

EFFECTS OF INSTRUCTIONAL MODEL ON THE ACHIEVEMENT OF BASIC ELECTRICITY STUDENTS IN BORNO STATE TECHNICAL COLLEGES

BABA GANA A. MUSTAPHA<sup>1</sup> and Dr. J.D. MEDUGU<sup>2</sup>

<sup>1</sup> Department of Technical Education, Ramat Polytechnic, Maiduguri, Borno State

<sup>2</sup> Department of Electrical Technology Education, School of Industrial Technology Education Modibbo Adama University of Technology, Yola.

Abstract

The study determined the effect of constructed electrical instructional models for teaching Basic electricity at the technical college level in Borno state, Nigeria. There are three null hypotheses formulated to guide the study. The design was experimental pre-test post test group control. The population for the study consisted of 90 students from the only two technical colleges that offer basic electricity in the study area. All the population was considered for the study as there was no sampling. The students were randomly assigned to either experimental or control group. Structured questionnaire titled; Basic Electricity Achievement test (BEAT) and Basic Electricity Retention test (BERT) were used for data collection. BEAT and BERT consist of 50 items each with four options. The draft of the BEAT, BERT and table of specification were given to six experts of varied years of teaching basic electricity from Modibbo Adama University of Technology, Yola and Ramat Polytechnic, Maiduguri, for face validation. Z – Test statistic was used to test hypotheses  $H_{01} - H_{03}$  at 0.05 level of significance. The findings include: there was a significant difference between the mean ratings of BE students, taught BE using constructed electrical models and those students that were taught BE using conventional method, also, there was no significant difference between the mean ratings of students taught BE, using constructed electrical models and those taught using conventional method in their retention test. It was recommended that, workshop should be organized at the technical college level to encourage the use of teacher made models.

**Introduction**

Technical Colleges in Nigeria were established to produce craftsmen at (secondary) level and master craftsmen at the advance craft post secondary level Federal Republic of Nigeria (FRN, 2004). The courses offered at the technical colleges lead to the award of National Technical Certificate (NTC) and Advance National Technical Certificate (ANTC). The curriculum of technical colleges are formed into trade groups and related trades. These includes, computer trade, electrical/electronic trade, building trade, fabrication and welding trade, auto-electrical work trade, mechanical engineering trade as well as related trade courses such as mathematics, English, physics, chemistry and technical drawing (FRN,2004).

In the contemporary Nigeria, greater emphasis is being placed on industrial and technological development. As a result of such, students are being encouraged to take up science and engineering related subjects in technical colleges. One subject that cut across the entire engineering and related technical subject is basic electricity. “Today, basic electricity literally pervades every field of human endeavor and plays a fundamental role in economic development of a country”. National Business and Technical Examination Board (NABTEB, 2008) syllabus outlined the basic electricity as one among the trade-related subjects offered at technical colleges level.

However, this subject cannot be taught successfully based on mere theoretical knowledge or

Lecture method, commonly known as conventional method by teachers, without proper use of instructional aids and practical skills (Umunadi, 2009 and Medugu, 2011). Therefore in such situation, to improve students achievement in basic electricity, the effort to construct electrical models as instructional aids cannot be over-emphasized for teaching basic subject in technical colleges. The need to update teachers’ knowledge on construction of models for teaching of basic electricity/electronic subject and acquaint students with other new innovations will further facilitate students’ skills, knowledge and attitude as explained by (Iheamacho, 1997; Grotzer and Sudbury, 2000 and Oluropo, 2005). Similarly, the best way to make learning more concrete is to make use of real objects (Akinwale, 2004). According to Umunadi (2009), it is certain, using real object or models to teach students will have proffered relevant impact on one way or the other than use of chalk- talk or conventional methods. Hence, the need to test the effect of Instructional models, in order to ameliorate the deteriorating performance of students in technical colleges in Borno state.

**Purpose of the study**

The main purpose of this study is to determine the effect of instructional models on students’ achievement in basic electricity in technical colleges of Borno State.

Specifically the study:

1. Determine the pre-test mean ratings of BE students in both experimental and control groups

2. Determine the mean achievement rating of students taught BE, using the instructional models and those taught using the conventional method, in a posttest Basic Electricity Achievement test (BEAT).
3. Compare the mean rating of students taught BE, using instructional models and those students taught BE using conventional method in a Basic Electricity Retention test (BERT).

### Hypotheses

- Ho<sub>1</sub>: There is no significant difference between the mean achievements of BE students in both experimental and control groups in the pretest
- Ho<sub>2</sub>: There is no significant difference between the mean achievements of students taught BE, using instructional models and those taught using conventional method in a BEAT.
- Ho<sub>3</sub>: There is no significant difference between the mean achievements of students taught BE, using instructional models and those taught using conventional method in a BERT.

### Methodology

The study was undertaken in Borno state. Borno state is located in North East geopolitical zone. The zone is in the Northern part of Nigeria. A total of 90 NTC II students of basic electricity in the two technical colleges were used as population and sample of the study. No sampling was done as all the 90 student of basic electricity in the two technical colleges were used for the study. These are the only colleges that offers BE in Borno state. The design of this study is experimental (pretest posttest control group design). In each college, an intact class was used. Individually students were randomly assigned to either experimental group (Ge) or control group (Gc)

A 50 item research instrument, tagged basic electricity achievement test (BEAT) and basic electricity retention test (BERT) were the instrument for the study. The contents of BEAT and BERT were same but numbering varies to avoid remembrance. They were multiple choice items with four options A – D; each correct response attracted 2.00 marks. The draft of the instruments and table of specification were submitted to six experts of varied years of teaching basic electricity; three (3) from Modibbo Adama University of Technology, Yola and three (3)

from Ramat Polytechnic, Maiduguri, for their comments and suggestions. It was latter pilot tested at Government Science and Technical College Mubi Adamawa state, where 38 students from BE class were involved in the exercise. The pilot test results produce reliability coefficients of  $r = 0.78$ , the researchers apply the Pearson's product moment correlation, to obtain the reliability coefficients. The instructional models were constructed based on the NABTEB syllabus 2008, and used for teaching the experimental group. These include (a) power supply: This model was used to teach basic electricity students to explain the concepts of electromagnetism, the principles of a transformer, method of construction and its operation. (b) AC - DC luminous inverter: it was used to teach how to invert AC from DC battery (6 – 12V) by using transformer with feedback windings and simple transistor, resistors, capacitors components to operate transistor in circuit to light up lamp or fluorescent tube. (c) Amplifier model: It was used to explain; the concept and principles of amplifier, types of amplifier, function and behavior of transistor as an amplifying device. See Appendix A, for Circuits. The questionnaire was directly administered to the students after teaching. T-test statistic was employed to analyze the three (3) hypotheses at 0.05 level of significance. A hypotheses was rejected if the calculated t-value at 0.05 probability level is greater than the table value, otherwise the hypotheses was accepted.

### Results

**Ho<sub>1</sub>: There is no significant difference between the mean achievements of BE students in both experimental and control groups in the pretest**

From Table 1, the calculated Z value is 0.36 while the critical Z value is 1.96. Since the calculated value of Z is less than the critical value, this shows that there is no significant difference between students in both experimental group and control group. Therefore, the null hypothesis is accepted. The implication is that, these students are equal at the initial stage; hence experimental study can be conducted.

Table 1: Z-test Results of Pretest Mean Scores of Both Experimental and Control Groups

Group	N	Mean	SD	Z-cal	Z-crit.	Decision
Experimental	46	37.90	6.99	0.36	1.96	Accepted
Control	44	37.39	7.82			

**Ho<sub>2</sub>: There is no significant difference between the mean achievements of students taught BE, using instructional models and those taught using conventional method in a BEAT.**

The data presented in Table 2 shows that, the Z-calculated value is 2.80. Since the calculated Z value exceed the critical or table Z value, there is

significant difference between the mean score of BE, students who were taught using constructed electrical models and those that taught BE, using conventional method. Therefore the null hypothesis was jettisoned. This is an indication that, the sequential presentation of instructional aids by basic electricity teacher in the experimental, group has offered a better understanding of the concepts by learners.

Table 2: Z-test Result on post test Mean Scores Between Experimental Group and Control Groups in RMAT

Group	N	Mean	SD	Z-cal.	Z-crit.	Decision
Experimental	46	49.77	10.93	2.80	1.96	Jettisoned
Control	44	41.57	8.25			

**Ho<sub>3</sub>: There is no significant difference between the mean achievements of students taught BE, using instructional models and those taught using conventional method in a BERT.**

Table: 3 show that, the calculated Z value is 2.95. This implies that Z- calculated value is greater than the critical z-value of 1.96. This led to jettisoned

of the null hypothesis, meaning there is significant difference between the BE, students who were taught using teacher instructional models and those that were taught using conventional method in retention test. The implication is that, both groups were able to retain what they learnt, but those taught using instructional models retains better as can be seen in their means.

Table 3: Z-Test Result on prêt test Mean Scores between Experimental and Control Groups in retention test

Group	N	Mean	SD	Z-cal	Z-crit.	Decision
Experimental	46	43.79	8.25	2.95	1.96	Jettisoned
Control	44	41.03	8.27			

### Findings of the study

1. There was no significant difference between the mean ratings of BE students in both experimental and control group in the pretest result of the two TC. This further confirms the student's equality, before treatment
2. The sequential presentation of instructional aids by basic electricity teacher in the experimental, group has offered a better understanding of the concepts by learners; hence they performed better than the control group.
3. All the students retain what they learnt, but those who were taught using electrical models, retains better.

### Discussion of Findings

The result of the analysis of the null hypothesis which stated that 'There would be no significant difference between the mean ratings of both experimental and control groups in BEAT, revealed that the experimental group performed significantly better than the control groups. This significant difference in the mean achievement scores between the experimental and control groups may be attributed to the treatment that exist between the two different groups leading to better retention of facts

among the subjects in the experimental group. This may well be an indication that the sequential mode of constructed electrical models as instructional aids by basic electricity teacher have offered a better understanding of difficult concepts by learners. The better performance of the experimental group over control group also enjoyed the effort of the basic electricity teachers through judicious utilization of the instructional models in the lessons. It was found out that used of the instructional models improves students achievement and retention of knowledge as a possible outcome of better initial learning among the experimental group at the end of the treatment. This finding agrees with the findings of Iheamacho (1997) and Oluropo (2005), who reported that instructional models enhance student's performance and retention. This signified that the conventional method of teaching readily practiced by teachers in the control groups did not offer significant change in the mean ratings of subjects when compared to the experimental groups. This could be as a result of poor use of instructional strategies and biased assessment of students learning outcome, there by resulting to low academic achievement of the students. Proper use of instructional materials were clearly

encouraged and suggested by Grotzer and Sudbury (2000), Umunadi (2009), and Medugu (2011).

The results of the analysis of the hypothesis 3, showed that there was no significant difference between the mean ratings of BE students taught using the instructional models and those taught BE using conventional methods in their retention test. This implied that when appropriate instructional methods were used, the learner could actually acquire the best of the lesson. Both groups were able to retain what they learnt, but those taught using electrical models, retains better with means of 43.79 for experimental group and 41.03 for control group.

### **Conclusion**

The poor achievement of BE, students in technical colleges examination was an indication of the fact that they were poorly taught BE and also that

difficulty exists in learning the subjects among the students. The used of instructional model as an instructional support proved more efficient than the talk to chalk method (conventional way) readily adopted by most technical college teachers.

### **Recommendations**

The following recommendations were proffered based on the findings of this study:-

1. Government of Borno State and different agencies should provide funds to procure the materials and components for designing and developing models of teaching the technical colleges students for effective learning.
2. Workshop should be organized at the technical college level to encourage the use of teacher made models for effective teaching.

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APPENDIX A: TEACHER CONSTRUCTED ELECTRICAL MODELS

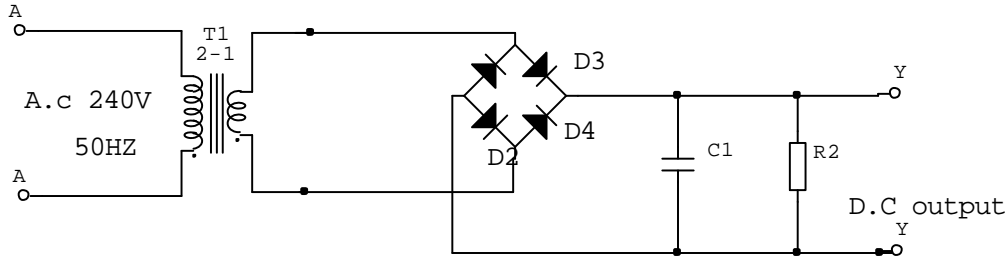


Figure 1: Full wave bridge rectifier model

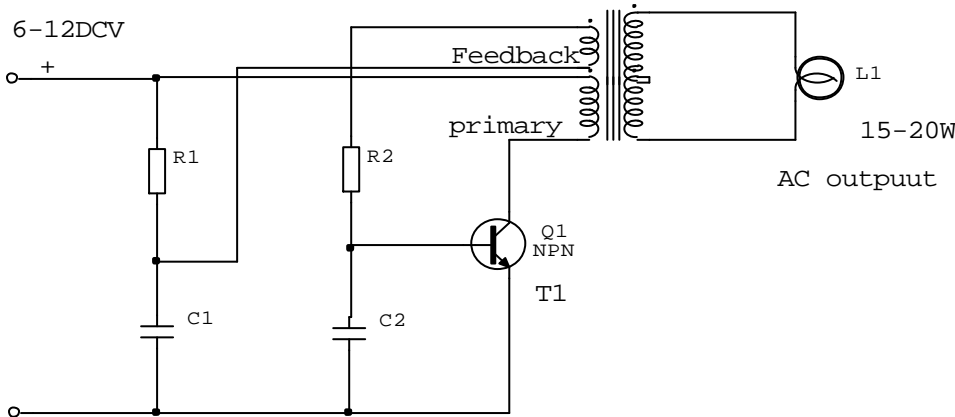


Fig. 2: DC-AC luminous Inverter model

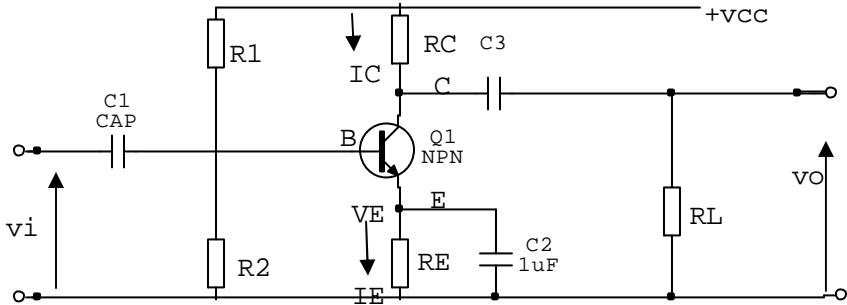


Figure 3: Common Emitter Amplifier Mode