

# **Impact of Information and Communication Technology (ICT) Based Teaching Method on Academic Achievement on Technical Subject (Basic Electricity)**

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## **Abstract**

*The aim of this research is to determine the effect of information and communication technology (ICT) based teaching method on academic achievement on technical subject (Basic Electricity). The researchers carried out this study in Rivers state, Nigeria. Five research questions and five Null hypotheses guided this study. The population of the study comprised 14,637 junior and senior secondary students of the technical and vocational colleges in Rivers State during 2015-2016 academic sessions, out of which 120 students were randomly selected to form the study sample. The instruments used for data collection were the Basic Electricity Test 1 and 2 (BET 1 and BET 2). Pretest-posttest control group experimental research design was used. T-test was used to compare the experimental and control group means, and the magnitude of the impact also determined. The results showed that ICT-based teaching method enhance academic achievement.*

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## **INTRODUCTION**

### **Background of the Study**

The process of knowledge transfer from instructors to learners is continually being improved upon by stakeholders in education as the world is advancing technologically. To meet the current trend of modern innovation, effort, energy and time are spent by scholars in endeavor toward finding ways to achieve a positive result. Some outcome of research studies on ways of improving learning processes has proved their usefulness in improving schools curricula, teaching methodologies and educational products.

Ashley (2016) stated that technology helps the teachers prepare students for the real world environment. She further stated that as our nations become increasingly more technology-dependent, it becomes even more necessary that to be successful citizens, students must learn to be tech-savvy. In Thomas (1998) a longitudinal study such as the ten-year investigation of the apple classroom of tomorrow (ACOT) project, shows that pedagogical innovations and positive learning results do eventually emerge from the infusion of multimedia and technology in schools.

Some countries including Nigeria established specialized system of education that is a little different from the conventional ones. This system strategizes on providing young people with technical and employable skills, and academic knowledge to pursue higher education. In

Nigeria, the post-primary institutions saddled with these responsibilities are the technical colleges in the country. From the vision through the mission of these educational institutions, coordinated by the National Board of Technical Education (NBTE), the system laid emphasis on understanding and practical application of applied science and modern technologies. It has as its objective the preparation of graduates for occupations that are classed above the skilled crafts but below the scientific or engineering professions (Encyclopedia Britannica, 2014).

This will also help in reducing some social vices on the streets as some youths who will undergo training in this system of education will be engaged meaningfully and occupied. Igbo and Ikpa (2013) studied causes, effects and ways of curbing youth restiveness in Nigeria. Their finding revealed the effects which include upsurge of social vices and destruction of lives and properties and proffered that they can be curbed through skills acquisition programmes and enlightenment against the phenomenon. Modern and appropriate technologies and methodologies are needed to enhance proper training to achieve the desired result. Academic achievement must be the main focus as this will lead to the goals of establishing these institutions. The introduction of information and communication technology (ICT) into educational processes as one of the modern technologies have proven to be the veritable strategy in bringing about the desired innovation. The use of ICT has a positive effect on many areas of attainment in science and technology. Through the use of ICT, pupils have improved their understanding of scientific concept, developed their problems solving skills, been helped to hypothesize scientific and technological relationships and processes, and improved their reasoning and explanations (DIES, 2003). Danielle (N.D.) in his study of "the impact of ICT on students achievement" concluded that ICT does affect achievement by way of increasing test scores, motivation or facilitate collaborative learning.

Both the state and federal government technical colleges operate the same curriculum. In addition to the general studies subjects such as English language Mathematics and Economics taught, there are also trade and trade-related subjects from which these institutions are sectioned into vocational departments. For students to achieve more, the researcher is of the view that ICT-based methodology is ideal for teaching the technical (trade and trade-related) subjects in these institutions. This view is resulting from the fact that ICT-based teaching methodology is result-oriented. Avinash and shailja (2013) in their study of the impact of ICT on achievement of students in chemistry at secondary level of CBSC and UP Board in India found that the ICT programme is more effective than the traditional teaching approach in terms of the achievement scores of the students.

ICT-based teaching can be defined as the application of modern digital devices in education for the purpose of teaching and learning. ICT-based teaching methods encompass the use of various devices such as computers, programs, projectors, electronic boards, multimedia teaching aids, and so on. This method offers better attention to learners due to its interesting nature and the advantage it has over the traditional teaching methods, as it's infinitely 'patient' presentation of lessons and ideas repeatedly and consistently without variation and fatigue (Alistair, Kelvin, Grigori, Kent & Marshall, 2000)

### **STATEMENT OF THE PROBLEM**

The main reason for establishing these technical colleges by both the Federal and Rivers state government is to train semi-skilled manpower personnel that should function in that sector of the economy. The design of the technical college curriculum is such that all trades and trade-related subjects are extensively taught together with the general studies subjects. Teachers are expected to identify the appropriate teaching method(s) suitable for use to enhance learners gain mastery of skill(s) being taught. Major aim to be achieved by these institutions is when graduates (both male and female) are able to perform the skills they have learned and also obtain the entry requirement into higher institutions of learning.

The evolution of information and communication technology from research endeavor has proof of a positive effect on many areas of attainment such as in art, education, psychology and science. The use of ICT in classrooms is fast gaining prominence and becoming one of the most important elements defining the basic competencies of students.

However, more than fifty percent of the students that finished from these technical colleges in each year for the past five years (from 2010 to 2015) could not obtain the minimum entry qualification into even polytechnics. Despite the effort of the federal and state governments in creating an enabling environment and providing adequate welfare for teachers, most students that finished from these schools are unable to perform skills learned while in school even when capital and starter packs are provided.

In response to this problem, this study investigated the impact of ICT-based teaching method as against the traditional (chalk and blackboard) teaching method on technical subjects. The reason is to identify which method will complement the governments' effort in enhancing students' comprehension and consolidation in understanding the concepts in technical and vocational training schemes, which will lead to the successful achievement of the goals of establishing these technical colleges.

### **PURPOSE OF THE STUDY**

The purposes of this study are to

1. Compare between students of experimental group academic achievement and students of control group academic achievement on technical subjects before treatment.
2. Contrast between students of experimental group academic achievement and students of control group academic achievement on technical subjects after treatment.
3. Contrast between male students' academic achievement who are taught using ICT-based teaching method and male students' academic achievement who are taught using traditional teaching method on technical subjects.
4. Contrast between female students' academic achievement who are taught using ICT-based teaching methods and female students' academic achievement who are taught using traditional teaching method on technical subjects.
5. Contrast between male students' academic achievement who are taught using ICT-based teaching methods and female students' academic achievement who are taught using ICT-based teaching method on technical subjects.

### **RESEARCH QUESTIONS**

The following research questions were answered to address the purposes of this study.

1. Do students of experimental group differ from students of control group in academic achievement on technical subjects before treatment?
2. Do students of experimental group differ from students of control group in academic achievement on technical subjects after treatment?
3. Is there any significant difference in academic achievement between male students taught using ICT-based teaching method and male students taught with traditional teaching method on technical subjects?
4. Is there any significant difference in academic achievement between female students taught using ICT-based teaching method and female students taught using traditional teaching method on technical subjects?
5. Is there any significant difference in academic achievement between male students taught using ICT-based teaching method and female students taught using ICT-based teaching method on technical subjects?

## RESEARCH HYPOTHESES

The following null hypotheses were tested in the course of this study.

**HO<sub>1</sub>:** There is no statistically significant difference in academic achievement between students of experimental group and students of control group on technical subjects before treatment.

**HO<sub>2</sub>:** There is no statistically significant difference in academic achievement between students of experimental group and students of control group on technical subjects after treatment.

**HO<sub>3</sub>:** There is no statistically significant difference in academic achievement between male students taught using ICT-based teaching method and male students taught using traditional teaching method after treatment

**HO<sub>4</sub>:** There is no statistically significant difference in academic achievement between female students taught using ICT-based teaching method and female students taught using traditional teaching method after treatment

**HO<sub>5</sub>:** There is no statistically significant difference in academic achievement between male students taught using ICT-based teaching method and female students taught using ICT-based teaching method after treatment

## LITERATURE REVIEW

The outcome of learning processes has always been of interest to stakeholders in the education sector of many societies and as such some individuals and corporate groups have vested interest. Some institutions have also made resources available for researchers to carry out studies that will give clear and direct pathways that lead to improved teaching and learning. The impact of ICT on students' achievement is not left out of this, as much research has been done by different individuals for the past two decades.

Constructivism forms the theoretical framework of this study. Academic achievement of students undergoing learning processes can be ascertained using different types of instruments but there are some indications in learners' performances that can easily be recognized that learning took place after a learning experience. Some examples of such are change in behaviour; coordination; improved creativity and better ability to solve problems after learners have been exposed to instructions by means of enhanced teaching aids. This theory is based on scientific study which explains how learners construct their own knowledge and understanding of concepts through experiences.

For the past two decades, there have been series of empirical studies conducted to examine and ascertain the impact of ICT on students' academic achievement in different fields of education in different regions of the world by different individuals. Some of these studies revealed positive effect while some showed that its effect is negative on students' academic achievement. Some studies could neither identify a positive nor negative effect of ICT use on students' performance in teaching and learning.

Luis and Andres (2011) in their study "access to a computer and academic achievement" found that having a computer and using it in learning improves scores.

Ting (2005) researched on the impact of ICT on learning and upheld the positive impact of ICT on learning.

Higgins (2003) stated that one of the important goals for introducing ICTs in schools is to enhance teaching and learning practices.

Shaikh and Khola (2011) in a study of role of ICT in shaping the future of Pakistan higher education system” came up with the suggestion that an effective and robust HES ICT policy could greatly improve the status of the Pakistani knowledge-based economy on noticing significant gaps in ICT demand and supply, ICT use, and ICT-based higher education problems.

Kwabena, Collins and Roderick (2013) in a case study exploring the trend of ICT adoption in tertiary institutions in Ghana found that the goal of integrated ICT in educational research and processes is very low. They further stated that the integration of ICT in institutions is critically important if Ghana is to produce graduates equipped with technologically-based knowledge.

In another research study conducted to develop and validate a computer-assisted instructional (CIA) package on physics for senior secondary school students in Nigeria, Isiaka and Mudasiru. (2014) observed that CIA with interactive animation is more effective in teaching the science concepts which seem to be too abstract while teaching physics concepts.

In Alesksander (2012), Becka (2012), Pelgrum and Anderson (1999), Hameed (2006), Kulik (2003), Igbal and Ahmed (2006) show positive impact of ICT on students achievement and argue that, in order to be successful, a country should improve its educational system by implementing effective and robust ICT policies.

Odhiambo (2010) in the study “the impact of e-learning on academic performance” that relates to a level one undergraduate module delivered using traditional lectures and e-learning based method. In this study, e-learning showed not to have a positive impact on academic achievement.

Robert and Jonathan found no effect of computers on any educational outcomes, including grades, standardized test scores, credits earned, attendance and disciplinary actions in their study of “experimental evidence on the effects of home computers on academic achievement among schools children” (Robert and Jonathan, 2012).

Bernard, Abraham, Lou, Borokhovski, Wade and Wozney (2004) in a meta-analysis in higher education found that overall, there was no significant difference in achievement, attitude, and retention outcome between distance education, which include outline education, and the physical traditional classroom education

Byron and Carl (2002) in their study “comparing web courses replacing the classroom in principles of microeconomics” found that students in the virtual classes, while having better characteristics, performed significantly worse on examinations than the live students.

In Adel and Mounir (2010), other studies that show negative impact of ICT on academic achievement are Coates (2004); Anstine and Skidmore (2005); Navarro and Shoemaker(2003).

Agnes, Wallace, Patrick and Moses (2010) concluded in an empirical survey on “domestication of ICT in schools in disadvantaged communities in South Africa”, that even though schools and educators appreciate the benefits of ICTs in education and willing to adopt the technology, there are a number of factors that impede its integration in teaching and learning.

Thomas and Ludger (2006) in a study estimating the relationship between students’ educational achievement and the availability and use of computers at home and at school showed a positive correlation between student achievement and the availability of computers both at home and at schools. Their study showed negative relationship for home computers and significant for school computers as they control extensively for family background and schools characteristics.

From the outcome of the studies presented above, the effect of ICT on learning is either positive or negative. It was found that no study has been conducted in the technical colleges in Rivers State of Nigeria regarding this topic. What would be the effect of ICT-based

teaching on technical subjects? This study will ascertain the impact of these modern technologies applied in teaching the technical subjects, in Rivers State of Nigeria.

## **METHODOLOGY**

### **Research Design**

Pretest-Posttest control group experimental research design was used in this study. During the study, samples were randomly selected and divided into two equal groups (experimental group and control groups). The two groups were pre-tested before administering treatment. The experimental group was taught basic electricity (a technical subject) using ICT teaching aids (treatment) while the control group was taught the same technical subject using the traditional teaching methods. After the treatment, the experimental and control groups were post-tested.

### **POPULATION**

The population of this study comprised all the 14,637 pre-voc (Junior Secondary school) and voc (senior secondary school) students of the technical colleges during the 2015-2016 academic sessions in Rivers State, Nigeria. These are the public technical schools under the senior Secondary Schools Board (S.S.S.B.), Universal Basic Education Board (U.B.E.B), Ministry of local Government and chieftaincy Affairs, and the Federal Ministry of Education (F.M.O.E)

### **SAMPLE AND SAMPLING TECHNIQUE**

Government Technical College, Port Harcourt was selected for the experimental study. Four technical departments (Electrical, Computer, Mechanical and Catering) were randomly chosen from the 12 departments of the college. From each of these four departments, 30 students were also randomly selected to form a sample size of 120 for this study. These 120 students were divided into two groups with each having 60 (30 male and 30 female) students.

### **INSTRUMENTATION**

The instruments used for data collection for this study were the Basic Electricity Test 1 and 2 (BET1 AND BET2). These instruments are equivalent forms of each other. They consist of topics taught within the ten weeks such as; *particulate nature of matter, electricity and its flow, direct current circuit and Ohm's law*. They were developed and validated by the researcher using SPSS version 22. They both have reliability coefficient of 0.88. Each of these instruments consists of 50 multiple-choice type questions with four response possibilities.

### **DATA COLLECTION**

BET 1 was administered during the pretest to both the experimental and control groups and BET 2 administration to both groups after treatment (teaching basic electricity to the experimental group using ICT devices) is given to the experimental group.

Each item in both BET 1 and Bet 2 are scored 2 marks and 50 items are scored 100 marks when the key is selected.

### **METHOD OF DATA ANALYSIS**

Descriptive and inferential statistics were used to manipulate, sort and extract information from the data collected. T-test was used to test the Null hypotheses at 0.05 level of significance and Eta Squared was also used to determine the magnitude (effect size) of the impact of ICT-based teaching on academic achievement on technical subjects.

## ANALYSES OF DATA AND INTERPRETATION OF RESULTS

The Effect Size (magnitude of Impact of ICT Teaching Method) is determined using the formula

$$\text{Eta Squared} = t^2 / t^2 + (N1+N2-2)$$

**HO<sub>1</sub>: There is no statistically significant difference in academic achievement between students of the experimental group and students of the control group on technical subjects before treatment.**

### Descriptive Statistics

	SAMPLE	N	Mean	Std. Deviation	Std. Error Mean
PRETEST	EXPERIMENTAL GROUP	60	36.1000	14.43830	1.86398
	CONTROL GROUP	60	33.2500	13.01840	1.68067

**Table 1**

### Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
PRETEST Assumes Equal variances	.542	.463	1.136	118	.258	2.85000	2.50979	-2.12007	7.82007
PRETEST Does not assume equal variances			1.136	116.758	.258	2.85000	2.50979	-2.12062	7.82062

**Table 2**

From the results in tables 1 and 2, the magnitude of differences when calculated was very small (eta squared = 0.0108), with the statistics between students of the experimental group (M = 36.1, SD = 14.4383) and students of the control group (M = 33.25, SD =13.0184); with t (118) =1/136, p = 0.258. Therefore Null hypothesis one (**HO<sub>1</sub>**) is accepted.

**HO<sub>2</sub> : There is no statistically significant difference in academic achievement between students of experimental group and students of control group on technical subjects after treatment.**

**Descriptive Statistics**

	SAMPLE	N	Mean	Std. Deviation	Std. Error Mean
POSTTEST	EXPERIMENTAL GROUP	60	81.9333	12.23480	1.57951
	CONTROL GROUP	60	59.1000	11.18974	1.44459

**Table 3**

**Independent Samples Test**

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.538	.465	10.667	118	.000	22.83333	2.14049	18.59459	27.07208
Equal variances not assumed			10.667	117.072	.000	22.83333	2.14049	18.59424	27.07242

**Table 4**

From tables 3 and 4, Null hypothesis two (HO<sub>2</sub>) is rejected. This is because the **p**-value is 0.000 at **t** (118) = 10.667 from the statistics between scores of students in experimental group (M = 81.9333, SD = 12.2348) and control group (M = 59.10000, SD = 11.18974). The magnitude of the differences in mean (eta squared) = 0.491. This has 49.1% effect size.

**HO<sub>3</sub> : There is no statistically significant difference in academic achievement between male students taught using ICT-based teaching method and male students taught using traditional teaching method after treatment**



### Descriptive Statistics

	SAMPLE	N	Mean	Std. Deviation	Std. Error Mean
MALE POSTTEST	MALE STUDENTS TAUGHT USING ICT TEACHING METHOD	30	81.3333	13.73978	2.50853
	MALE STUDENTS TAUGHT WITH TRADITIONAL TEACHING METHOD	30	62.1333	13.68547	2.49861

**Table 5**

### Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.005	.942	5.423	58	.000	19.20000	3.54059	12.11274	26.28726
Equal variances not assumed			5.423	57.99	.000	19.20000	3.54059	12.11273	26.28727

**Table 6**

From tables 5 and 6, Null hypothesis three (**HO<sub>3</sub>**) is rejected. This is because the **p**-value of 0.000 of the obtained **t** (58) which gave 5.423 is less than 0.05 from the statistics of male students taught using ICT teaching method ( $M = 81.3333$ ,  $SD = 13.73978$ ) and male students taught with traditional teaching method ( $M = 62.1333$ ,  $SD = 13.68547$ ). The effect size of the differences in the means ( $\eta^2 = 0.3365$ , i.e. 33.65%) is large.

**HO<sub>4</sub>: There is no statistically significant difference in academic achievement between female students taught using ICT-based teaching method and female students taught using traditional teaching method after treatment**

### Descriptive Statistics

	SAMPLE	N	Mean	Std. Deviation	Std. Error Mean
FEMALE POSTTEST	FEMALE STUDENTS TAUGHT USING ICT TEACHING METHOD	30	83.6667	10.62312	1.93951
	FEMALE STUDENTS TAUGHT WITH TRADITIONAL TEACHING METHOD	30	56.6667	6.83466	1.24783

**Table 7**

### Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
FEMALE POSTTEST	Equal variances assumed	5.063	.028	11.707	58	.000	27.00000	2.30625	22.38355	31.61645
	Equal variances not assumed			11.707	49.496	.000	27.00000	2.30625	22.36660	31.63340

**Table 8**

The **p**-value of 0.000 at **t** (58) =11.707 shows that there is statistically significant difference between female students taught using ICT-based teaching method (M = 83.6667, SD = 10.62312) and female students taught with traditional teaching method (M = 56.6667, SD = 6.83466). The effect size of the differences in the means is found to be very large (eta = 0.7026 which is 70.26%).

**HO<sub>5</sub>: There is no statistically significant difference in academic achievement between male students taught using ICT-based teaching method and female students taught using ICT-based teaching method after treatment**

### Descriptive Statistics

	SAMPLE	N	Mean	Std. Deviation	Std. Error Mean
MALE AND FEMALE POSTTEST	MALE STUDENTS TAUGHT USING ICT-BASED TEACHING METHOD	30	81.3333	13.73978	2.50853
	FEMALE STUDENTS TAUGHT USING ICT-BASED TEACHING METHOD	30	83.6667	10.62312	1.93957

**Table 9**

### Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.234	.630	-.540	58	.592	-1.73333	3.21214	-8.16313	4.69647
Equal variances not assumed			-.540	55.328	.592	-1.73333	3.21214	-8.16975	4.70309

**Table 10**

The **p**-value of 0.592 at **t** (58) = -0.540 from tables 9 and 10 is greater than 0.05 from the test statistics between male students taught using ICT-based teaching method (M =81.3333, SD = 13.73978) and female students taught using ICT-based teaching method (M = 83. 6667, SD = 10.62312). The Null hypothesis five (**HO<sub>5</sub>**) is therefore accepted. The magnitude of the differences in the means (eta = 0.005, i.e. 0.5%) is very small.

### DISCUSSION

It is obvious that technical education is a necessity in Rivers State and the country because the economy also needs middle-level manpower to function at the semi-skilled level. It is this fact that lead to the establishment of the technical colleges. Effective teaching and learning of technical subjects designed to train learners will enable the achievement of the goals of establishing these technical colleges.

It is also clear that for the past two decades pedagogical approach to learning has been changing. This is due to the technological innovations and its adoption in educational processes, which have yielded positive results in some developed societies. ICT cannot be over emphasized in the field of education as it does not only enhance effective communication but also buttresses understanding of educational concepts. This trend leads the researcher to investigate the impact of an ICT-based teaching of technical subjects in the technical colleges to ascertain if it will have a positive or negative effect on students' academic achievement.

The answers to the five research questions posed by this study are as follow. The difference (2.8500) in the mean of experimental group of students (M=36.1000) and control group (33.2500) and the t-test value (t=1.136) at P-value (0.258) as shown in the table 1 and 2 indicates that students in the control group do not differ from students in the control group when both groups were taught with the traditional teaching method (before treatment).

Tables 3 and 4 show that the mean of experimental group after treatment ( $M=81.93333$ ) differs greatly from the mean of the control group ( $M=59.1000$ ) by 22.8333. The t-statistic shows that experimental group differ greatly from control group after treatment.

Tables 5 and 6 show that the mean of male students taught using ICT-based teaching methods ( $M=81.333$ ) differ from the mean of male students taught with traditional teaching method ( $M=62.1333$ ) with the difference of 19. The t-statistics reveals that the difference is significant. ( $t=5.423$ ;  $p=0.000$ ) meaning that there is a difference in academic achievement between male students taught using ICT-based teaching methods and male students taught using traditional teaching method.

Tables 7 and 8 also shown reveal that the mean of female students taught using ICT-based teaching methods ( $M=83.6667$ ) differ from the mean of female students taught with traditional teaching method ( $M=56.6667$ ) with the difference of 27. The t-statistics also shows that the difference is significant ( $t=11.707$ ;  $p=0.000$ ) meaning that there is difference in academic achievement between female students taught using ICT-based teaching methods and female students taught with traditional teaching method.

The mean values from the descriptive statistics of table 9 and the inferential statistics of table 10 indicate that the difference between male and female students taught using ICT-based teaching method is insignificant. The difference in mean between male students ( $M=81.3333$ ) and female students ( $M=83.6667$ ) from table 9 equals 2.333. Table 10 shows that  $t=-0.540$  at  $p=0.592$ . These are indications that the difference that exists between male and female students taught using ICT-based teaching methods is not significant and so the two groups do not differ.

## CONCLUSION

Inferential statistics (t-test) used to test the five hypotheses showed the following results.

**HO 1:** The p-value of 0.258 of the test statistics ( $t=1.136$ ) shows that **HO 1** is accepted, stating that there is no statistically significant difference in academic achievement between students of experimental group and students of control group before treatment. The effect size between the two groups was found to be 0.011(1.1%) which is insignificant.

**HO 2:** This Null hypothesis is rejected because the p-value of 0.000 of the test statistics ( $t=10.667$ ) is less than 0.05. Also, with the magnitude of the effect size of ICT-based teaching method ( $\eta=0.491=49.1\%$ ), there is statistically significant difference in academic achievement between students of experimental group and control group after treatment

**HO 3:** This Null hypothesis is also rejected because the p-value of 0.000 of the test statistic ( $t=5.432$ ) is less than 0.05. The magnitude of the effect size of ICT-based teaching method on male students is 0.3365 which is 33.65%. These, therefore show that there is statistically significant difference in academic achievement between male students taught using ICT-based method and students taught with traditional teaching method.

**HO 4:** This Null hypothesis is rejected as well, from the fact that the p-value of 0.000 of the test statistic ( $t=5.432$ ) is less than 0.05. These values also show, from estimation, that the effect size of ICT-based teaching on female students ( $\eta^2$ ) is 0.7026 which is 70.26%. Therefore, there is statistically significant difference in academic achievement between female students taught using ICT-based teaching method and female students taught using traditional teaching method.

**HO 5:** This Null hypothesis is accepted because the P-value of 0.592 of the test statistic ( $t=-0.540$ ) is greater than 0.05. Eta is found to be equal 0.5%. Therefore, there is no statistically significant difference between male students and female students taught using ICT-based teaching method.

## RECOMMENDATION

From the outcome of this study, which reveals that ICT-based teaching methods enhance better students' academic achievement in technical subject (basic electricity), the researcher, therefore recommend that ICT devices that aid teaching and learning should be made available in the technical colleges in rivers state to enhance constructivism method of acquiring knowledge.

The government, stakeholders and other relevant authorities should make policies stressing the use of ICT-based teaching as well as encourage and supervise its implementation.

This teaching method should be applied to other subjects in the technical colleges in Rivers State because it is result oriented. Teachers in these colleges should update their skill on the use of ICT for teaching in technical college.

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