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EFFECTIVENESS OF COMPUTER AIDED INSTRUCTIONS (CAI) ON STUDENTS' PERFORMANCE IN BASIC ELECTRICITY IN TECHNICAL COLLEGES IN RIVERS STATE OF NIGERIA

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Abstract

The study focused attention on the effectiveness of Computer Aided Instructions (CAI) on students' performance in basic electricity in technical colleges in Rivers State. The study adopted the pretest posttest quasi experimental design method. The population of the study comprises of all the vocational I basic electricity students in the five technical colleges in Rivers State. They comprised of 93 students. Purposive sampling technique was used to select two Government Technical Colleges and a sample size of 60 students was randomly selected for the study. This sample size comprised of 30 males and 30 females. The research instrument used for the study was the Basic Electricity Test (BET). The instrument was validated by two lecturers from technical education department of Ignatius Ajuru University of Education Port Harcourt. The reliability of the instrument was done using test-re-test method and Pearson's product moment correlation was used to obtain a coefficient of 0.65. Two research questions were drawn and two hypotheses were formulated for the study at 0.05 level of significance. The data for the study were analyzed using Mean and Analysis of Covariance (ANCOVA). The result indicated that students taught using Computer Aided Instructions (CAI) performed significantly better than those taught using conventional method. Also, there was no significant difference in the post test performance scores of male and female students. Some recommendations were made from the findings.

Keywords: Effectiveness; Computer; Instructions; Students; Performance; Electricity and Technical Colleges.

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1. Introduction

One of the goals of technical education programme is to provide trained manpower in technical skill that will lead trainees to the industry or self-reliant economically. According to Okoro

(2013), this type of education enables trainees to gain competence in a specialized field of study like Mechanical Technology, Electrical Technology, Electronics Technology and Building Technology. Okoro (2013) stated further that this training is usually carried out in technical institutions like Technical College.

This implies that technical college is a key institution in the implementation of technical education programme. Bako (2009) opined that technical colleges are institutions where skill trainings are provided practically by teachers armed with relevant technical know-how in various subjects in order to enhance students' performances. Some of the subjects taught in technical colleges are Metal works, Woodwork and basic electricity.

Basic electricity is the generation, transmission, and distribution of electricity (Amadike, 2007). It is the bedrock of all technological subjects and also the key to the industrial development of any nation, since no industry can function without electricity. The knowledge of basic electricity plays a significant role in enhancing the country's social, industrial and economical system. Bela (2012) opined that the acquisition of a good knowledge in basic electricity requires a firm grasp of some manipulative and calculative skills which if properly provided, will enhance students' academic performance. However, the performance of students in basic electricity in technical colleges has been poor generally in Nigeria and Rivers state in particular.

This was revealed by National Business and Technical Examination Board (NABTEB) examination results from 2008 to 2013 that only about 40% of students who sat for the examination passed basic electricity at credit level. This revelation was so disheartening that students positive attitude towards learning was affected negatively (Okonkwo, 2014). The situation calls for urgent attention in order to avoid the depletion of students' enrolment in Electrical Craft trade in the technical colleges.

According to Okafor (2014), the use of conventional teaching method like 'Lecture Method' is a key contributing factor to the poor performance of students in basic electricity in technical colleges. This conventional method is not innovative enough to create adequate practical skills that conform to the present dispensation of managing current flow in basic electricity (Okafor, 2014). Okafor however emphasized that teachers in basic electricity prefer this conventional teaching method because it covers more subject content. Zakari, Chine and David (2015), concluded that students can perform better when a teacher changes his approach to a more innovative student centered method like Computer Aided Instruction (CAI). Sharon (2008) added that teaching of basic electricity with the use of innovative instructional media like the Computer Aided Instruction (CAI) will enhance better performance in technical colleges.

Computer Assisted Instructions (CAI) is a self-learning technique that involves the students in programmed instructions. It makes use of the computer system to facilitate and improve learning by creating, analyzing, modelling and simulation of the current flow in circuits and devices. Izoro (2001) stated that Computer Aided Instructions (CAI) is an interactive instruction technique where the computer can be used to present instructional materials and monitor teaching/learning processes. He went further to state that in the field of basic electricity, the use of computer aided instructions (CAI) is very important.

Egbekwu (2004) opined that the potential benefits of computer aided instructions cannot be underestimated in our today's contemporary world. It is obvious that the trends in the teaching/learning process all over the world have embraced the use of Computer Aided Instruction (CAI) towards enhancing students' performance in different subjects and basic electricity cannot be an exception. Now the question is; if computer aided instruction is used in the teaching of basic electricity in technical colleges in Rivers State, what will be its effectiveness on students' performances? The answer to this question is the essence of this study.

2. Statement of the Problem

It is quite sad to note that electrical technology graduates from technical colleges are finding it difficult to achieve the aims and objective stipulated in the National Policy on Education. This is seen in their inability to perform good practical skills associated with electricity and their poor performances in the National Business and Technical Examinations Board (NABTEB) examinations in basic electricity. It was reported that, only about 40% of students who sat for the NABTEB examination passed basic electricity at credit level from 2008 to 2013. This report revealed a very serious and disturbing problem attributable to the use of conventional teaching methods in basic electricity. The problem has caused negative effects on students' attitude to learning and hence calls for urgent attention in order to avoid the depletion of students' enrolment in electrical craft trade in technical colleges. In that respect, the need to use an innovative instructional media like Computer Aided Instruction (CAI) is necessary. This innovative computer aided instruction will create practical skills that will enable students to have better understanding and practical know-how in basic electricity which will in turn create better performance. Therefore the question is; what is the effectiveness of Computer Aided Instruction (CAI) on students' performance in basic electricity in technical colleges in Rivers State?

3. Purpose of the Study

The purpose of the study is to determine the effectiveness of computer aided instructions on student's performance in basic electricity in technical colleges in Rivers State. Specifically the study intends to;

- 1) Determine the difference in mean performance of vocational I students in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State.
- 2) Determine the difference in mean performance of male and female vocational I students in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State.

4. Research Questions

The following research questions were drawn to guide the study:

- 1) What is the mean difference of vocational I students' performance in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State?

- 2) What is the mean difference of vocational I male and female students' performance in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State?

5. Hypotheses

The following null hypotheses (H_0) were formulated to be tested at 0.05 level of significance.

- 1) There is no significant difference between the mean performance of vocational I students in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State.
- 2) There is no significant difference between the mean performance of vocational I male and female students in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State.

6. Research Methodology

The design of the study was Quasi-Experiment Design of the Pretest Posttest in an experimental group and control group. The population of the study comprised of all the vocational I basic electricity students in the 5 Government Technical Colleges (GTC) in Rivers State. They were 93 students in number. A purposive sampling technique was used to select two Government Technical Colleges which are GTC Port Harcourt and GTC Ahoada. A simple random sampling technique was used to select 30 students (15 females and 15 males) in each of the two selected technical colleges. The 30 students in each college were randomly selected and distributed equally into two intact classes of experimental group and control group. Hence, a total number of 60 students were used as sample for the study.

The instrument used for data collection was the Basic Electrical Test (BET) being developed by the researchers. The BET was of two types; the Pre-BET and Post-BET. The test consist of twenty multiple choice questions with four options labeled A-D. The instrument was subjected to both face and content validation by two lecturers from Ignatius Ajuru University of Education, Port Harcourt. The reliability of the instrument was established by using a trial test carried out on a group of vocational 1 GTC students who were not used in the study. A Pearson's Product Moment Correlation was used on the reliability and a 0.65 correlation coefficient was obtained.

In the administration of the instrument, two BET test were actually administered. Prior to the treatment, the students were given a pre-test BET and after the treatment a post-test BET was administered to the students in both the experimental and control group. The treatment for the students was the teaching of basic electricity to vocational 1 students using CAD and conventional method on the experimental group and control group respectively. The scripts were all marked and the scores were recorded. Mean was used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

7. Presentation and Data Analysis

Research Question 1: What is the mean difference of vocational I students' performance in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State?

Table 1: Mean difference of students' using computer aided instructions and those taught with conventional method

N	Conventional Method		Computer Aided Instruction (CAI)	
	Mean	STD	Mean	STD
PRE-TEST 60	16.075	3.489	16.508	2.881
POST-TEST 60	25.275	5.253	29.358	70.065
Mean Difference	9.2		12.85	

The table 1 above shows the mean performance of students taught with Computer Aided Instructions (CAI) and those taught with conventional method. From the table, it is clear that the students that are taught with CAI performed better than those taught with conventional method. The mean performance of students taught with CAI is 12.85 (i.e. $29.358 - 16.508$), while the mean performance of students taught with conventional method is 9.2 (i.e. $25.275 - 16.075$).

Research Question 2: What is the mean difference of vocational I male and female students' performance in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State?

Table 2: Mean difference of male and female students taught basic electricity using computer aided instructions

N	MALE		FEMALE	
	Mean	STD	Mean	STD
PRE-TEST 30	15.765	2.635	17.250	2.967
POST-TEST 30	29.085	7.880	29.515	6.324
Mean Difference	13.32		12.265	

The table above shows the mean performance of male and female students taught basic electricity using Computer Aided Instruction (CAI) and conventional method. From the above, it is seen that male students taught with CAI with mean 13.32 (i.e. $29.085 - 15.765$) performed slightly better than their female counterparts who were taught with CAI with a mean of 12.265 (i.e. $29.515 - 17.250$).

Hypotheses 1 (Ho₁): There is no significant difference between the mean performance of vocational I students in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State.

Table 3: Analysis of covariance of students mean scores in BET

Source	Type III sum of square	DF	Mean Square	F	Sig.
Corrected model	1141.9a	2	570.95	3.7085	.001
Intercept	4792.3	1	4792.3	31.129	.000
PRE-TEST A	141.5	1	141.5	0.919	.89
Treatment	945.3	1	945.3	6.1405	.001
Error	9006.05	57	77.0		
Total	189236.0	60			
Corrected Total	10147.95	59			

From table 3 above, the value of F-calculated for the effect of treatment of methods on students' performance on BET is 6.1405 at 0.001 level of significance, which is less than 0.05 levels set for the study. The null hypothesis is therefore rejected. This means, there is a significant difference in the mean performance of basic electricity students taught with CAI and those taught with conventional method.

Hypotheses 2 (Ho₂): There is no significant difference between the mean performance of vocational I male and female students in basic electricity when taught with Computer Aided Instructions (CAI) and those taught with conventional method in technical colleges in Rivers State.

Table 4: Analysis of covariance in male and female students mean scores in BET

Source	Type III Sum of square	DF	Mean Square	F	Sig.
Corrected model	595	2	297.5	1.821	0.145
Intercept	4467.75	1	4467.95	27.35	0.00
PRE-TEST A	209.95	1	209.95	4.5	0.56
Gender	384.9	1	384.9	1.285	0.145
Error	9552.95	57	81.65	2.439	
Total	189236	60			
Corrected Total	10147.95	59			

From table 4 above, the value for F-calculated for the effect of gender on students' performance is 1.285 at 0.145 level of significant, which is greater than 0.05 level set for the study. The null hypothesis is therefore accepted. This means there is no significant difference in the mean scores of male and female students in BET using CAI.

8. Discussion of Findings

In research question 1 as seen in table 1; the result of the study shows that students taught basic electricity using computer aided instructions in technical college performed better than those taught basic electricity using the conventional method. This result agrees with earlier findings by Phillip and Aksu (2013) and the findings of Jegede, Okebukola & Ajewale (1992), which are of the views that method like computer aided instructions can enhance learning Biology more than conventional methods.

Similarly in research question 2 as seen in table 2; the mean performance score of male students was revealed to be slightly higher than their female counterparts. Though the difference was not quite much, hence was in agreement with Bello (1999) views that gender is not a problem in the performance of students in Mathematics.

Again, in hypothesis 1 as seen in the analysis in table 3; it revealed that there was a significant difference between experimental group (Using CAI) and control group (Using conventional method) in their mean performance scores. This invariably means that those taught with Computer Aided Instructions (CAI) performed significantly better than those taught with conventional method. The finding agrees with the finding of Ndubuisi (2007), who opined that students taught with computer aided instructions significantly perform better than other students taught with conventional methods in technical colleges.

Similarly, in hypothesis 2 as seen in table 4 revealed that male students mean performance score was slightly higher than their female counterpart. Hence, there was no significant difference in the performance of male and female students in their mean performance score. This finding shows that gender had no influence on the performance of students in basic electricity when they are taught with CAI. However, Alero (2006) has a different view that gender bias in Nigeria and Africa as a whole is still very prevalent.

9. Conclusion

The study has critically examined the effectiveness of computer aided instructions (CAI) on student's performance in basic electricity, especially within the technical colleges in a rapid changing world. There is still a wide gap to be bridged in the area of teaching and learning of basic electricity. The use of computer aided instructions seems to be the answer. Computer aided instructions is more effective in teaching and learning basic electricity concept and it is also gender friendly.

10. Recommendations

Based on the findings, the following recommendations are made;

- 1) Since CAI has been found out to be an effective method of teaching basic electricity in technical colleges, a formal means to enhance its learning should be provided in all technical colleges in Rivers State.
- 2) The use of CAI for teaching has a lot to do with the computer systems; hence adequate computer systems should be made available in all technical colleges in Rivers State.
- 3) Since the world is now going digital, and CAI is one of the means to digitalization; the curriculum of technical colleges should be re-viewed to adequately accommodate digital learning.

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