics

Considering the scores in learning mathematics of students after conducted pre-test post test of control group post-test is more effective in improving the learning scores of mathematics students. In SSSM.

Objective three: Effect of ICT and Traditional Method On Learning Mathematics

Considering the scores in learning mathematics of students in experimental and traditional teaching method after the intervention. Meaning the experimental group performed better than the traditional group which shows ICT has more effect after the intervention.

Conclusion

The study concluded that both experimental and traditional group scores significantly improved after the intervention. Also, learning mathematics significantly improved after the experimental and traditional intervention.

The study similarly concluded that the experimental group performs better than the traditional group which shows ICT has more effect after the intervention.

Recommendations from the Study

The application of ICT was found effective for learning mathematics at secondary level. To make its application more effective in education, students should be trained in ICT from the grass root level. Therefore, it is recommended that Information and communication technology (ICT) should be introduced as a separate discipline in the curricula of Nigeria from primary level.

Application of ICT as a teaching strategy in mathematics was found effective as compared to traditional method of teaching. So to enhance its use in other disciplines of education, ICT should be taught as a subject and it should be integrated into all other subjects of the curricula at secondary and higher secondary levels.

Considering the slight improvement on student learning after traditional teaching signifies students can learn also through traditional teaching however the researcher recommends combination of the two methods to ensure maximum learning.

Policy makers and curriculum designers should endeavor to integrate ‘O’ level curriculum and find the different types of software and learning style that are most effective for use with computer education.

The management of SSSM. should provide software for delivery mathematics.

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