



Effects of Three Teaching Methods on Students' Academic Achievement in Automobile Electrical works in Government Science and Technical Colleges of Yobe state

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ABSTRACT

The study assessed the Effects of three Teaching Methods on Student's Achievement in Automobile Electrical Works in Government Science and Technical colleges of Yobe State. The study adopted quasi-experimental research design and was guided by four research questions and four hypotheses. The population of the study was made up of 80 NTC II (Technical) students for the 2014/2015 academic session, majoring in Automobile Electrical Work in Yobe state Government Science and Technical Colleges. This is made up of four intact classes three in Government Science and Technical College Potiskum. For Experimental group and the other one in Government Science and Technical College Damagum. For control group. Each of the classes consists of 20 students used for the study. The entire population was used for the study, hence no sampling was used. The instrument is a standard test as adopted by the researcher from National Business and Technical Examination (NABTEB) past question papers. There was no need for re-validation. Data for the study were collected through direct administration of the achievement test with the help of two trained research assistants one from each of the school. The results obtained from the achievement test were used for data analysis. The Microsoft Excel was employed for analyzing the data. Mean achievement score were used to answer the research questions 1, 2, 3 and 4 while Analysis of Variance (ANOVA) test hypothesis 4 only and Z-test were used to test the hypotheses 1, 2 and 3 at, 0.05 level of significance. The findings of the study, among others revealed that; the learning achievement of students' taught using demonstration, simulation and project methods of teaching was effective when compared with conventional method. Based on the findings of this study, the followings recommendations were made; the use of demonstration method of teaching should be made mandatory in all technical colleges to catalyze learners' interest and motivation. This will surely improve the students' academic achievement in automobile electrical work. Similarly technical college should acquire the necessary information and encourage the teachers to adopt the use of simulation method of teaching in Automobile Electrical work. Hence, there is the need to encourage teachers to attend seminars and workshop on the use of project method of teaching, for teaching and learning. This will help them in updating their knowledge.

Keywords: Auto-Electrical work teaching method, Technical College

INTRODUCTION

Teaching is essentially concerned with how best to bring about desired learning by some educational activity (Kyriacou, 1995). The World Book Encyclopedia (2001) defines teaching as "helping other people learn". This makes teaching one of the most important ways that enable people to relate to one another as far as knowledge and skills acquisition are concerned. Teaching helps people acquire the knowledge they need to become responsible citizens, to earn a living and to lead useful rewarding lives. Teaching is also said to be a vehicle for transferring knowledge from one generation to another. The topic; titled ' effect of three teaching methods on students' achievement in automobile electrical work in Government Science and Technical Colleges of Yobe State". These teaching methods are (demonstration, simulation and project methods as my experimental group) while conventional methods as my control group. Oyetunde and Famwang (1999) defined methods as an overall plan for

the orderly presentation of content or learning material. Demonstration is the basic method for introducing new skills to the learner. It consists of nothing more than showing the learner how the new skills should be performed. The teacher does the showing while the learner observes. The showing is accompanied by explanation on the part of the teacher of 'how' the skill is being demonstrated (Leighbody and Kidd, 1968 and Miller, 1990). A simulation includes time for reflection and processing which allows students to share their experiences, assess their learning and evaluate their assessments against the intended outcomes of the simulation. In addition to accomplishing the objectives of the simulation activity, students often become interested in the real world system on which it is based and what makes it work the way it does (Heijden, M. C. van der, Harten, A. van, Ebben, M. J. R., Saanen, Y. A., Valentin, E. C., & Verbraeck, A., 2002). While Project method of teaching according to Kilpatrick in Knoll M. (1997), is perceived to be a student centered approach to learning. It is predominantly task oriented and the project is often set by the teacher. The students need to produce a solution to solve the problem and are then required to produce an outcome in the form of a report.

Those that are in the teaching profession are referred to as teachers. A teacher in educational process refers to the person who instructs to provide the teaching-learning process. The teacher assumes various capacities as educator, instructor, tutor, lecturer, counselor and professor. Aghenta (1991) is of the view that as an input operator into the educational system, the teacher plays a vital role in the conversion of raw materials (students) into finished products, i.e graduates. Teachers are important in any educational system; this is because the quality of teachers in any educational system determines to a great extent the quality of the system itself. With reference to the teacher in formal education, Lassa (1993) asserted that the teacher is the initiator of learning process, the facilitator of learning skills, the coordinator of learning sequence, the assessor of learning efficiency, and indeed the pivotal element in the entire educational development. Similarly, Tal and Garba (2006) asserted that a teacher is a person who awakens his students desire to learn and getting it accomplished through counseling, good preparation and presentation of lessons, self-composure, clarity of presentation, use of appropriate teaching, motivation methods and effective evaluation techniques. Professional teachers in particular are crucial to the formulation and successful implementation of educational policies in any country. However, the nonperformance of AEW teacher on the job, has a lot to do with the kind of training received in the institutions responsible for their training, Arfo (2006) admitted that the non-performance of AEW teachers is as a result of poor preparation from school due to the fact that institutions are facing series of problems. In order to enhance teachers role, a practical advice for the teachers, is to explore different ideas in their teaching, to address the needs of the students. Similarly, Okoro (1993) observed that students' poor performances in tests and examinations may be due to the teaching methods adopted, as such careful assessment of teaching methods is required in order to avoid the adoption of ineffective ones. Ineffective teaching methods reduces students rate of learning as well as the extent to which the objectives of a programme are attained. Okoro further stressed that ineffective teaching may also be caused by lack of suitable tools, equipment and materials. However, excellence in teaching depend on the techniques employed by the teachers and the methods and materials of instruction used. These methods may include Demonstration, Simulation, Discussion, Conventional, Experiment, Field trips, Assignment and Project method (Daramola, 2008). Demonstration methods according to him is a teaching method which involves doing or describing for the students to see, hear and participate while lecture method is a teaching method in which the teacher supplies the needed information to the students.

The teacher of AEW in a similar perspective is to exhibit high performance through having sufficient knowledge of the subject matter, be effective in the use of appropriate language of instruction and possessing quality skills in lesson preparation and classroom organization among others things. Technical teachers like teachers of Auto Electrical Works (AEW) perform certain activities, while teaching Auto Mechanic Trades (AMT) to students in technical colleges. Aliyu (1992) enumerated some of the activities performed by teachers as imparting skills, knowledge and attitudes of the subject matter, using various teaching methods to facilitate learning, carrying out administrative activities as guidance, provide career information, welfare to students, manage instructional materials, keep school records, asses students, provides progress report and inculcate right attitudes and values (Psycho-social aspects) to the students. Technical teachers train students to acquire skills, knowledge and attitudes in different discipline (Automobile Electrical Work inclusive). Performances of technical teachers toward

achieving this objective have an impact on students' outcome in AEW. Garba (2002) reported that the performance of AMT teachers is poor especially in maintenance of workshop equipment and assessment of students' work. In line with this, Tal and Garba (2006) posited that there is general inadequacy in terms of quantity and quality of AMT teachers with regards to enrolment, preparation and production. To attain these, there is the urgent need for enhancing the performance of AEW teachers for an effective instructional delivery. This research study is on Effects of three Teaching Methods on Students Achievement in Automobile Electrical Work (AEW), in technical colleges, in Yobe State of Nigeria.

Research Questions

The study sought to answer the following research questions.

1. What is the effect of Demonstration Method of Teaching on Students Achievement in Automobile Electrical Work, in Government Science and Technical Colleges of Yobe State?
2. What is the effect of Simulation Method of Teaching on Students Achievement in Automobile Electrical Work, in Government Science and Technical Colleges of Yobe State?
3. What is the effect of Project Method of Teaching on Students Achievement in Automobile Electrical Work, in Government Science and Technical Colleges of Yobe State?
4. What is the effect of Demonstration, Simulation and Project Method of Teaching on Students Achievement in Automobile Electrical Work, in Government Science and Technical Colleges of Yobe State?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

- Ho₁:** There is no significant difference in students' mean performance scores in Automobile Electrical Work when taught using demonstration and conventional method of teaching.
- Ho₂:** There is no significant difference in students' mean performance scores in Automobile Electrical Work when taught using simulation and conventional method of teaching.
- Ho₃:** There is no significant difference in students' mean performance scores in Automobile Electrical Work when taught using project and conventional method of teaching.
- Ho₄:** There is no significant difference in students' mean performance scores in Automobiles Electrical Work when taught using demonstration, simulation, project and conventional method of teaching.

MATERIALS AND METHODS

Research Design

A quasi-experimental design was used for the study due to great limitations in the school setting of obtaining a random sample (Charles, 1998).

G ₁	Y ₁₁	X	Y ₂₁
G ₂	Y ₁₂	X	Y ₂₂
G ₃	Y ₁₃	X	Y ₂₃
G ₄	Y ₁₄	-	Y ₂₄

Source (Sambo, 2005)

While,

- G₁ = Experimental group
- Y₁₁ = indicates the mean (performance of Experimental group) administered Before the experimental treatment.
- X = Indicates the experimental treatment administered to the experimental group after the pre-test, for a specific period.
- Y₂₁ = the mean performance of the experimental group on the post-test.
- G₂ = Experimental group
- Y₁₂ = indicates the mean (performance of Experimental group) Administered before the experimental treatment.
- X = indicates the experimental treatment administered to the group after the pre- test, for a specific period.
- Y₂₂ = the mean performance of the experimental group on the post-test.
- G₃ = Experimental group

Y_{13} = indicates the mean (performance of Experimental group) administered before the experimental treatment.

X = indicates the experimental treatment administered to the experimental group after the pre-test, for a specific period.

Y_{23} = the mean performance of the experimental group on the post-test.

G_4 = the control group

Y_{14} = the mean performance of the control group on a pre-test.

= No treatment.

Y_{24} = the mean performance of the control group on the post-test.

G_1 = Demonstration Method, G_2 = Simulation Method, G_3 = Project Method and

G_4 = No Treatment

Population of the Study

The population of the study was made up of 80 NTC II (Technical) students for the 2019/2020 academic session, majoring in Automobile Electrical Work in Yobe state Government Science and Technical Colleges. This is made up of four intact classes three in Government Science and Technical College Potiskum (GSTC). For Experimental group and the other one in Government Science and Technical College Damagum (GSTC), for control group. Each of the classes consists of 20 students used for the study. The entire population was used for the study, hence no sampling was used.

Experimental Procedure

Both groups were pre-tested with a 40 items multiple choice instrument in the first week to ascertain their entry behavior of the students (see appendix i). The experimental groups were taught Ignition, Battery, Starter and Alternator using demonstration, simulation and project methods of teaching. While the control group was taught the same concepts using conventional method of teaching by trained research assistant from each of the colleges under study. This research assistance is as well teachers of Automobile Electrical Work in their schools. This was allowing the students feel comfortable during the experiment, because new face during experiment may alter students' behaviour and consequently the results of the study. All the groups were taught twice per week as indicated in the school time table for eight weeks using Demonstration, Simulation and Project methods of teaching. The researcher breaks down the topics into small units.

A comprehensive lesson notes were presented to the students by the trained research assistants. The control groups were taught using conventional method of teaching in the same topics, the time allocated was the same with those in the experimental group. Finally, the students were post-tested after the lessons. During the test, the students were asked to select from the options a, b, c, and d. The correct options were obtained for all correct answers; one mark was awarded for each correct answer while zero was awarded for wrong answers. A total of 40 marks.

Instrument for Data Collection

The instrument for data collection was the Automobile Electrical Work Achievement Test Instrument (AEWATI). The questions were based on a National Board for Technical Education (NBTE) Syllabus for Auto Electrical Work Trades and the following topics were covered;

1. Battery system
2. Ignition system.
3. Alternator.
4. Starter.

The achievement test instruments include the following;

- i. A 10-item multiple choice post-test instruments based on battery system.
- ii. A 10-item multiple choice post-test instruments based on ignition system.
- iii. A 10-item multiple choice post-test instruments based on an Alternator
- iv. A 10-item multiple choice post-test instruments based on a starter

Method of Data Collection

Data for the study were collected through direct administration of the achievement test with the help of two trained research assistants one from each of the school. The results obtained from the achievement test were used for data analysis.

Method of Data Analysis

The Microsoft Excel was employed for analyzing the data. Mean achievement score were used to answer the research questions 1, 2 and 3 while Analysis of Variance (ANOVA) to answer hypothesis 4 only and Z-test were used to test the hypotheses 1,2 and 3 at, 0.05 level of significance. The null hypotheses was rejected when the z-calculated values is greater than the table value otherwise the null hypotheses will not be rejected for two-way Analysis of Variance.(ANOVA) if the table value of F-ratio is greater than the calculated F-value the null hypotheses was accepted, otherwise the null hypothesis will be rejected (Uzoagulu, 2012).

RESULTS AND DISCUSSIONS

The presentation was made in line with the research questions and hypotheses of the study, the data collected for research questions 1, 2, and 3 were analyzed using mean, while hypothesis 1, 2, 3 and 4 were tested using Z-test and ANOVA. The results of the study are presented in tables, based on the research questions and hypotheses.

Research Question 1

What is the effect of Demonstration Method of Teaching on Students Achievement in Auto Electrical Work, in Government Science and Technical Colleges of Yobe State?

The data presented in table 1 shows the post-test results to answer research question one. The information presented indicates that the Demonstration group had a mean achievement score of 57.88 and 46.88 for the Conventional group.

Research Question 2

What is the effect of Simulation Method of Teaching on Students Achievement in Auto Electrical Work, in Government Science and Technical Colleges of Yobe State?

The data presented in table 2 shows the post-test results to answer research question two. The information presented indicates that the simulation group had a mean achievement score of 50.08 and 46.88 for the Conventional group.

Research Question 3

What is the effect of Project Method of Teaching on Students Achievement in Auto Electrical Work, in Government Science and Technical Colleges of Yobe State?

The data presented in table 3 shows the post-test results to answer research question three. The information presented indicates that the project group had a mean achievement score of 48.13 and 46.88 for the Conventional group.

Table 1: Post-Test Mean Achievement Scores of students when taught using Demonstration and Conventional Method of Teaching

Demonstration method

S/N	Items	Demon(%)	Conv. (%)	Performance
1		60	23	37
2		58	30	28
3		53	28	25
4		70	20	50
5		55	33	22
6		45	38	7
7		73	35	38
8		65	43	22
9		63	48	15
10		43	45	-2
11		68	50	18
12		48	40	8
13		50	45	5
14		53	48	5
15		45	53	-8
16		48	50	-2
17		65	55	10
18		53	60	-7
19		60	65	-5
20		50	58	-8
21		58	68	-10
22		65	63	2
23		75	40	35
24		75	38	37
25		45	50	-5
26		63	48	15
27		53	58	-5
28		60	55	5
29		58	45	13
30		53	48	5
31		48	53	-5
32		45	43	2
33		53	45	8
34		60	50	10
35		50	65	-15
36		48	58	-10
37		70	45	25
38		64	48	16
39		69	53	16
40		78	35	43
Average		57.875	46.875	11

Table 2: Post-test Mean Achievement Scores of students when taught using Simulation and Conventional Method of Teaching

S/n	Items	Conv. (%)	Simul.(%)	Performance
1		23	48	25
2		30	45	15
3		28	43	15
4		20	38	18
5		33	50	17
6		38	48	10
7		35	53	18
8		43	60	17
9		48	58	10
10		45	63	18
11		50	68	18
12		40	45	5
13		45	43	-2
14		48	45	-3
15		53	48	-5
16		50	53	3
17		55	48	-7
18		60	58	-2
19		65	40	-25
20		58	43	-15
21		68	53	-15
22		63	73	10
23		40	70	30
24		38	58	20
25		50	38	-12
26		48	43	-5
27		58	45	-13
28		55	53	-2
29		45	63	18
30		48	55	7
31		53	48	-5
32		43	45	2
33		45	50	5
34		50	43	-7
35		65	45	-20
36		58	40	-18
37		45	38	-7
38		48	50	2
39		53	53	0
40		35	43	8
Average		46.875	50.075	3.2

Table 3: Post-test Mean Achievement Scores of students when taught using Project and Conventional Method of Teaching

S/n	Items	Conv. (%)	Project (%)	Performance
1		23	45	22
2		30	50	20
3		28	43	15
4		20	40	20
5		33	48	15
6		38	38	0
7		35	48	13
8		43	53	10
9		48	58	10
10		45	68	23
11		50	73	23
12		40	63	23
13		45	60	15
14		48	50	2
15		53	38	-15
16		50	43	-7
17		55	53	-2
18		60	60	0
19		65	68	3
20		58	55	-3
21		68	45	-23
22		63	48	-15
23		40	23	-17
24		38	40	2
25		50	43	-7
26		48	35	-13
27		58	38	-20
28		55	40	-15
29		45	48	3
30		48	45	-3
31		53	53	0
32		43	50	7
33		45	48	3
34		50	45	-5
35		65	38	-27
36		58	45	-13
37		45	42	-3
38		48	45	-3
39		53	55	2
40		35	45	10
Average		46.875	48.125	1.25

Hypothesis 1: There is no significant difference in students' mean achievement scores in Automobile Electrical Work when taught using Demonstration and Conventional Methods of Teaching.

Table 4: Z-test analysis on Post-test Experimental and Control group on students' achievement in the study.

Method of Teaching	N	\bar{X}	VAR	Z-cal	Z-crit	Decision
Demonstration	20	57.88	92.60			
				4.71	1.96	Rejected
Conventional	20	46.88	125.80			

Table 4 shows the summary of data collected to test hypothesis 1 using Z-test statistics. The analysis showed a Z-calculated value of 4.71 which is greater than the Z- critical value of 1.96. Since the Z-calculated value is greater than the Z-critical value, the null hypothesis is rejected. This indicates that there is a significant difference in students' means achievement scores in Automobile Electrical Work when taught using demonstration methods of teaching.

Hypothesis 2: There is no significant difference in students' mean achievement scores in Automobile Electrical Work when taught using Simulation and Conventional Method of Teaching.

Table 5 shows the summary of data collected to test hypothesis 2 using Z-test statistics. The analysis retrieved a Z-calculated value of -1.42 which is less than the Z- critical value of 1.96. Since the Z-calculated value is less than the Z-critical value, the null hypothesis is therefore accepted. This shows that there is no significant differences in students' mean achievement scores in Auto Electrical Work when taught using Simulation method of teaching.

Table 5: Z-test analysis on Post-test Experimental and Control group on students' achievement in the study.

Method of Teaching	N	\bar{X}	VAR	z-cal	z-crit	Decision
Simulation	20	50.08	78.20			
				-1.42	1.96	Accepted
Conventional	20	46.88	125.80			

Hypothesis 3: There is no significant difference in students' mean achievement scores in Automobile Electrical Work when taught using Project and Conventional method of teaching.

Table 6 shows the summary of data collected to test hypothesis 3 using Z-test statistics. The analysis retrieved a Z-calculated value of -0.53 which is less than the Z- critical value of 1.96. Since the Z-calculated value is less than the Z-critical value, the null hypothesis is therefore accepted. This shows that there is no significant difference in students' mean achievement scores in Automobile Electrical Work when taught Project methods of teaching.

Table 6: Z-test analysis on Post-test Experimental and Control group on students' achievement in the study

Method of Teaching	N	\bar{X}	VAR	z-cal	z- crit	Decision
Project	20	48.13	97.00			
				-0.53	1.96	Accepted
Conventional	20	46.88	125.80			

Hypothesis 4

There is no significant difference in students mean achievement scores in Auto Electrical Work when taught using demonstration, simulation, project and conventional method of teaching.

Table 7 shows the summary of the data collected from the experiment to test hypothesis 4 using the students' ANOVA statistics. Testing this data at 0.05 level of significance, the summary of the analysis presented in table 8 shows that the analysis returned a f-value of 11.93 with critical f-value of 3.07. This indicates that there is no significance difference in the post-test performance of the three groups for this study. The null hypothesis states that, there is no significant difference in student's achievement in Automobile Electrical Work when taught using demonstration, simulation, project and

conventional methods of teaching in the two study group is rejected. These results provide a sound bases for studying the effect of three methods of teaching on the two groups of students.

Table 7: ANOVA Result Comparing the Students' Mean Performance Scores in Experimental and Control Group in the Study

Source of Variation	SS	Df	MS	F	F crit	Remark
Between Groups	2129.40	2.00	1064.70	11.93	3.07	
Within Groups	10443.53	117.00	89.26			Rejected
Total	12572.93	119.00				

Findings

The results of the study have revealed the following findings:

1. The learning achievement of students' taught using demonstration method of teaching was high with a mean scores of 57.88 when compared with mean score of 46.88 when taught using conventional method.
2. The learning achievement of students' taught using simulation method of teaching in Automobile Electrical Work mean score was 50.08 while that of conventional method of teaching was 46.88 mean scores.
3. The project group has a mean achievement of 48.13 while conventional group has a mean achievement scores of 46.88.
4. There was significant difference in students' achievement in Auto Electrical Work when taught using demonstration and conventional methods of teaching. The finding revealed that the null hypothesis was rejected. Because Z-calculated (4.71) was greater than Z-critical (1.96)
5. There was no significant difference in the students' achievement in Auto Electrical Work when taught using simulation and conventional methods of teaching. The finding revealed that the null hypothesis was accepted. Because the Z-calculated (-1.42) is less than the Z-critical of (1.96).
6. There was no significant difference in the student's achievement in Auto Electrical Work when taught using project and conventional methods of teaching. The finding revealed that the null hypothesis was accepted. Because the Z-calculated (-0.53) is less than the Z-critical of (1.96).
7. There is no significance difference in the post-test performance of the three groups for this study. The null hypothesis states that, there is no significant difference in students' achievement in Auto Electrical Work when taught using demonstration, simulation, project and conventional methods of teaching in the two study group was rejected. Since f-value (11.93) is more than the critical f-value (3.07.)

CONCLUSIONS

The study investigated the effectiveness of three teaching methods - demonstration, simulation, project methods used in teaching automobile electrical work in Government Science and Technical College Potiskum and Damagum of Yobe State. Based on the findings of this study, it was concluded that demonstration method of teaching as a supplement to conventional method of teaching can greatly improve students' academic performance in automobile electrical work concept.

Simulation and project method of teaching helps learners to understand and retain what they have learned. Similarly in project method of teaching students have occasion to define the problem, plan his work, find appropriate resources, carryout his plan and draw conclusion. Project method of teaching is a means of teaching the students self-disciplines. Based on the finding the academic performance of students as discovered in this study a significantly different achievement levels for the experimental group as against those taught through the conventional teaching method..

RECOMMENDATIONS

Based on the findings of this study and their implications, the followings recommendations were made;

1. The use of demonstration method of teaching should be made mandatory in all technical colleges to catalyze learners' interest and motivation. This will surely improve the students' academic achievement in automobile electrical work.

2. The technical college should acquire the necessary information and encourage the teachers to adopt the use of simulation method of teaching in Automobile Electrical work.
3. There is the need to encourage teachers to attend seminars and workshop on the use of project method of teaching, for teaching and learning. This will help them in updating their knowledge.
4. Technical college authorities should allocate adequate time in the timetable for workshop practical work to enable students gain more skills and competencies, especially in Automobile Electrical Work.
5. Technical teachers should always teach using demonstration method because it allows for skillful performance, teachers should avoid chalk-talk syndrome but to inculcate the spirit of “doing than saying”.

required to teach the demonstration lesson were inadequate, as a result, the researcher had to sources for them from the market, and this made work to be capital intensive. A simulation includes time for reflection and processing which allows students to share their experiences, assess their learning and evaluate their assessments against the intended outcomes of the simulation.

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