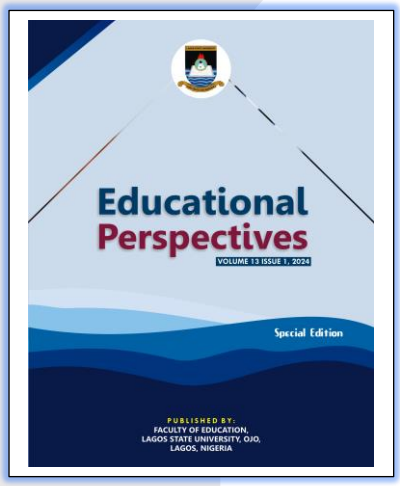

Enhancing Pedagogy with Technology: A Study on ICT Integration in Teaching Primary Mathematics

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ABSTRACT

Information and Communications Technology (ICT) has become an integral and accepted part of everyday life for many people. Technology is increasing in importance in people's lives, and it is expected that this trend will continue, to the extent that technological literacy will become a functional requirement for people's work, social, and personal lives. The creative use of Information and Communications Technology (ICT) in education has the capacity to increase the quality of people's lives by enhancing teaching and learning. This study aims to examine the effect of integrating ICT tools in teaching and learning of primary school mathematics which seeks to find out if there exists any difference in the achievement of the students taught mathematics using computers and those taught mathematics without using them. The study also sought to find out if the gender of the students had any effect on their achievement when they use ICT materials to learn. The researcher used the quasi-experimental design in carrying out the study. The students that participated in the study were twenty-six in all and were divided into two groups (control and experimental). Treatment was done by using ICT materials to teach the experimental group which was not done for the control group. Data collected were analyzed using analysis for covariance (ANCOVA) at 0.05 level of significance. Findings revealed a statistical difference in the achievement of (i) those taught using ICT materials and those taught without it {$F(1, 26) = 15.922$, $p < 0.05$}; (ii) male and female pupils taught using ICT materials. Pupils taught using ICT materials performed better than their counterparts taught without ICT materials. Female pupils taught using ICT materials performed better than their counterparts in the same group. Based on the findings from the study, it was suggested among others that technology

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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 times. 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 pupils in ways that have not been possible before. The rapid rate at which ICT has evolved since the mid-20th century, with its convergence and pervasiveness, gives it a strong role in development and globalisation (Nwagwu, 2006).

Pupils who use ICT gain a deeper understanding of complex topics and concepts and are more likely to recall information and use it to solve problems outside the classroom (Apple Computer, 2002).

One of the subjects, where the use of ICT is being done and studied at the same time is mathematics. Since mathematics is abstract, teachers are constantly looking for ways or tools to help pupils understand the underlying concepts of the lesson. Numeracy becomes better when teachers use resources including ICT to model mathematical ideas and methods. In addition, ICT is seen as a tool that will be able to help pupils with problem-solving, which is a basic but utterly essential skill needed in the mathematical world. The 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 pupils and teachers towards learning and teaching mathematics.

Gender is a cultural construct that distinguishes the roles, behaviour and mental and emotional characteristics between females and males developed by society. Umoh (2003) defines gender as a psychological term used to describe behaviours and attributes expected of individuals based on being born as either male or female. According to Okeke (2003), the study of gender is not just a mere identification of male and female sexes. Scholars have gone further to identify responsibilities assigned to opposite sexes and to analyse the conditions under which those responsibilities are assigned. Furthermore, Okeke (2003) specifically notes that the study of gender means the analysis of the relationship of men and women including the division of labour, access to resources, and other factors that are determined by society as opposed to being determined by sex. It further involves the study of the socio-cultural environment under which responsibilities are assigned and the relationships emanating from it. Thus, gender equally projects the properties that distinguish and classify organisms based on their reproductive and cultural expectant roles. It relates to the cultural and psychological attributes of men and women to their socio-economic contributions, expectations, and limitations. Thus, the concept of gender does not support or suggest the dominance of males over females or vice versa in academics and other human resource development areas, but it stresses equality and equity in enhancing effective and efficient recognition, development and use of competencies and endowed capabilities of both sexes.

Purpose of the Study

The general purpose of this study is to investigate in detail the effects of ICT integration in the teaching and learning mathematics among primary school pupils. The

study therefore aims at achieving the following objectives:

i. To investigate the effects of integrating ICT in primary classroom instruction on the pupil achievement in mathematics.
ii. To investigate the influence of ICT on male and female pupils' achievement in mathematics.
iii. To study the effect of attitude on pupil's achievement in primary mathematics.

ICT Materials: Their Effectiveness in Teaching-Learning Process

There has been no consensus about the workability or otherwise of the ICT materials in learning of the numerous works done by researchers and authors of repute, and there are conflicting conclusions. While others find ICT materials useful, some consider using them as misfits. Giving perspective to the effectiveness of ICT materials, the use of ICT materials can increase concreteness, clarity, and effectiveness of ideas and skills being transferred by the teacher. The implication of this is that ICT materials enable teachers not only to teach but also give learners the opportunity to look, listen and learn faster and better. In addition to what the learner achieves at a fast rate, the learner adopts quickly and is capable of learning more thoroughly and remembering longer. This practise erodes not learning.

Naturally, it is true that what you see and possibly touch has its image almost permanently imprinted in your subconscious. ICT materials are not only important to teaching-learning mathematics alone but also contribute a great deal towards the socio-economic and socio-physical changes in societies.

Consolidating the gains of effective use of ICT materials, a child who is born into the world blind, deaf, and dumb is greatly handicapped in the race of life. His communication to the whole world is practically impossible. All that is left is the ability to touch and taste, which can enable him to obtain very little knowledge.

Information reaches us through five senses; these are seeing, hearing, smelling, testing, and touching (Agugu, 2019). Learning through these five senses is distributed as taste - 1%, touch - 1.5%, smell - 3.5%, hearing - 83%, sight - 11%.

Importance of the Use of ICT Materials in Schools

Having critically examined the various types of ICT materials, their sources, and effectiveness in the teaching-learning process, it is very necessary to look at the importance of these materials when used as teaching-learning of mathematics. The use of instructional materials is indispensable in Nigerian secondary schools because a larger number of children are from rural areas; as such, they have rare or no opportunity to travel from their homes to see the outside world, which further renders them unknowledgeable enough about their outside world. Worst of all, in most homes where these children come from, there is no source of stimulation that they need for their academic work, that is to say there are neither books, newspapers, radios, pictures nor television. Moreover, children receive education in a foreign language (English) in a situation like this; the use of visual aids becomes vital for understanding the meaning of the new words and ideas they come across in their school programme.

Audio-visual materials give the pupils direct contact with the realities of their world. Audio-visuals help reduce verbalism or repetition of

words without acknowledging their meaning and reinforce verbal message (Bruce, 1997). All these attributes help promote better understanding and intellectual curiosity among pupils. Furthermore, visual materials facilitate learning. This means that visual aids when used in a lesson inform better understanding at a faster rate. Finally, visual materials substitute travelling and risks as they present the real picture of what is being imagined or what does not exist in the learning environment. For example, you can bring in pictures or models or even films about a particular topic of study in a classroom.

Classification of ICT Materials

The ICT materials can be broadly classified under two headings: sight and sound, specifically, they are grouped under the following:

I. Graphic materials
II. Projected still pictures.
III. Non-projected still pictures
IV. Motion pictures
V. Audio materials
VI. Three-dimensional materials or objects.

The justification for the description revolves around the fact that due to the level of education in schools, suffice that before a teacher operates an ICT material or learns the skills for producing or improvising some materials, it is incumbent on him to be able to identify the various types of materials that exist.

Constraints to the use of ICT Materials during the Teaching and Learning Process

Since there is always the other side of everything, the use of ICT materials to impact knowledge in mathematics pupils is always associated with some problems that calls for attention. This is because, since the problems have posed as a threat, the good work of ICT materials in teaching-learning of mathematics which enhances scholarships among learners, is drastically inhibited and intends to redress ICT materials would be strangled and ultimately, teaching-learning process would not be effective.

Among several problems that thwart the effectiveness of ICT materials is that of finance. Finance is required for the acquisition of gadgets such as graph boards, charts, and computer systems etc. These items require high capital outlay which is always not there. The problem is compounded by the poor nonchalant attitudes towards the educational system by the government. This is in consonance with the poor education habit in the private sector. Loans and overdrafts, which could have a veil themselves as well-come reliefs, are not forth coming for lack of collateral or unwillingness of the banking sectors to grant loans.

While stressing the use of ICT materials in the teaching and learning process, Coomb (1974) did not hesitate to affirm that despite the accomplishment in 1921, the programme faced two serious problems in addition to the perennial one, which included insufficient financial support and lack of highly motivated graduates for the extension of ICT devices. His exposition reveals that apart from the absence of finance, the system suffers from the death of personnel, and that our educational system lacks trained staff who could impact knowledge unto pupils. Few who find themselves in the classroom as instructors are mostly misfits, incapable of doing the least job a professional can do. Since the teachers themselves are incapable of manipulating or demonstrating the materials to the learners, the funny scenario becomes akin to an adaptation of a blind man

leading another, whose disaster or woe is better imagined.

Methodology

The Research Design

The research method that was adopted for this study was a quasi-experimental research design that involves pre-test, post-test, experimental group and control group design. The research project used two independent samples: experimental and control groups of primary five pupils in two private primary schools using all the population of all the primary five pupils in the two schools. The two private schools were arrived at through non-probability sampling procedure as these were the only private schools with similar background and learning experience within the same locality. ICT facilities was then introduced to teach the selected pupils of one of the schools which was randomly selected by a simple random sampling technique whereby the names of the two schools were written on different small paper which was folded and all placed in a bag and mixed thoroughly, One was drawn out. The first draw represents the experimental group of which all the learners in the entire class participated while the second the control group.

The two groups learnt a mathematical concept of simple statistics, in the topic Data presentation using Bar chart, in a single period of 45 minutes per week which was done for four weeks. The reason why the classes held four times is due to the practical nature of the concept content under the study. The experimental class learnt the concept by using Microsoft Excel to tabulate data and later plot the tabulated data into a graph in the presence of the researcher for purposes of quality assurance and control while the control group received the teaching in the normal traditional way of exposition and drilling thereafter the two groups were subjected to the same written mathematics standardized test. Four weeks period of research was allowed to enable the two participating schools and pupils to cover the said content and do the necessary practice. The test lasted for 40 minutes, which was enough in relation to the content covered. The test paper contained 4 extended test items, testing all the 6 levels of Blooms Taxonomy as well as factual, procedural, analytical and meta-cognition dimensions. Learners used the paper containing the test items to work. The subject teacher supervised and invigilated this exercise closely; the aim was to increase the validity. The entire test was carefully marked and scored by the researcher using a common marking scheme as the protocol. Pass mark was set at 20 marks out of the maximum possible score of 40. The results for each individual school and student in each category were tabulated.

Population, Sample and Sampling Technique

The population for the study consisted of all the primary school pupils in private primary schools in Ogun State. Each group were intact groups and geographically separated from one another. The sample consisted of 26 pupils in primary five class from two private schools in Egudu-Baale town and Idanyin town in the same Agbara-Igbesa Local Government Development Area, Ado-Odo LG in Ogun State. The sample comprises of 15 males and 11 females. Non-probability sampling method was used to select the two schools. In this way, all schools in the location were given equal chance of being selected. Two intact classes were used for the study.

Data Collection Instrument

The two instruments used for the study were developed and validated by the researcher. They are Pupils attitude towards mathematics

questionnaire and Mathematics Achievement Test (MAT).

The Mathematics Achievement Test (MAT) contains four extended items examining all the four knowledge dimensions, in terms of factual, procedural, analytical and meta-cognitive dimensions and the six levels of Blooms cognitive taxonomy. A common marking scheme was carefully used for fairness and test marks were scored based on factual, analytical, creativity and originality. A camera was used to capture photo-clips of the sessions in the experimental class during the actual teaching and learning (see Appendix 4) which aimed at relating the different learning environments and the learning outcomes.

Data Collection Procedures

After the initial random selection of the classes to be used in each school, two groups were selected and designated as follows: Experimental Group (Group A) and the Control Group (Group B).

Pre-test in mathematics was administered to test pupil's level of masterly on the selected topics. A questionnaire on pupil's attitude toward mathematics was also administered.

Experimental Group: Prior to administering the treatment package, Microsoft Office package was installed in all the computers in the laboratory for those in the experimental group, the pupils were exposed to the concept of using Microsoft Excel to plot graph for the gathered data on the computer with the guide of the researcher. Also, a motivational talk on the importance of mathematics was given to the experimental group by the researchers to aid build up the attitude of the learners towards mathematics.

The control group were taught using conventional method and thus restricted from using the computer in their school laboratory.

During this period, both groups (Experimental and Control group) were exposed to the same content materials. The treatment lasted for four weeks of single period of forty-five minutes per week. The investigators personally handled the treatment conditions in all the classes. At the end of the treatment, the Mathematics Achievement Test and attitude in mathematics questionnaire were administered to the two groups again as post treatment test to the pupils. Strict supervision was also carried out during the pretest and posttest to prevent adverse effect on the result of the study.

The researcher did not disclose to the participants that they are taking part in an experiment, otherwise it would have interfered the natural setting, hence achievement. After four weeks, a written standard mathematics achievement test comprising of four extended items was administered by the researcher which lasted 40 minutes under normal examination conditions to the two groups in the study.

Four weeks period was allowed to enable all participating schools and pupils to cover the said content and do the necessary practice. The 6 levels of cognitive development in Blooms taxonomy were considered while formulating the test items. Item1, 3 and 4 was about interpreting a given constructed bar charts and using the information to answer some questions given. Item 2 consist of information about the ages of primary pupils in a certain school and use the information to construct a bar chart and answer questions on the drawn chart. Each item constituted 10 marks. The test was marked out of total possible score of 40 by the researcher using a common marking scheme. 26 pupils were used in the study in which 17 constituted experimental group and 9 the control group. Learners' raw scores were tabulated to be used to evaluate the influence of integration of ICT tools in comparison with traditional practices. The resulting scores were recorded in the excel

spreadsheets, codes of 1 and 2 were used for experimental and control groups respectively and subjected to independent 2 sample t-test analysis. This exercise lasted four weeks during the months of February-March 2019. Quantitative data obtained from the scores were used to measure the difference in the two methods of teaching on achievement.

Validation of Instrument

The instruments for data collection in this study were validated by experts in mathematics. Their observations/comments were used to improve the quality and content validity of the instrument before administration.

Data Processing

Data in form of pupils' scores was prepared and cleaned by checking for incorrect entries and missing ones. Data was inputted into computer software; in this case Microsoft Excel was used, for purposes of identifying and coding variables. The captured data was later imported to SPSS for the purpose of analysis. Analysis was done to obtain output. Further analyses and presentation of the output to facilitate interpretation was done, scores were coded 1 for the experimental group of learners and 2 for the control for the purpose of testing the significance of difference between means of 2 independent samples.

Scope and Limitations

The study was designed to gather information on how ICT integration in mathematics teaching and learning may influence achievement of the subject in private primary schools in Ogun State in Nigeria. The study involved pupils with almost equal academic background. The study was limited to private primary schools and could not be generalized to cover public primary schools, tertiary institutions and universities. These findings are only applicable in developing countries.

Time and finances were limitations for the researcher to carry out the study on a wider scale, in public and heterogeneous groups. Confounding variables (C.V.) like teachers' experience, learners' entry behavior, teachers' willingness to participate and the ratio of learners to computer may also have posed a challenge to the study.

Results

The data from the respondents were analysed using descriptive statistics (mean, standard deviation and mean gain) and analysis of covariance (ANCOVA) was used as inferential statistics.

Hypothesis One: There is no significant main effect of treatment on students' achievement in mathematics

Table 1: ***Summary of Analysis of Covariance (ANCOVA) of Post-Test Achievement Scores***

Source	Type III sum of squares	Df	Mean Square	F	Sig.	Partial Eta. Squares
Corrected model	1031.396a	11	93.763	4.519	0.005	0.780
Intercept	18462.049	1	18462.049	889.890	0.000	0.985
Treatment	330.316	1	330.316	15.922	0.001	0.532
Gender	127.535	1	127.535	6.147	0.027	0.305
Attitude	7.761	2	3.880	0.187	0.831	0.026
Treatment*Gender	20.683	1	20.683	0.997	0.335	0.066
Treatment*Attitude	22.101	2	11.050	0.533	0.598	0.071
Gender*Attitude	2.245	2	1.123	0.054	0.948	0.008
Treatment*Gender*Attitude	51.932	2	25.966	1.252	0.316	0.152
Error	290.450	14	20.746			
Total	31514.000	26				
Corrected Total	1321.846	25				

a = R. Squared = .780 (Adjusted R squared = .608)

The result in table 1 indicate that the main effect of treatment (ICT integration) on students' achievement in mathematics is statistically significant {F (1,26) = 15.922, p < 0.05)}. Since the p-value of the F ratio is significant, it follows that **Ho_1** regarding the main effect of treatment on students' achievement in mathematics is rejected. Therefore there is a significant main effect of treatment on students' achievement in mathematics. The partial Eta squared estimated was 0.532, implying that treatment accounted for 58.2% of the variance observed in post-test achievement score. Table 2 below showed that the mean achievement scores of students exposed to ICT is higher than that of their counterparts in the control group. Therefore the mean achievement scores of the experimental group is significantly higher than that of their counterparts in the control group.

Table 2: ***Scheffe post Hoc multiple comparison of Treatment***

(I) methods	(J) methods	Mean difference (I – J)	Standard Error	Sig.
Control	Experimental	-8.892*	2.228	.001
Experimental	Control	8.892*	2.228	.001

Hypothesis Two: There is no significant main effect of Gender on students' achievement in mathematics

The result in table 1 indicate that the main effect of gender on students' achievement in mathematics is statistically significant {F (1,26) = 6.147, p < 0.05)}. Since the p-value of the F ratio is significant, it follows that **Ho_2** regarding the main effect of gender on students' achievement in mathematics is rejected. Therefore there is a significant main effect of gender on students' achievement in mathematics. The partial Eta squared estimated was 0.305, implying that treatment accounted for 30.5% of the variance observed in post-test achievement score. Table 3 below showed that the mean differences of achievement scores of female students is higher than that of their male counterparts. Therefore the mean achievement scores of the female students is significantly higher than that of their male counterparts.

Table 3: Scheffe Post Hoc Multiple Comparison of Gender

(I) Gender	(J) Gender	Mean difference (I – J)	Standard Error	Sig.
Male	Female	-5.525*	2.228	.027
Female	Male	5.525*	2.228	.027

Hypothesis Three: There is no significant main effect of attitude of students to mathematics on their achievement in mathematics

The result in table 1 indicate that the main effect of gender on students' achievement in mathematics is not statistically significant {F (2,26) = 0.187, p > 0.05)}. Since the p-value of the F ratio is not significant, it follows that **Ho3** regarding the main effect of attitude on students' achievement in mathematics is accepted. Therefore there is no significant main effect of attitude on students' achievement in mathematics. The effect is therefore not generalizable. The partial Eta squared estimated was 0.026, implying that based on the sample for the study, attitude accounted for 2.6 % of the variance observed in post-test achievement score. Table 4 below showed that the mean achievement scores of low attitude students is the highest of the three groups. This is followed by the high attitude students while the medium attitude students have the least mean achievement score. The differences are however not significant. Therefore, they are not generalizable.

Table 4: *Scheffe Post Hoc Multiple Comparison of Attitude*

(I) Atttitude	(J) Attitude	Mean difference (I – J)	Standard Error	Sig.
Low	Medium	1.563	2.650	.565
	High	0.163	2.576	.951
Moderate	Low	-1.563	2.650	.565
	High	-1.400	2.947	.642
High	Low	-0.163	2.576	.951
	Medium	1.400	2.947	.642

Hypothesis Four: There is no significant interaction effect of Treatment and gender on students' achievement in mathematics

The result in Table 1 indicates that the interaction effect of treatment and gender on students' achievement in mathematics is not statistically significant {F (1,26) = 0.997, p > 0.05)}. Since the p-value of the F ratio is not significant, it follows that **Ho4** regarding the interaction effect of treatment and gender on students' achievement in mathematics is accepted. Therefore there is no significant interaction effect of treatment and gender on students' achievement in mathematics. The effect is therefore not generalizable. The partial Eta squared estimated was 0.066, implying that based on the sample for the study, treatment and gender accounted for 6.6 % of the variance observed in post-test achievement score. Table 5 below showed that the mean achievement scores of female students in the experiment is the highest, followed by male students in the experimental group, followed by female in the control group while male in the control group has the least mean post achievement score. The differences are however not significant. Therefore, they are not generalizable.

Table 5: ***Scheffe Post Hoc Multiple Comparison of Treatment and Gender***

(I) Gender	(J) Treatment	Mean difference (I – J)	Standard Error
Male	Experimental	36.033	1.663
	Control	24.917	2.277
Female	Experimental	39.333	2.235
	Control	32.667	2.630

Hypothesis Five: There is no significant interaction effect of Treatment and attitude on students' achievement in mathematics

The result in Table 1 indicates that the interaction effect of treatment and attitude on students' achievement in mathematics is not statistically significant {F (2, 26) = 0.533, p > 0.05)}. Since the p-value of the F ratio is not significant, it follows that **Ho5** regarding the interaction effect of treatment and attitude on students' achievement in mathematics is accepted. Therefore there is no significant interaction effect of treatment and attitude on students' achievement in mathematics. The effect is therefore not generalizable. The partial Eta squared estimated was 0.071, implying that based on the sample for the study, treatment and attitude accounted for 7.1 % of the variance observed in post-test achievement score. Table 6 below showed that the mean achievement scores of high attitude students in the experiment group is the highest, while high attitude students in the control group has the least mean post achievement score. The differences are however not significant. Therefore, they are not generalizable.

Table 6: ***Scheffe Post Hoc Multiple Comparison of Treatment And Attitude***

(I) Attitude	(J) Treatment	Mean difference (I – J)	Standard Error
Low	Experimental	38.750	1.859
	Control	28.875	2.546
Medium	Experimental	35.000	2.789
	Control	29.500	3.221
High	Experimental	39.300	2.495
	Control	28.000	3.221

Hypothesis Six: There is no significant interaction effect of gender and attitude on students' achievement in mathematics

The result in Table 1 indicates that the interaction effect of gender and attitude on students' achievement in mathematics is not statistically significant {F (2, 26) = 0.054, p > 0.05)}. Since the p-value of the F ratio is not significant, it follows that **Ho6** regarding the interaction effect of gender and attitude on students' achievement in mathematics is accepted. Therefore there is no significant interaction effect of gender and attitude on students' achievement in mathematics. The effect is therefore not generalizable. The partial Eta squared estimated was 0.008, implying that based on the sample for the study, gender and attitude accounted for 0.8 % of the variance observed in post-test achievement score. Table 7 below showed that the mean achievement scores of female students in the low attitude group is the highest, while male students in the medium attitude group has the least mean post achievement score. The differences are however not significant. Therefore, they are not generalizable.

Table 7: Scheffe Post Hoc Multiple Comparison of Gender and Attitude

Gender	Attitude	Mean	Standard Error
Male	Low	30.625	1.972
	Medium	29.500	2.789
	High	31.300	2.495
Female	Low	37.000	2.460
	Medium	35.000	3.221
	High	36.000	3.221

Hypothesis Seven: There is no significant interaction effect of treatment, gender and attitude on students' achievement in mathematics

The result in Table 1 indicates that the interaction effect of gender and attitude on students' achievement in mathematics is not statistically significant {F (2, 26) = 1.252, p > 0.05)}. Since the p-value of the F ratio is not significant, it follows that **Ho7** regarding the interaction effect of treatment, gender and attitude on students' achievement in mathematics is accepted. Therefore there is no significant interaction effect of treatment, gender and attitude on students' achievement in mathematics. The effect is therefore not generalizable. The partial Eta squared estimated was 0.152, implying that based on the sample for the study, treatment, gender and attitude accounted for 15.2 % of the variance observed in post-test achievement score. Table 8 below showed that the mean achievement scores of female students in the experimental group who belong to the high attitude group is the highest, while male students in the in the control group who also belong to the low attitude group has the least mean post achievement score. The differences are however not significant. Therefore, they are not generalizable.

Table 8: ***Scheffe Post Hoc Multiple Comparison of Gender and Attitude***

Attitude	Gender	Treatment	Mean	Standard Error
Low	Male	Experimental	38.500	1.972
		Control	22.750	2.789
	Female	Experimental	39.000	1.859
		Control	35.000	4.555
Medium	Male	Experimental	31.000	3.221
		Control	28.000	4.555
	Female	Experimental	39.000	4.555
		Control	31.000	4.555
High	Male	Experimental	38.600	2.037
		Control	24.000	4.555
	Female	Experimental	40.000	4.555
		Control	32.000	4.555

Discussion and Conclusion

Findings from Hypothesis One showed that the main effect of treatment was statistically significant. This implies that the treatment greatly improved the pupil's achievement in primary mathematics. The findings of this study agree with the findings of Hanan et al. (2015) in which the treatment (ICT Integration) resulted in an improvement of the pupils' achievement in mathematics concept.

The findings also corroborate the findings of Cotton's study in (1995) and Izzet & Ozkan (2008) which maintained that the use of ICT materials as a supplement to traditional instruction produces higher achievement compared to use only traditional instructional method. This was also supported and quoted in Olga (2008), Kirk (2000), who produced the results of meta-analysis of 40 pupils that compared the effectiveness of traditional

instruction outcome with a combination of traditional instruction and ICT materials on pupils in mathematics achievement.

The result of Hypotheses One revealed that, there is significant main effect of gender on pupil's achievement in Mathematics. This is in line with Oluwadaisi's (2011) findings which opine that there is a significant gender difference in achievement whereas the findings of Spencer (2004), Olaoye (2011), contrasted the results. Their study revealed no differences in achievement mean scores of male and female pupils in science.

Also, there is no significant interaction effect of treatment and gender on pupil's achievement in Mathematics test scores of participants. This implies that, the interaction effect of treatment and gender did not influence achievement of participant in Mathematics. Therefore, it is not sensitive to gender. Meaning that, the teaching strategy used in this study is not sensitive to gender. The finding corroborated that of Keziah (2011) which revealed that there is no significant difference in the achievement of the boys and girls in the use of computer in the learning of science in school. However, an empirical study from Greece (Barkatsas, Kasimatis, & Gialamas, 2009) supported that, boys were found to possess significantly higher levels of confidence and liking for computer-assisted instruction than girls. Thus, the girls do not see the possibility which computers offers in the learning process

The significant effect of gender as regards the interaction effect of treatment and gender in this study also showed that the female pupils' achievement is significantly higher than that of their male counterparts from the use of ICT materials in teaching mathematics concepts.

The result obtained from the experiment using pre and post achievement test on primary mathematics administered to the respondent showed that the use of ICT materials in teaching and learning of mathematics as a subject in primary school increased the achievement of pupils in solving primary mathematics problems. The findings go in line with Ferguson (2014); ICT materials have shown to be effective in improving the understanding and application of content material for pupils of varing abilitiy level.

Based on the findings as revealed in Table 4, the use of ICT materials strategy seems to be a very important approach that determines not only the pupil's achievement but their attitude. Therefore, the treatment intervention is significantly more effective than the conventional method of teaching. The findings of Izzet and Ozkan (2008) revealed that the use of ICT materials as a supplement to traditional instruction produces higher achievement compared to use only traditional instruction. This also is in collaboration with Olga (2008), whose study on the effectiveness of traditional instruction outcome with a combination of traditional instruction and ICT materials on pupils in mathematics achievement found that mathematics instruction with ICT materials was significantly more effective in improving pupils' achievement; as well as Kirk's (2000), who found that pupils who use computers in the classroom show at least a modest level of achievement gain over pupils who do not use computers.

As regards the attitude of pupils in both groups, the result revealed that pupils exposed to Mathematics lesson through ICT materials exhibited higher attitude than those who were not. The hypothesis was therefore rejected, since there is a main effect of attitude on pupil's achievement in Mathematics. Thus, the positive attitude exhibited by the pupils instructed with Computer must have aided in their ability to

perform highly. This shows that if educators want to improve pupils' achievement and attitude in Mathematics, materials that they can feel, and touch should be used. Further, motivational talks on the objectives of exposing learners to any subject area should be communicated to them to aid raise awareness and thus arouse the attitude of the learners. This is in line with the findings of Krapp (2004) which showed that attitude influences academic achievement and learning in schools.

The result reiterates the importance associated with adequate material provision at this level of education to arouse and sustain learner's attitude (Varol & Farran, 2006; Bennett, Elliot, & Peters, 2005). Educators and researchers believe that quality primary classroom-learning environment and provision of adequate teaching aids are associated with encouraging teacher-pupil interaction and creating better atmospheres for effective learning (Bruce, 1997; Varol & Farran, 2006). For instance, Katz (1989) is of the view that the central aim of schooling at this level should be to give children direct experiences, to allow their initiatives and extend them, to support intrinsic motivation broadly and in depth, and to facilitate the development of dispositions and attitudes which are helpful to learning. Further, educators also believe that certain subjects e.g. science and mathematics should be introduced to young children through materials they can see and feel (Wolfe, 2002; Bruce, 1997). They are of the opinion that its use makes learning an engaging and fun activity.

Thus, it stands to reason that, replacing speech with pictures in the class may improve pupil's achievement. Ugbamadu (2003), Ezeuwa and Orogwu (2005) see instructional materials as the variety of materials like textbooks, chalkboards, charts, TV, computers and others including projected and non-projected devices which aid teaching and learning processes and invariably enhance the achievement of instructional objectives. Further, research results suggest that pupils remember 20% of what they hear, 40% of what they see and hear and 75% of what they see, hear and do (Kucukahmet, 2001).

Other researchers are of the view that the use of good and appropriate materials in Mathematical application makes the lessons more interesting and encouraging and makes the difficult Mathematical concepts to be learnt easy in a more effective way (Halis, 2002; Demirel, 2004; Izzet & Ozkan, 2008). It appears that teachers should use visual aids during teaching activities for pupils to understand the lesson better thus aiding in inculcating positive interest towards the lesson. Also, if we consider that learners especially at the primary school level have difficulty in learning abstract concepts, it is important to make these concepts less abstract but physical presented to encourage better understanding by learners.

In view of the findings from this study, the following conclusions are made:

i. ICT integration in teaching of primary mathematics brought about better results in primary mathematics instruction concepts of statistics. In the two schools, ICT class posted superior results and indeed percentage pass was higher compared to the lower percentage for the non-ICT class based on the achievement criteria set in the study. These results do suggest that pupils who are taught through ICT integration may be able to transfer skills in statistics from concrete to abstract situations.

i. Some factors were found to impact negatively in the use of ICT; Computers were not adequate for each learner for the entire class, time was not enough for

practice. ICT lesson preparations tend to consume more time but in terms of lesson delivery it is faster.

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