Relevance of E-learning Teaching Activities (ELTA) to Achievement in Electricity Concepts by Technical College Students in Benue State, Nigeria: A Focus on Gender

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Abstract: **- The study determined the relevance of e-leaning teaching activities to the achievement of technical college students in electricity in Benue State, Nigeria. The population of the study consisted of 724 Part II Students in Education Zone B of the 2013/2014 academic session. This number is made up of 543 males and 181 females. Two research questions and two hypotheses were asked and formulated respectively. An Electricity Achievement Test (EAT) was used to collect data with two lessons plans of which one was for the experimental group and the other for the control group. Two research questions were answered using mean and standard deviation. The hypotheses were tested at 0.05 level of significance using analysis of covariance. The results from the study revealed that male and female students exposed to the ELTA obtained greater mean achievement scores in electricity than those taught with lecture method. It also revealed that ELTA was more gender friendly with respect to achievement in electricity. The study recommended this approach to be adopted in schools and the training of teachers in the teaching of electricity and related topics in Physics.**

Keywords: **Technical Education, Gender, Electricity, e-Learning Teaching Activities, Benue State Nigeria**

I. INTRODUCTION

Gender is a concept used to distinguish femininity and masculinity from biological sex (Imoko, 2004). It is said to be one of the factors affecting students' socio-cultural and academic phenomena. Esiodu (2005) reported that gender did influence students' achievement significantly. Studies conducted on gender showed that there were inconsistencies on the conclusions reached by previous researchers. This study therefore investigated activities which would improve upon students' achievement in Electricity irrespective of gender. The poor achievement of students in Electricity is further triggered by gender imbalance, which now constitutes a major research focus across the globe and because genuine development can only be attained with gender equality. The problem of poor achievement in Electricity, as a result of gender imbalance, is not a welcome development, and so the trend should not be allowed to continue. Therefore it is of a serious concern for all in the educational sector in Nigeria; it is a thing of worry, knowing the consequences of such a phenomenon in science, technology, economy and industrial development of the nation. Based on these, there is a need to continue to search for an alternative teaching approach on how to improve on male and female students' achievement, which has been the challenge facing teachers of electricity in technical colleges.

Imoko (2004) and Fatoki (2007) have identified some learning difficulties of students resulting from their preconceptions and misunderstanding of concepts in science. Consensus has not been reached on appropriate pedagogical approach to adequately address these difficulties (Akinyemi&Afolabi, 2009).

The most important task is to insightfully design learning approaches and activities that start with students' viewpoint rather than the teacher's anticipation to foster conceptual change (Olubunmi, 2006). Ada (2010) advised that teachers should evolve the approach that involves learner's active participation that will improve the achievement of both male and female students rather than the traditional lecture method.

II. LITERATURE REVIEW

The study was anchored on two theories; they are Connectivism and Constructivism theories. The Connectivity Theory, otherwise known as Connectivism was propounded by George Siemens, a Canadian theorist in December, 2005. It addresses e-learning directly when it discusses learning as a process of connecting specialized nodes or information sources; learning as residing in non-human appliances such as computer terminals; nurturing and maintaining connections as a need to facilitate continual learning.

The theory is related to this work in that:

(1) electronic -resources harbor useful information that reside outside of the learner, and the learner would get the information by linking to it;

(2) Electronic-resources information have to be connected to specialized set of equipment such as computers, androids, iPods, notepads and other electronic gadgets before the information can be accessed;

(3) Information to the learner from e-resources is more current and comprehensive than the former sources of information.

Constructivism, as founded on Kantian beliefs, claims that reality is constructed by the learner based upon mental activity (Jonassen, 1991). Humans are perceivers and interpreters, who construct their own reality through engaging in those mental activities; thinking is grounded in perceptions of physical and social experiences, which can only be comprehended by the mind. The learner is building an internal representation of knowledge and a personal interpretation of experience. This representation is constantly open to change, its structure and linkages forming the foundation to which other knowledge structures are appended. Learning is an active process in which meaning is developed on the basis of experience. It must be situated in a rich context, reflective of real world context, for this constructive process to occur and transfer to environments beyond the school (Bednar, 1992).

International Bureau of Education (2000)and Wieman and Perkins (2005) assert that science educators and in particular Physics teachers in technical schools need to change their teaching approaches to make them more effective and relevant to a much larger proportion of the student population than in the past. Safeer and Keenan (2005), and UNESCO (2010) affirm that this is as a result of rapid scientific and technological innovations over the past several decades. Many of the problems confronting society currently, such as global warming, terrorism, genetic modification, global market competition, energy and population crises, ethical issues involving biotechnology among other critical issues, require the knowledge of physics, if they are to be dealt with.

Modern knowledge-based economies are so heavily dependent on technology. Thus having a better understanding of electricity and technology, and better technical problem-solving skills will enable people to meet the challenges and demands of the work place (Effandiand Zanaton, 2006 and Porter, *et al*, 2007).

The twenty first century skills include creativity and innovativeness, critical thinking and problem solving, communication and collaboration, information, media and technology, life and career skills among others. The overall students' performance in physics has been poor coupled with very low student enrollment and gender imbalance. The preferred mode of delivery by physics teachers in many countries of the world in technical schools is the expository teaching approach (Umunadi, 2009). This approach is dominant despite growing evidence that it is not effective in inculcating the content knowledge, conceptual knowledge and science process skills that are part of quality physics teaching. Available literature shows that e-learning teaching activities are capable of promoting these attributes among students, (Wombo, 2014; Sunday, 2010; and Al-Khawaldah, 2007).

It is also affirmed by Zaka (2013), that information and communication technology (ICT), which are a major branch of the e-learning teaching activities in physics,are a very active field of research and innovation, where learning is understood to be more meaningful than rote learning.There are a great amount of theories, learning approaches, methodologies for teaching and learning using ICT. Despite the utilization of the new learning approaches with ICT, students experience difficulties in learning relevant electricity concepts, which remain unclear about the relationship between the computer environment and the activities supporting the knowledge that emerge from such activities.

Sunday (2010) researched on the impact of information and communication technology (ICT) on teaching and learning of physics.He found that ICT had a great impact on teaching and learning of physics. ICT makes learning of physics interesting which results to better achievement.

In an Investigative study carried out by Hulyan and Pnaour (2006) on the effect of e-learning teaching activities on students' understanding of electricity, it was discovered that even though there was no meaningful difference regarding pre-test results between experimental and control groups, after the treatment, a statistically significant difference was found between the two groups. Result showed that the students taught using the e-learning teaching activities were more successful than the students taught by the traditional lecture method.

III. STATEMENT OF PROBLEM

Annually the Registrar and Chief Executive of NABTEB give consistent report of the poor achievement of students in Electricity. The evidence of this poor achievement is an indication that the educational objective of the country for technological development may not be achieved, hence an inhibition of the Nigeria vision 2020 objectives of attaining a modern and vibrant educational system. Thus, the researchers sought to explore the e-learning teaching activities, whether they wouldenhance technical college male and female student's achievement.

IV. PURPOSE OF THE STUDY

The purpose of this study was to ascertain the efficacy of E-learning Teaching Activities (ELTA). Specifically, the research was to determine if the achievement gap of male and female students' in electricity would be bridged when taught using the ELTA approach. It also sought the interaction effect of gender and ELTA on technical college male and female students' mean achievement scores in electricity.

V. RESEARCH QUESTIONS

The study was guided by the following research questions:

1. What are the mean achievement scores of male and female technical college students taught electricity using ELTA?
2. What is the interaction effect of gender and ELTA on technical college students' mean achievement scores?

VI. RESEARCH HYPOTHESES

The following hypotheses were formulated and tested at0.05level of significance:

1. There is no significant difference between the mean achievement scores of male and female technical college students taught electricity using e-Learning teaching activities.
2. There is no significant interaction effect of gender and ELTA method on technical collegestudents mean achievement scores.

VII. METHODOLOGY

This study focused on the E-learning Teaching Activities (ELTA)of Part II students of the Technical Schools in Education Zone B of Benue State. The physics content was Electricity as contained in NABTEB (2007) curriculumof Part II students. Specifically, emphasis was on Current, Potential Difference, Resistance (in series & parallel), Electric Cells, arrangement of cells in a circuit, Electric Energy and Power. The ELTA was used as an instructional strategy of electricity, which was the topic for the experimental group while the traditional lecture method was used by the control group.

This study adopted a quasi-experimental design of non-randomized group using pretest-posttest of non-equivalent groups.

The study was carried out in Benue State, Nigeria. The state is made up of three educational zones, A, B, and C with twenty three Local Governments Areas which are distributed as 7 in Zone A, 7 in B and 9 in C. The specific area of this study is Zone B where achievement and interest of students in physics in the technical schools is generally poor (Benue State Examination Board, 2013) and wherewe have the highest population of Technical Colleges in the state. The population of the study comprises724 Part II Students in Education Zone B of the 2013/2014 academic session. This number is made up of 543 males and 181 females.

The instrument used for data collection was the Electricity Achievement Test

(EAT).This was a teacher made test that comprised 30 items of 4 optional questions based on the recommended curriculum. The items were structured on levels of difficulties to ascertain thorough understanding of the electricity concept by the students. The items were strictly based on lower and higher cognitive levels as contained in a table of specification.

The instrument was validated by five experts: two physics educators and two experts in measurements and evaluation for both content and face validation from both University of Agriculture and Benue State University in Makurdi. The EAT was also given to one physics teacher in Benue State University Science and Technical College Makurdi to ensure conformity of questions to the curriculum's standard and appropriateness of the instrument to the student level.The reliability coefficient of EAT using Kuder-Richardson 20 was 0.73. Means and standard deviations were used to answer the research questions. Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

VIII. RESULTS AND DISCUSSION

The results of this study are presented according to the research questions and related hypotheses.

Research Question One: What are the mean achievement scores of male and female technical school students taught electricity using ELTA? (See results in Table 1)

Table 1:Mean Achievement Scores of Male and Female Technical College Students in E-Learning Teaching Activities (ELTA**)**

Source	**Pre-test**			**Post-test**	
	N	$\bar{X}$	**SD**	$\bar{X}$	**SD**
Male Students	46	2.41	1.09	13.72	3.65
Female Students	35	2.51	1.20	13.86	1.20
Mean difference		**0.10**		**0.14**	
Total	**81**				

Table 1 revealed the pretest mean achievement scores of both male and female students was 2.41 and 2.51 while the standard deviations were 1.09 and 1.20 respectively. The mean difference of both groups was initially 0.10,

showing that students of the study were at the same level of ability before the commencement of the study.

Also, the posttest mean achievement scores for male students was 13.71 and standard deviation was 3.65 while female students has the mean achievement of 13.85 and standard deviation 3.74. The mean difference was 0.14.This showed an improvement in the mean achievement scores of the Technical College Students in electricity.

Hypothesis One: There is no significant difference between the mean achievement scores of male and female students taught electricity using ELTA. (See result of this hypothesis as presented in Table 2).

Table 2: ANCOVA Result of Technical Schools Students'Mean Achievement Scores in E-Learning Teaching Activities and Lecture Method.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1049.413[a]	2	524.706	1539.365	.000
Intercept	479.614	1	479.614	1407.075	.000
PreTestIntTotal	1049.025	1	1049.025	3077.590	.000
Group	0.680.	1	.680	1.994	0.162
Error	26.587	78	.341		
Total	16452.000	81			
Corrected Total	1076.000	80			

a. R Squared = .975 (Adjusted R Squared = .975)

In Table 2, reading across row heading Gender, F (1, 78) with df =1 and P-value of 162 which is greater than the set P-value of 0.05. Since p >.05, the hypothesis which stated that there is no significant difference between the mean achievement scores of male and female students taught electricity with ELTA is not rejected. Hence, the male and female Technical Schools Students equally improved in their achievement in Electricity concepts taught during the period of this study.

Research Question Two: What is the interaction effect of gender and ELTA on students' mean Achievement scores? (See answer to this research question as presented in Table 3).

Table 3:Interaction Effect of Gender and E-Learning Teaching Activities on Students' Achievement Scores

Dependent Variable: Posttest achievement scores

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	278.464[a]	3	92.821	6.189	.000	.078
Intercept	30410.329	1	30410.329	2027.722	.000	.903
Group	264.864	1	264.864	17.661	.000	.075
Group * Gender	.841	2	.420	.028	.972	.001
Error	3284.406	219	14.997			
Total	37303.000	223				
Corrected Total	3562.870	222				

a. R Squared = .078 (Adjusted R Squared = .066)

Table 3indicated that Partial Eta Squared(Group * Gender: Partial Eta Squared = 0.001) = 0.001 approximately. The calculated percentage of interaction effect (0.001×100 =.1 %) = 0.1 %. So ELTA does not allowed gender discriminative effect on achievement in electricity.

*Hypothesis Two:*There is no significant difference in the mean interest ratings of male and female students taught electricity

using ELTA. (See test result of this hypothesis is presented in Table 4).

Table 4: ANCOVA Test of Interaction Effect of Gender and E-Learning Teaching Activities on Students' Achievement Scores.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	278.464[a]	3	92.821	6.189	.000	.078
Intercept	30410.329	1	30410.329	2027.722	.000	.903
Group	264.864	1	264.864	17.661	.000	.075
Group * Gender	.841	2	.420	.028	.972	.001
Error	3284.406	219	14.997	6.189		
Total	37303.000	223				
Corrected Total	3562.870	222				

a. R Squared = .078 (Adjusted R Squared = .066)

In Table 4, reading across row heading Group * Gender, F (2, 219) with df =2 and P-value .972, which is greater than the set P-value of 0.05. Since p >.05, the hypothesis which stated that there is no significant interaction effect of gender and ELTA on students' Achievement scores is not rejected. Hence the interaction effect of gender and instructional method on achievement due to the use of ELTA was not statistically significant.

IX. DISCUSSION OF FINDINGS

The study revealed that both male and female students taught using ELTA in technical schools electricity equally improved significantly in their achievement scores. Also, the interaction effect of gender and instructional method on achievement due to the use of ELTA was not statistically significant.

This finding revealed that there was no significant difference between mean achievement scores of male and female students taught electricity with ELTA. This result is in agreement with Achor and Ukwuru(2014) and Wombo (2014) who agreed that with the provision of equality of educational experiences with a suitable instructional method, inequality of students' learning outcomes for male and female students is not expected.

Furthermore, thisstudy revealed that the interaction effect of gender and ELTA on mean achievement scores was not statistically significant. The finding was in agreement with Achor and Ukwuru(2014)that also discovered that interaction effects on achievement due to methods and gender was not significant when they used e-learning approach on senior secondary school students' achievement in electricity.

X. CONCLUSION

Based on the finding of this study, the ELTA enhanced male and female students' achievement scores due to its learner-centered nature. This finding made the researchers to conclude that the method was relevant to male and female students' achievement. So, it could be concluded that e-learning teaching activities are appropriate to be adopted by physics teachers as an instructional strategy especially as it is gender friendly.

Based on the findings of this study, the following recommendations were made:

1. Physics teachers in technical schools should be encouraged to use ELTAin teaching electricity and other concepts in physics.
2. Teacher education institutions should be encouraged to include ELTA in their physics method curriculum for training and retraining of physics teachers.
3. Writers of text books should be encouraged to incorporate ELTA approach in their writings. This would makemore physics teachers to be educated about the approach.

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