

Comparison of the Effects of Improvised Electrical Models On Students Academic Achievement In Male And Female Technical Colleges In Borno State, Nigeria

Dr. J.D. MEDUGU¹ BABA GANA A. MUSTAPHA²

¹ Department of Electrical Technology Education, School of Industrial Technology Education Modibbo Adama University of Technology, Yola.

² Department of Technical Education, Ramat Polytechnic, Maiduguri, Borno State
E-mail jdmedugu2010@yahoo.com

Abstract

The study was conducted to find out the comparative effects of teacher-improvised electrical models on academic achievement of students in basic electricity at the technical college level in Borno state, Nigeria. Four research questions and four null hypotheses were considered and tested. The pretest posttest experimental research design was employed for the study. The population for the study consisted of 90 students from the only two technical colleges that offer basic electricity. All the population was considered for the study as there was no sampling. The students were randomly assigned to either experimental or control groups. Structured questionnaire titled; Researcher made achievement test (RMAT) and Researcher made retention test (RMRT) were used for data collection. RMAT and RMRT consist of 50 items each with four options. The draft of the RMAT and RMRT 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 comments and suggestions. Mean standard deviation and t – test statistics were employed for data analysis at 0.05 level of significance. The findings include; there was a significant difference between the mean ratings of students taught BE using improvised electrical models and students that were taught BE using conventional method in posttest, also; there was no significant difference between the mean ratings of male and female students taught BE, using improvised electrical models in a retention test. It was recommended that, workshop should be organized at technical colleges; to introduce the need for teacher improvised electrical models and stress the importance of electrical models to practicing teachers.

Keywords: Electrical models, Achievement test, Retention test, Conventional method, Basic electricity

1. Introduction

Basic electricity (BE) is one of the fundamental trade related subject offered at technical college level, whose main objective is to equip students with the necessary basic knowledge, skills and attitude to be self-reliance (FRN, 2004). The technical colleges are expected to produce craftsmen. Unfortunately, it is apparent that there is an astronomical decline of students' academic achievement in the technical subjects such as BE in Borno State (Education Resource Centre, 2010). Various stakeholders have advance reason for this negative development in education in the state among which, over years teachers have been depending on excessive use of words to express and convey ideas, or fact in teaching and learning process. This practice is termed the “Chalk-Talk Method” (Onasanya, Adegbija, Olumorin and Daramola, 2009).

The consequence of these poor states of encouragement on learning materials and performance of students can be enormous. Adenipekun (2010) revealed that, lack of improvised materials for teaching is still one of the consequences that cause low education standard and students tasks orientation on acquisition of skills. A report of NABTEB Chief Examiners on examinations conducted in basic electricity subject in technical colleges of Borno State in 2009 recorded a failure rate of 68% unsatisfactory students achievement, this problem is an indication of overall poor performance of candidates achieving below average (NABTEB, 2010 and Medugu, 2011). Omosewo (2008) ascertained that in a science and technical curriculum programme, students need to be encouraged to learn not only through their ears, but should be able to use their eyes and hands to manipulate apparatus, device to acquire skillful knowledge. Therefore, in the light of these inadequacies in technical colleges, to what extent have the goals of the FRN (2004) which includes giving training and imparting the necessary skills to individual who shall be economically self reliant been achieved? Such question and inadequacies raised the concern of the researcher. In an attempt to ameliorate the problem of inadequacy, poor teaching and study habit, lack of improvisation of instructional materials, has been examined to be one of the major factors responsible for persistent failure in technical colleges. Hence, this study to improvised electrical models on students academic achievement in technical colleges of Borno state

1.1 Research Questions

1. What are the pre-test mean ratings of Basic electricity (BE) students in both experimental and control groups?
2. What are the mean ratings of students taught BE using teacher-improvised electrical models and those taught using conventional method in a post test?
3. What are the gender differences between students taught BE, using teacher-improvised electrical models in an achievement test?
4. What are the gender differences between students taught BE, using teacher-improvised electrical models in a retention test?

1.2 Hypotheses

Based on the research questions, the following three null hypotheses were formulated to guide the study:

- Ho₁: There is no significant difference between the mean ratings of BE students in both experimental and control groups in the pretest
- Ho₂: There is no significant difference between the mean ratings of students taught BE using teacher-improvised electrical models and those taught using conventional method in post test.
- Ho₃: There is no significant difference between the mean ratings of male and female students taught BE, using teacher improvised electrical models in an achievement test
- Ho₄: There is no significant difference between the mean ratings of male and female students taught BE, using teacher improvised electrical models in a retention test.

2.0 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 experiment. The colleges were the only college that offers BE in Borno state. The design of this study is pretest posttest group experimental design. In each, an intact class was individually randomly assigned to either experimental group (Ge) or control group (Gc)

A 50 item research instrument tagged researcher made achievement test (RMAT) and researcher made retention test (RMRT) were the instrument for the study. The contents of RMAT and RMRT 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 from Modibbo Adama University of Technology, Yola and 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 a reliability coefficients of $r = 0.76$. The electrical models were constructed based on the NABTEB syllabus 2008, and used for teaching the experimental group. These include model of power supply unit, amplifier model and DC – AC luminous inverter model (see Appendix A). The questionnaire was directly administered to the students after teaching. The simple mean and standard deviation were used to answer research question 1 to 4; while T-test statistic was employed to analyse hypotheses 1 to 4 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 if the calculated value is less than the value on the table of values

3.0 Results

- ### 3.1 Research questions 1: What are the mean ratings of students taught BE using teacher-improvised electrical models and those taught using conventional method in a post test?

Data analysis on table 1 shows that: Male students who were taught BE, using teacher-improvised electrical models had a mean score of 60.01 with SD 10.68 and those students that were taught BE, using conventional method had a mean score of 42.46 with SD of 9.24. While the maximum score in experimental group is 78.00, and that of control group is 57.00

Table 1: Mean Rating Scores of Male and Female BE Students, of Experimental

and Control Groups in post test in two Technical Colleges

Group	N	Mean	SD	Min.	Max.
Experimental	46	60.01	10.68	30.00	78.00
Control	44	42.46	9.24	25.00	57.00

3.2 Research question 2: What are the gender differences between students taught BE, using teacher-improvised electrical models in a post test?

Data analysis on table 2 shows that: Male students who were taught BE, using teacher-improvised electrical models had a mean score of 52.77 with SD 12.73, while female students that were taught BE, using teacher-improvised electrical models also had a mean score of 47.25 and SD of 8.63.

Table 2: Mean Rating Scores of Male and Female BE Students, in achievement test

Group	N	Gender	Mean	SD	Min.	Max.
Experimental	21	Male	52.77	12.73	36.00	78.00
Experimental	25	Female	47.25	8.63	30.00	65.00

3.3 Research question 3: What are the gender differences between students taught BE, using teacher-improvised electrical in a retention test?

Table 3 shows that, male students who were taught BE, using Teacher-Constructed Electrical Models had mean score of 46.24 with SD of 6.33, while female students that were taught BE, using Teacher improvised Electrical Models had a score of 41.73 and SD of 9.19.

Table 3: Mean Rating Scores of BE, Male and Female Students Exposed to Teacher-improvised Electrical Models in retention test

Group	N	Gender	Mean	SD	Min	Max.
Experimental	21	Male	46.24	6.33	36.00	59.00
Experimental	25	Female	41.73	9.19	20.00	60.00

3.4 H_{01} : There is no significant difference between the mean ratings of BE students in both experimental and control groups in the pretest

From table 4, 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.

Table 4: 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			

3.5 H_{02} : There is no significant difference between the mean ratings of students taught BE, using teacher-improvised electrical models and those taught using conventional method in post test.

Table: 5 show that, the calculated t-value is 2.96; this value is greater than t critical value of 2.02. The null hypothesis is jettisoned, meaning, there is a significant difference between the mean scores of students taught BE, using teacher-improvised electrical models and those taught using conventional method, in this case, in

favour of the improvised electrical models.

Table 5: T-test Result on Post test Mean Scores between Male Experimental and Control Groups in Technical College

Group	N	Mean	SD	df	t-cal	t-crit.	Decision
Experimental	46	52.77	12.73	39	2.96	2.02	Jettisoned
Control	44	42.46	9.24				

3.6 Ho₃: There is no significant difference between the mean ratings of male and female students taught BE, using teacher improvised electrical models in an achievement test

Table: 6 show that, the calculated t-value is 1.75. This value is less than the t- critical value of 2.01. Hence, the null hypothesis is accepted. That is, there is no significant difference between the mean scores of male experimental group and female experimental group in achievement test.

Table 6: T-test Result of Treatment Effects on Post Test between Male Experimental and Female Experimental Group in RMat

Group	Gender	N	Mean	SD	df	t-cal	t-crit.	Decision
Experimental	Male	21	52.77	12.73	44	1.75	2.0154	Accepted
Experimental	Female	25	47.25	8.63				

3.7 Ho₄: There is no significant difference between the mean ratings of male and female students taught BE, using teacher improvised electrical models in a retention test.

Tables 7 show that, calculated t-value is 1.10. Since this value is less than the t- critical of 2.01. This means, there is no significant difference between male and female exposed to teacher-improvised electrical models in retention test in both technical colleges. Hence both students were given treatment using improvised electrical models respectively.

Table 7: T-test Result of Treatment Effects, on Gender difference in experimental group in retention test

Group	Gender	N	Mean	SD	df	t-cal	t-crit.	Decision
Experimental	Male	21	46.24	6.33	44	1.10	2.01	Accepted
Experimental	Female	25	41.73	9.19				

3.8 Findings of the study

1. There was a significant difference between the mean ratings of students taught BE, using improvised electrical models and students that were taught BE, using conventional method in achievement test.
2. There was no significant difference between the mean ratings of male and female students taught BE, using improvised electrical models in achievement test.
3. There was no significant difference between the mean ratings of male and female students taught BE, using improvised electrical models in retention test

4.0 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 pretest, revealed that no significant difference exists between, both the experimental groups and their control groups. Result on table 5 revealed that the experimental groups performed significantly better than their control groups. This is in agreement with the findings of (Omosewo, 2008; and Medugu, 2011). This significant difference in the mean achievement scores between the experimental and control groups may be attributed to the treatment that exists between the two different groups. This may well be an indication that the sequential mode of electrical models as instructional aids improvised has 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 electrical models in their lessons. According to Onasanya et al (2009) improvised electrical models assists students' achievement better compared to when they are not exposed to. In table 6, the male BE students in experimental group and female BE, students in experimental group were found to be no significant difference in their post test on treatment of gender effects. Both male and female experimental

groups had no significant difference in post test. This finding is in agreement with that of Okeke (2004) and Vero, Garcia, and Pedros (2006), who all found that, there were no significant difference between the achievement of male and female students in science and technology. This implies that when appropriate stages of delivery instruction are employed and relevant instructional materials were used, the learners would actually acquire the best in whatever lesson or course of study irrespective of sex difference. Similarly, the result of the analysis of the third hypothesis showed that there is no significant difference between the mean ratings of male BE, students taught using improvised electrical models and female BE, students taught using improvised electrical models in their retention test. This implies that when appropriate instruction was used, the learner could actually acquire the best in their lesson irrespective of sex difference. Both groups were able to retain what they learnt.

5.0 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 improvised electrical models proved more efficient than the talk to chalk method (conventional way) readily adopted by most technical college teachers.

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, for teaching the technical colleges students for effective learning.
2. Constant power supply, generators and all necessary components like transistors, integrated circuits, galvanometers, transformers, oscilloscope, soldering irons, and other workshop tools and accessories including computers, digital meter, signal generators should be distributed by the state ministry of science and technology for effective teaching and learning.
3. Workshop should be organized at technical colleges; to introduce the importance of teacher improvised electrical models and stress the importance of electrical models to practicing technical teachers.

References

- Adenipekun, O. (2009), *New Educational Matters Awaiting, Federal Government, States Government, Implementation*: Retrieved December, 26 2010 from <http://www.Vanguardngr.com/> Vanguard Nigeria
- Borno State Government (2010), Education Resource Centre, Ministry of Education. Government press - Maiduguri
- Federal Government of Nigeria (2004), National Policy on Education, (4thed) Lagos: NERDC Publishers.
- Medugu, J.D. (2011), "Effectiveness of a Digital Oscilloscope for the Teaching of Some Radio, Television and Electronics Work Concept at Technical Colleges Level", *PhD Thesis*, Ababakar Tafawa Balewa University, Bauchi, Nigeria
- National Business and Technical Examinations Board (2010), *ETF, Intervention in TVET Syllabus for engineering trades examination based on National Board for Technical Examination, Modular curricula*.
- Omosewo, E. O. (2008), *Physics Teachers Education aand National Education Reform*.In: Edu. Reform in Nigeria-Past, Present and Future, Lawal A.A.(Eds) Stirling Horden Publisher.Ltd, Lagos, 247-250.
- Onasanya, S.A. Adegbija, M.V. Olumorin C.O. & Daramola, F.O. (2009), "Education reform and Assessment of Teachers Competence in Instructional Media Technology Use In:Education reforms in Nigeria- Past, Present and Future", Lawal A.R.(Eds) Stirling Horden Publisher. Ltd, Lagos, 259-272.
- Okeke, B.C. (2004). "Development of an instrument for evaluating practical, metal work programmes in Delta state colleges", *Nigerian Journal of curriculum and instruction* 9(2) 44-47
- Vero, M; Garcia, C. & Pedros, G. (2006), "Computer in physics, *International Journal of Science Education*", 17(8)157-171

APPENDIX A: TEACHER CONSTRUCTED ELECTRICAL MODELS

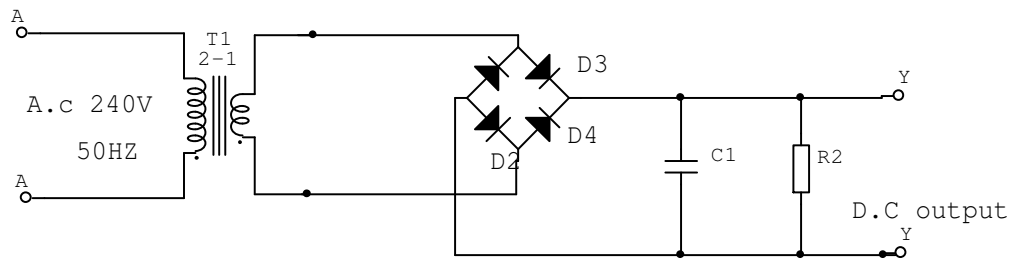


Figure 1: Full wave Bridge rectifier Model

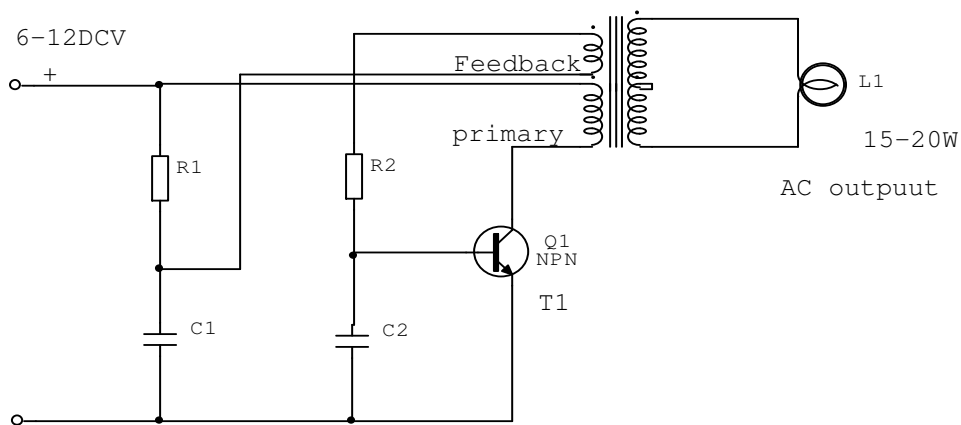


Fig. 2: DC-AC luminous Inverter model

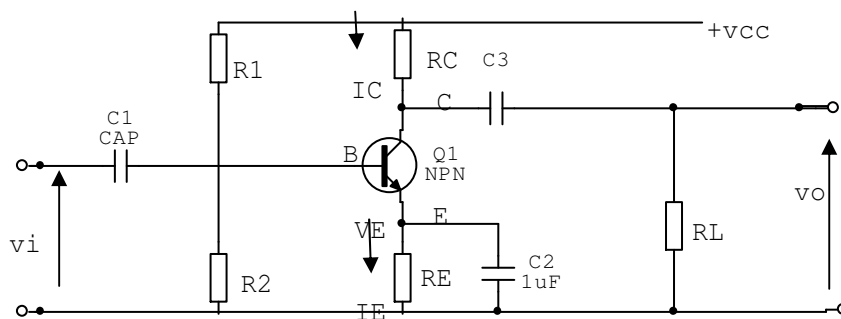


Figure 3: Common Emitter Amplifier Model

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