# Effect of Blended Learning Method on Students' Academic Achievement in alternating current Machines in Technical Colleges in Rivers State

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**Abstract:** *The study investigated the effect of blended learning method on students' academic achievement in alternating current machines in technical colleges in Rivers State. A quasi-experimental design was adopted in the study. The population of the study consisted of 295 electrical students from the government technical colleges in Rivers Sate. A sample size of 87 electrical students drawn from two intact classes of National Technical Certificate for the study. Purposive sampling was used to draw one technical college from the four government technical colleges in Rivers State. The selected college was Government Technical College Ahoada. Two research questions were answered and Two hypotheses were tested at .05 level of significance. The instrument for the study was a self-structured "Alternating Current Machine Achievement Test.'' The instrument was face and content validated by three research experts. The reliability of the instrument was established through a test-retest reliability method and Pearson Product Moment Correlation Coefficient was used to correlate the scores of the two tests. The reliability coefficient achieved was 0.96. Mean statistics was used to answer the research questions, while t-test was used to test the null hypotheses at .05 level of significance. The findings shows that students taught with the blended learning method achieved higher mean scores than those taught with traditional lecture method and the difference in the mean scores were statistically significant at .05 level of significance. Based on the findings, it was recommended among others that teachers of electrical machines and other technical subjects should adopt blended learning approach in the delivery of their lessons. Implications of the results and suggestions for further studies were made.*

*Keywords: Blended learning, Alternating current machine, Academic Performance, Technical College*

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## Introduction

In Nigeria, technical colleges are institutions responsible for training individual in technical and vocational skill. According to Sanni (2015), technical and vocational education is an integral part of the total educational process which contributes towards the development of good citizenry by developing the physical, social, civic, cultural and economic competencies of individuals. The National Board for Technical Education (NBTE) is responsible for accrediting and supervising academic programs run by technical colleges. The National Business and Technical Examinations Board (NABTEB) is responsible for

the examination and certification of the occupational trades leading to the award of National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC). The trades offered in the technical colleges in Nigeria according to NBTE (2015), include the following, building, beauty, culture, computer craft practice, electrical installation and repairs, wood work, printing work, textile work, hospitality and mechanical works.

According to Okoro (2014) technical colleges are principal vocational institutions in Nigeria which are established to prepare individuals to acquire practical skills, knowledge and attitude required of technicians at sub-professional level. Oweis (2018), observed that this current era is characterized by rapid changes resulting from scientific and technological advances, including information technology. He stated that some of this changes are, large volume of information to be processed by learners, increase in the number of learners and shortage of teachers, he suggested that the traditional method of learning is no longer effective so active learning method were learning is student-centered, such as e-learning, blended learning has to be introduced.

Traditional lecture has been around for decades, and have become outdated, the teachers speaks and the student throughout the class listen whether they understand or not, the lecture tend to bore students and have them wonder-off or day dream because there is no activity going on, they just sit and listen

but active learning is student centered, it is an open setting where students feel the freedom to express what they know and what they want to know more about. Active learning method such as blended learning is helping to unshackle school from the one teacher one classroom model and usher in more creative and diverse instructional approaches, beyond just restructuring the classroom, blended learning models are starting to open up new connections and diversify student's networks. This has a huge potential to address not just academic achievement gaps but opportunity gaps, blended learning has the ability on multiplying the sources of content and experiences student turn to including adults and experts beyond the four walls of the classroom.

Umoh and Akpan (2014) argued that traditional method of teaching where the lecturer stands before the students and delivered his lecture while students listen, take notes and remain passive throughout the teaching and learning process is a teacher-centered approach. They stressed that in teacher- center approach the teacher dominates the class and students accept what the teacher says without contributing to the lecture. They pointed out that in a classroom situation, students differ in terms of intellectual ideas and perception; stating that some learn and understand more quickly and easily than others but these facts were not taken into consideration in traditional method of teaching. Amaso, Ahmad, Odundele and Olourotimi (2012) stated that traditional method of teaching alone may

not be suitable for individual requirements thus, there is need for modern technology to cater for difference in learning styles. These could include: mobile learning, flipped classroom, e-learning, blended learning, among others.

Poon (2013) opines that Blended Learning is the interaction of teachers with students, and audio-visual illustration or internet to improve the educational process. Blended learning program combines face-to-face practical hands-on classroom sessions with theoretical activities in an online setting. The students attend on-site classes to complete the hands-on aspects of their trade skills (carpentry, welding, masonry, and engineering) while also completing online asynchronous learning activities (Marshall 2018). In the words of Garrison and Kanuka (2015), blended learning is a term that explains the various attempts made by teachers to incorporate the element of technology into the traditional classroom setting, because of the efficiency this arrangement brings. Charles (2015) was of the view that blended learning is a formal education program in which students learns: at least in part through online learning, with some element of student control over time, place, path or pace, at least in part in a supervised brick-and-mortar location away from home; and the modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience. In the same vein, Norm (2012) defined blended learning as a formal education program in which students learn at least

in part through delivery of content and instruction via digital and online media with some element of students control over time, place, path, or pace. Blended learning can also be referred to an approach of learning which allows creation of suitable environment for students to achieve their objective more easily in an improved educational environment by applying modern technologies in various classroom environment. In the words of Heinze (2010) blended learning is the making of face-to-face teaching and online learning. Thorne (2013), described blended learning as "a way of meeting the challenges of tailoring learning and development to the needs of individuals by integrating innovative and technological advances offered by online learning with the interaction and participation offered in the best of traditional learning". Graham (2013) defined blended learning as learning systems that combine face-to-face instruction with computer mediated instruction. Poon (2013), was of the opinion that if BL is properly implemented, it is a promising alternative learning approach compared to the traditional and e-learning approach, and can improve student academic achievement.

Crow and Crow (2011), defined academic achievement as the extent to which a learner is profiting from instructions in the given area of learning ie achievement is reflected by the level to which skill and knowledge has been imparted to the learner They went on to explain that academic achievement also indicates the knowledge attained

and skill developed in the school subject, generally designated by test scores. Tebabal and Kahssay (2011) were of the opinion that academic achievement represents performance outcome that indicate the extent to which a person has accomplished specific goals that were the focused on activities in a learning environment, specifically in school, college, and university. Peter, James and Kpolovie (2012), suggested that academic achievement of student is the ability of the student to study and remember facts and being able to communicate his knowledge orally or in written form even in an examination condition. They were of the view that the factors that influence students' academic achievement include students' attitude towards school, interest in learning, study habit, intelligence, motivation, and more especially teaching method etc. Since students' academic achievement depends on a number of variables, Simpson and Weiner in Udoh (2012) noted that academic achievement could be enhanced through identifying and manipulating each of such variables. Otobo (2012) stated that of all the strategies used in teaching science and technology, the blended learning method tends to attract most student's attention which leads to a better academic achievement in alternating current machine.

Alternating current machine is an electrical machine that functions as a generator used to produce alternating current (ac generator) or a motor that converts electrical energy into mechanical work (ac motor). Thomas (2017) noted

that an AC electrical machine design is a key skill set for developing competitive electric motor and generators for application in industry, aerospace and defense. Philip (2008) noted that an AC generator converts mechanical energy into alternating current electricity. Because power transferred into the field circuit is more than power transferred into the armature circuit, he stated that the AC generator can be classified into the induction generator and the synchronous generator. And that AC motor convers alternating current into mechanical energy it is made up of the asynchronous motor and the synchronous motor.

**Statement of the problem**

Technical colleges electrical graduates are trained to become technicians, which qualifies them for jobs in both public and private sectors of the economy. As technicians they should be able to set up their private workshop or gain employment in the industries. (Okoro 2014). Ogwo and Oranu (2014) observed that generally, graduates of technical colleges lack the necessary practical skills to either setup their private workshops or gain employment in the industries. Amen (2014) observed that the low level of achievement has been attributed to certain factors, such as inadequate qualified electrical teachers, lack of students' interest, non-exposure to field trip, non-inclusion of technical college students in Students Industrial Work Experience Scheme (SIWES) and above all, poor method of delivering lessons. Therefore, in order to seek for a better alternative

instructional strategy, this study attempts to investigate the effect of blended learning method on students' academic achievement in AC machines in technical colleges in Rivers State.

**Purpose of the Study**

The purpose of the study is to investigate the effect of blended learning method on students' academic achievement in alternating current machines in technical colleges in Rivers State. Specifically, the study seeks to:

1. Determine the effect of blended learning method on students' achievement when taught A.C generators.

2. Determine the effect of blended learning method on students' achievement when taught A.C motors.

**1.4    Research Questions**

The following research questions were raised to guide the study.

1. What is the effect of blended learning on student's academic achievement when taught AC generators?

2. What is the effect of blended learning on students' academic achievement when taught AC motors?

**Hypotheses**

The following null hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant difference in the achievement of students taught AC generators using blended learning and those taught using traditional lecture method.

2. There is no significant difference in the achievement of students taught AC motors using blended learning and those taught using traditional lecture method.

**I.    Methodology**

The research design for the study is nonequivalent quasi-experimental. This study was carried out in Rivers State The population of the study consisted of all the 295 students in the Department of Electrical Technology from the four Technical Colleges in Rivers State, namely; Government Technical Colleges; Port Harcourt, Tombia, Ahoada and Ele-Ogu (Rivers State Ministry of Education, 2019). A total of 87 Electrical Technology year two students from Government Technical College Ahoada was purposively selected as sample for the study because it's the most populated technical college in Rivers State.

The National Technical College II class in Government Technical College Ahoda consists of two arms (NTC II$^A$ and NTC II$^B$) the both arms were used as intact classes for the study. NTC II$^A$ consist of 50 students and NTC II$^B$ consist of 37 students which were used as experimental and control group respectively.

The research instrument is a forty-item multiple-choice type of teacher made achievement test titled Alternating Current Machine Achievement Test (ACMAT). Then the content appropriateness was face and content validated by the experts. The reliability of the instrument was determined using test-retest method. Pearson Product Moment

Correlation Coefficient was used for computation. Copies of the instrument were administered to 25 Electrical Technology students of Government Technical College, Port Harcourt which was randomly selected by the researcher because of its proximity to the researcher. The coefficient of the reliability obtained for equivalent test was 0.96 which was high enough to permit the use of the instrument for the study (Wali, 2013).

The control and experimental group were taught differently within three weeks. This was broken into three lesson period of forty minutes a week, which summed up to a total of nine periods. AC generator was taught in the first four periods while AC motors was taught in the other four periods and the last was used for revision. The experimental group was taught with blended learning (that is they were taught with videos and also given website, YouTube channels and other multimedia content to access the contents of the topic with their phones and laptops for better understanding) while the control group was taught using the traditional lecture method.

The pretest consisted of 40 items which was administered to the two groups of students which established the pretest mean. There after the experimental group was taught with blended learning while the control group was taught using the traditional lecture method then the post-test which consisted of 40 test items was administered to the two groups in order to determine any difference in the performance of students taught with blended learning method and those taught with the traditional lecture method.

The data generated from the research questions of this study was analyzed using mean. The pretest mean scores compared with the posttest mean scores in respect to those taught with blended learning method and those taught with the traditional lecture method. The t-test statistics was used to test hypotheses at 0.05 level of significance. According to Uzoagulu (2011), t-test is a statistics tool used to test hypothesis about the difference between means of two groups, essentially it is used to determine whether two means are significantly difference at a chosen level of significance.

Decision: if t-calculated (t-cal) is less than the t-critical (t-crit), $H_0$ should be accepted. On the other hand, if t-calculated (t-cal), is greater than or equal t-critical (t-crit), $H_0$ should be rejected. Guided by this statistical rule, decisions were taken in respect of the hypotheses tested in the course of this study.

## II.    Result

### Research Question 1

What is the effect of blended learning on students' academic achievement when taught AC generator?

**Table 1 Mean score of Students' Academic Achievement in AC Generator**

| Groups | Pre-Test (N) | Post-Test (N) | Pre-Test Mean $\left(\overline{X_1}\right)$ | Post-Test Mean $\left(\overline{X_2}\right)$ | Mean Gain |
|---|---|---|---|---|---|
| Experimental Group | 50 | 50 | 9.70 | 36.24 | **26.54** |
| Control Group | 37 | 37 | 10.21 | 25.02 | **14.81** |
| **Mean difference (Between)** | | | **-0.51** | **11.22** | **11.73** |

**Source:** *Researcher's Field Result, 2021*
(Note: N = Sample Size)

The result from Table 1 revealed that the experimental group with a class size of 50 has a pre-test mean ($M_1$) scores of 9.70 and a post-test mean ($M_2$) scores of 36.24, this gives a mean gain of 26.54. Also, the control group with a class size of 37 has a pre-test mean ($M_1$) score of 10.21 and a post-test mean ($M_2$) scores of 25.02. This gives a mean gain of 14.81. This implies that the control group performs better than the experimental group at the pre-test stage with a mean difference of 0.51. On the other hand, the experimental group performs better than the control group at the post-test level with a mean difference of 11.22.

**Research Question 2:** What is the effect of blended learning on students' academic achievement when taught AC motors?

**Table 2: Mean Score of Students Academic Achievement in AC Motor**

| Groups | Pre-Test (N) | Post-Test (N) | Pre-Test Mean $\left(\overline{X_1}\right)$ | Post-Test Mean $\left(\overline{X_2}\right)$ | Mean Gain |
|---|---|---|---|---|---|
| Experimental Group | 50 | 50 | 11.68 | 36.64 | **24.96** |
| Control Group | 37 | 37 | 9.95 | 24.81 | **14.86** |
| **Mean difference (Between)** | | | **1.73** | **11.83** | **10.10** |

**Source:** *Researcher's Field Result, 2021*
(Note: N = Sample Size)

The result from Table 2 revealed that the experimental group with a class size of 50 has a pre-test mean ($M_1$) scores of 11.68 and a post-test mean ($M_2$) scores of 36.64. This gives a mean gain of 24.96 Also, the control group with a class size of 37 has a pre-test mean ($M_1$) score of 9.95 and a post-test mean ($M_2$) scores of 24.81. This gives a mean gain of 14.86. This implies that the experimental group performs better than the control group at the pre-test stage with a mean difference of 1.73. Also, the experimental group performs better than the

control group at the post-test level with a mean difference of 11.83.

Hypothesis 1: There is no significant difference in the achievement of students taught AC generator using blended learning or lecture method

**Table 3: t- test for scores in AC generators**

| Groups | N | Mean $\bar{X}$ | SD | DF | T cal | T cri | Decision |
|---|---|---|---|---|---|---|---|
| Experimental group | 50 | 36.24 | 2.91 | 85 | 10.28 | 1.98 | Reject |
| Control group | 37 | 22.02 | 6.15 | | | | |

**Source:** *Researcher's Field Result, 2021*

Following the result in Table 3 t-calculated 10.28, t-critical 1.98. At 0.05 significant level, degree of freedom (df) is and 84.

With reference to the result above, t-calculated is greater than t-critical ($t_{cal} > t_{crit}$) hence, the null hypothesis is rejected. This shows that there exists a significant difference in the mean score of

academic achievement between student's taught AC generator with blended learning method of instruction and those taught using the traditional lecture approach.

**Hypothesis 2**

There is no significant difference in the achievement of students taught AC motor using blended learning or lecture method

**Table 4 t – test for scores AC motors**

| Groups | N | Mean $\bar{X}$ | SD | DF | T cal | T cri | Decision |
|---|---|---|---|---|---|---|---|
| Experimental | 50 | 36.64 | 2.18 | 85 | 13.22 | 1.98 | Reject |
| Control | 37 | 24.81 | 5.11 | | | | |

**Source:** *Researcher's Field Result, 2021*

From the result in Table 4 t-calculated is 13.22, t-critical 1.98.

At 0.05 significant level, degree of freedom (df) is 85. In reference to the result above t-calculated is greater than t-critical ($t_{cal} > t_{crit}$) hence, the null hypothesis rejected. This shows that there is a significant difference between the mean score achievements of students taught AC motors with blended learning method of instruction and those taught with the traditional lecture method.

**Discussion of findings**

**Effect of blended learning on Students' Academic Achievement when AC generator with the method with the Method**

On the issue of AC generator, the result indicated that students in the traditional lecture method group did better than the blended learning group with pre-test mean of 9.70 and 10.21 respectively but the blended learning group did better than the traditional lecture group in the post test with a mean of 36.24 and 25.02 respectively. On the other hand, the findings showed a significant difference between students taught with the blended learning

method and those exposed to the conventional lecture method on ac generator. The result agrees with Mona (2015) who stated in his that there is a better learning outcome for students who learnt using blended learning compared to the learning outcome of those who learnt by traditional approach.it also agrees with Ibrahim and Mehmet (2014) who in their study analyzes students' academic performance by comparing the blended learning environment and traditional learning environment and found that the final test grades, the experiment group using the blended learning has been found more successful than the control group using the traditional environment. Obiedat, Nasir, Harfoushi, Koury, ALHamarsheh, and AlAssaf (2014 ), agrees with this result when they evaluated the effectiveness of blended learning on the academic achievement of students in the University of Jordan and reported that there is a significant and positive impact of blended learning on academic achievement of the students in university of Jordan. Blended learning is a problem-solving approach of instruction which is meant for self-development and sustainability. It enables the learners to identify an objective, plan for its actualization with the guidance of the teacher.

**Effect of blended learning on Students' Academic Achievement when Taught AC motors System with the Method**

On the Ac motor, the analysis of the result showed that the blended learning method group performed better than the traditional lecture method group

with pre-test mean score of 11.68 and 9.94 as well as post-test mean score of 36.64 and 24.81 respectively. The finding showed a significant difference in the academic achievement of students taught with blended learning method and those exposed to the traditional lecture method on AC motor. This result agrees with Wel, shl, and Harrison (2017) who suggested that the blended learning can improve students' learning achievements effectively, and Khader (2016) who stated that blended learning had the potential to improve students' achievements on exams when compared to a traditional classroom model. blended learning provides learners with greater opportunities to comprehend and extend the knowledge presented and produces a stronger sense of community among students than either traditional or fully on-line courses. Blended learning has potential to be transformative by offering the "best-of-both-worlds." That is, by incorporating the ubiquity of online learning approaches with the best active learning that traditional face-to-face education affords, students would be more engaged in learning and retaining new knowledge.

## III. Conclusion

Based on the findings from the study, blended learning has proved to have a significant effect on student academic performance, as academic performance of students taught AC machine with blended learning was better than their counterpart taught with traditional lecture method. Student

remain passive during traditional learning all they do is listen and copy down facts while in blended learning student are active during the learning process, they find out facts for themselves and enjoy the luxury to learn at their own pace, place and time with improved technology, this help them learn better.

### Recommendations

1. Parents should ensure they provide students with materials to enable them access online and

multimedia materials such as laptops and tablets.

2. Teachers of electrical technology should point students to online and multimedia materials that will aid their learning process

3. The government of Rivers State should provide constant power supply in the state and also provide free internet services at designated points in the state especially around the school environment this will enhance students access to online information

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