

# Adapting to E-Learning Teaching during Covid-19 School Closure: It's Effect on Physics Students' Achievement

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**Abstract:** The sudden outbreak of coronavirus disease also known as COVID-19 in the world has become a major public health issues for many countries leading to total lockdown of most of the human activities in various parts of the world especially in Nigeria educational sector. This lockdown of educational activities in the country necessitated the investigation of effect e-learning teaching on students' achievement in Physics during covid-19 school closure. The study employed quasi experimental design of pretest posttest non-equivalent control design. The population of the study consist of 3264 Senior Secondary Two (SSII) Physics students in Awka education zone of Anambra State, Nigeria. Sample size of 332 SS2 Physics students were used for the study. A 40-item Physics Achievement Test developed by the researchers was used for the study. Face and content validation of the instrument was established. Reliability coefficient of .89 was obtained for the instrument using Kuder-Richardson (KR-20) 20. Data obtained were analyzed using means and standard deviations in answering all the research questions while analysis of covariance (ANCOVA) was used to test the formulated hypotheses at 0.05 level of significance. Findings of the study revealed that; students exposed to e-learning teaching had higher mean achievement scores compared to students exposed to conventional method; there was no significant difference in the mean achievement score of male and female students in Physics.

**Keyword:** E-learning, Covid-19, Physics and Achievement

## I. INTRODUCTION

Precisely, on Monday March 23<sup>rd</sup> 2020, many students in Nigeria received no education after schools were closed due to corona virus diseases outbreak. The ripple effect of coronavirus according to Adeoye, Adanikin, Adanikin (2020) has been felt by both the educators and students in primary, secondary, colleges and universities as academic sessions were disrupted after the coronavirus was declare a public health emergency. The pandemic have resulted in temporarily closure of all educational institutions in an attempt to contain the spread of the virus. Meanwhile, before the outbreak of corona virus especially in Nigeria, the use of digital content in education worldwide was relatively uncommon. If the virus therefore continues, it might change education from face to face classroom interaction to e-learning teaching (Shahzad, Hassan, Aremu, Hussain & Lodhi, 2020). The COVID-19 outbreak witnessed has opened up the importance and the need for an online and distance learning in Nigeria. This may

be the reason why Lawal, Haruna, Kurfi and David (2020) opined that COVID-19 pandemic has opened up opportunities for an upgrade in the educational mode of delivery and the need to embrace emerging technologies.

It is therefore no doubt that electronic learning (e-learning) is gradually changing the educational scenario rapidly especially in developing countries like Nigeria. The term e-learning can be seen as the use of any electronic technology to aid in the acquisition and development of knowledge and understanding in order to demonstrate and positively influence students' behavior. Musawi (2011) sees e-learning as a delivery method that combines a variety of non-traditional instructional techniques, tools, and approaches to design, develop, manage and evaluate the learning process. To Comerchero (2006), e-learning is a flexible term used to describe means of teaching through technology.

Teaching through e-learning can be conducted solely through on-line applications with elements of web interaction or in addition with the traditional approach in order to help teachers gain experience and improve their understanding in any given subject like Physics. According to Mohamad (2014), e-learning is used to provide instructional programmes to students who are separated by distance and from the instructors or teachers. In e-learning system, students have the opportunity to interact anytime from wherever with different instructional materials such as text, sound, pictures, video among others through the internet (Al-Ammari & Hamad as cited in Kumar & Bajpai). In view of this, Kumar and Bajpai (2015) posit that students in e-learning environment can communicate with their teachers and classmates individually and as a group discussion with the use of message boards, instant message exchanges and video conferencing. This is in line of the view of Weaver, as cited in Mohamad (2014) that students by nature are 'social learners' who usually prefer to learn in groups and interact with their peers. In view of these numerous advantages of e-learning teaching, there is need to investigate its effect on students' achievement in physics as an alternate to teaching during pandemic periods.

### Research Questions

The following research questions were posed to guide the study;

1. What is the effect of e-learning teaching approach on students' achievement in Physics?
2. What is the influence of gender on students' achievement in Physics?

### Hypotheses

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

1. There is no significant difference in the mean achievement scores of students taught Physics using e-learning teaching approach and those taught with conventional (lecture) method.
2. There is no significant difference in the mean achievement scores of male and female students in Physics.

## II. METHOD

The study employed quasi-experimental research design. Specifically, pre-test post-test nonequivalent control group design was used for the study. According to Nworgu (2015), quasi-experimental research design is an experiment where random assignment of subjects to both experimental and control group is not possible.

The study was conducted in Awka education zone of Anambra State with population of 3264 SS2 Physics students. Sample size of 332 SS2 Physics students in Awka education zone was used. The sample was determined through multistage sampling procedure.

Physics Achievement Test (PAT) developed by the researchers was used for data collection. The instrument consists of 50 multiple choice questions each with 4 options (A-D) from which the students is expected to choose the answer that best answered the question. One mark was given for each correct responses and zero for incorrect responses.

To ensure face validity of the instrument, the instrument was given to three experts in Department of Science Education (one in Measurement and Evaluation unit and two in Physics Education unit) all in Faculty of Education, University of Nigeria, Nsukka. The experts were requested to examine the instrument with respect to: the structure and clarity of the questions; whether the answers to the questions tally with the ones in the marking and whether the questions correspond to the table of specifications. To ensure content validity of the instrument, a table of specification also known as test blueprint based on the six levels of cognitive domain of Bloom's taxonomy of education was used in the construction of the instrument.

The reliability of the instrument was administered by administering twenty five (25) copies of the instrument to 25 SSII Physics students in Awka education zone of Anambra State who are not part of the sampled school for the study. The students' responses were subjected to Kuder-Richardson 20 (KR-20) since the instrument was polytomously scored and reliability coefficient of .89 was obtained.

During the experimental procedure, simple random sampling technique was used to assign the groups into treatment and control group. Students in the experimental group were taught using e-learning teaching approach method while those in the control group were taught using conventional (lecture) method. Before the commencement of the treatment, pretest was administered to the two groups. After the administration of the pretest, students in the control group were taught using lesson note prepared basically on the use of lecture method while, students exposed to e-learning teaching method were taught basically using e-learning teaching which was designed for the study. At the end of fourth week of treatment, the post test was administered to the two groups.

In controlling the extraneous variables, the researchers adopted the following measures to ensure the control of the extraneous variables. These measures include; inter-group variable, effects of pretest and posttest, control of teacher variables.

Data obtained was analyzed using mean and standard deviation in answering all the research questions while Analysis of Covariance (ANCOVA) was used to test the formulated null hypotheses at .05 level of significance.

## III. RESULTS

### Research Question One

What is the effect of e-learning teaching approach on students' achievement in Physics?

*Table 1:* Mean and standard deviation of students' achievement in Physics when exposed e-learning teaching approach and those not exposed

Groups	n	Pretest		Posttest		Gain Scores	Gain Scores Difference
		Mean	S.D	Mean	S.D		
Experimental Group	163	19.56	4.45	30.01	7.29	10.45	7.31
Control Group	169	19.19	4.91	22.33	5.18	3.14	

Result in Table 1 revealed the mean achievement scores of students exposed to e-learning teaching approach (experimental) and control groups. From the Table, it was revealed that the mean achievement scores of 19.56 and 19.19 with standard deviation of 4.45 and 4.91 were recorded for experimental and control groups respectively at the pre-test. However, at the post-test, mean scores of 30.01 and 22.33 with standard deviation of 7.29 and 5.18 were recorded for experimental and control groups respectively. Moreover, mean gain score difference of 7.31 was recorded from the two groups. The result indicated that e-learning teaching approach

is more effective compared to conventional (lecture) method in enhancing academic achievement of students in Physics.

### Research Question Two

What is the influence of gender on students' achievement in Physics?

Table 2: Mean and standard deviation of male and female students' achievement in Physics

Gender	N	Pretest		Posttest		Gain Scores	Gain Scores Difference
		Mean	SD	Mean	SD		
Male	151	19.92	5.00	26.40	7.73	6.48	.54
Female	181	18.92	4.36	25.94	7.11	7.02	

Result in Table 2 shows that at the pre-test, male students obtained a mean achievement score of 19.92 with a standard deviation of 5.00 while their female counterpart had a mean achievement score of 18.92 and standard deviation of 4.36. At the post-test, male students had a mean score of 26.40 and standard deviation of 7.73 while their female counterpart recorded a mean achievement score of 25.94 with standard deviation of 7.02. The results therefore, show that female students had a higher mean achievement score than their male counterpart. This can be seen from a slight mean gain score of .54. Therefore, gender may have an influence on students' achievement in Physics.

### Hypothesis One

There is no significant difference in the mean achievement scores of students taught Physics using e-learning teaching approach and those taught with conventional (lecture) method.

Table 3: Summary of Analysis of covariance (ANCOVA) of students' mean achievement scores in Physics taught using e-learning teaching approach and conventional (lecture) methods

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5415.661 <sup>a</sup>	4	1353.915	34.982	.000
Intercept	8507.948	1	8507.948	219.823	.000
Pretest	378.270	1	378.270	9.773	.002
Method	4880.695	1	4880.695	126.104	.000
Gender	79.334	1	79.334	2.050	.153
Method * Gender	26.452	1	26.452	.683	.409
Error	12656.107	327	38.704		
Total	245059.000	332			
Corrected Total	18071.768	331			

Table 7 shows that teaching strategy is a significant factor on students achievement in Physics;  $F(1, 327) = 126.104$ ,  $P = .000$ . Thus, the null hypothesis of no significant difference in

the mean achievement scores of students is rejected. This is because the exact probability value of .000 is less than level of significance set at 0.05. Therefore, the researchers conclude that there is significant difference in the mean achievement scores of students taught Physics using e-learning teaching approach and those taught with conventional (lecture) method.

### Hypothesis Two

There is no significant difference in the mean achievement scores of male and female students in Physics.

Result of the analysis in Table 3 was also used to test hypothesis two. The Table shows that gender is not a significant factor on students' achievement in Physics;  $F(1, 327) = 2.050$ ,  $P = .153$ ). Therefore, the null hypothesis of no significant difference in the mean achievement scores of male and female students in Physics was upheld since the exact probability level of .153 is greater than 0.05 level of significance. The researchers therefore, conclude that there is no significant difference in the mean achievement scores of male and female students in Physics. The result indicated that gender is not a significant factor in the mean achievement scores of male and female students in Physics.

## IV. DISCUSSION OF FINDINGS

### Effect of e-learning Teaching Approach on Students' Achievement in Physics

The findings of the study shows that students exposed to e-learning teaching approach had higher post-test mean achievement scores in physics compared to students exposed to conventional (lecture) method. The achievement difference was further strengthened by analysis of covariance (ANCOVA) which shows a significant difference in the mean achievement scores of students taught physics using e-learning teaching approach and those taught using conventional (lecture) method. This implies that e-learning teaching approach significantly enhances students' academic achievement in physics compared to conventional method. The implication is that, e-learning teaching approach when used in teaching physics even during the period of pandemic is capable of producing positive effects on students' achievement. The finding is not surprising since e-learning provides learners with the advantage of taking classes anytime and anywhere. Secondly, students in e-learning environment are unlikely to get bored during their studies as there are much interactive content they can get access to.

The findings of the study is in agreement with the findings of Rovai and Jordan (2004) who examined the relationship of sense of community between traditional classroom and the blended format, and they found that students in the blended format had a stronger sense of community than students in the traditional format. In a study that compares learning outcomes for students who self-selected into the online format for a macroeconomics course, researchers found that after correcting for sample selection bias, test scores for the online

format students were four points higher than for the traditional format. Also, the finding of the study is in agreement with the findings of Ljubica (2009) who reported that e-learning is a powerful tool for visualization and simulation of the key notions of mathematics which leads to higher achievement.

#### *Influence of Gender on Students' Achievement in Physics*

The result of the findings revealed that gender does not significantly influence students' achievement in physics; though male students had a slight higher mean achievement score than their female counterparts. The analysis of covariance (ANCOVA) shows no significant difference in the mean achievement score of male and female students in Physics. This shows that the higher mean achievement score by male students as earlier obtained was due to other factors which could be age, complexity of the problem. The result indicated that e-learning teaching approach enhances both male and female students' achievement in Physics. This implies that male and female students benefited equally from the treatment.

The result of the study is in agreement with the findings of Gok and Silay (2009) whose study revealed that gender had no significant influence on the physics achievement of students when exposed to problem solving strategies. Also in agreement with the findings of this study is the research conducted by Jennifer, Anna, and Hayal (2010) who reported no significant difference in the science achievement of high school female and male students. Also in agreement with the findings of the study is the study conducted by Ogunkola and Fayombo (2009) that reported no statistically significant difference in the male and female students' science achievement. The result is also in line with the findings of some earlier research studies conducted by Ogunkola and Fayombo (2009), Nwosu and Azih (2011) that reported no significance difference in the mean achievement scores of male and female students in various subject investigated. However, the findings of the study disagreed with the study conducted by Eraikhuemen (2003) that reported a significant difference in the academic achievement of male and female students in mathematics.

#### V. CONCLUSION

Electronic learning (e-learning) without doubt has beginning to gain popularity in the educational system especially with the outbreak of corona virus in the study. From the findings of the study, it was concluded that Physics students exposed to e-learning had an improved achievement in Physics compared to their counterpart exposed to conventional (lecture) method. The study also proven that e-learning could provide greater flexibilities on instructor-led or self-study courses among the students. The main advantage of e-learning is it

enables learning at any place and time while its disadvantages are the students may be required to buy computers or go to cyber cafes to use computers, thus, reducing the opportunities for face to face contact among students and teachers.

#### VI. RECOMMENDATIONS

The following recommendations are made based on the findings of this study

1. Since the use of e-learning instructional approach has been found to be effective in enhancing students' achievement in Physics and it is rarely used by classroom teachers, teachers should be exposed to the use of e-learning instructional approach in schools.
2. Government in conjunction with other professional associations like Science Teachers Association of Nigeria (STAN) should organize workshops, seminars; conferences and in-service training on a regular basis to train teachers on the use of e-learning teaching strategy since the strategy have been found to be effective in enhancing students' academic achievement in Physics.
3. Government as a matter of urgency need to provide basic ICT tools and infrastructure to schools to effectively help in e-learning teaching.

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