EFFECT OF E-LEARNING ON ACADEMIC PERFOMANCE OF STUDENTS OF TERTIARY INSTITUTIONS IN NIGERIA

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Abstract
The study critically examined the effect of e-learning on the students' academic performance of tertiary institutions in Nigeria. It adopted a survey research design with 399 respondents sample size. Structured questionnaire was used for data collection, while mean, chi square, and z tests for data analysis. It observed that e-learning was not completely implemented in the public universities in the South Eastern States of Nigeria. They study therefore recommends that, there is a need for the Government and Management of tertiary institutions to liaise and come up with good ideas by adopting the different types of e-learning such as synchronous and asynchronous learning, CD-ROM and blended learning in teaching and learning, provision of adequate funding, e-learning tools for online teaching and learning; steady power supply, train and retrain the lecturers and to be effectively prepared and be ready for a thriving implementation of e-learning, among other things.

Keywords: E-learning, academic performance, e-learning implementation.

Introduction:

The adoption of e-learning is thought to enhance the effectiveness of tertiary institutions and the student academic performance, developing the quality of products/student learning, improving immediate scoring after exams, quick and useful method of learning, classes can be taken from any location and at any time that students or instructors prefer, offering excellent interaction and collaboration in teaching and learning, academic convenience and comfort, encouraging learning among the students, and influencing changes in teaching methodology. It also improves communication, ensures quick delivery of lessons, makes information easy to grab and absorb, and fosters critical thinking, student perception, and digital records of student growth and development.

E-learning implementation in tertiary institutions includes online teaching and learning via virtual classrooms where facilitators and students engage for direct communication, lecture notes and teaching materials to be shared through forums, emails, and wikis, use of digital resources like Compact Disc Read-Only Memory (CD-ROM) to store and access computerized lectures, student enrolment, and grades, the use of class platforms, utilization of recorded lectures passed unto students and blended learning which allows for both traditional face-to-face contact learning and virtual learning, devices such as laptops, desktop computers, internet, print scanners, telephones, network software, video conferencing, personal digital assistants, projectors, teleconferences and students sourcing information from the availability of digital reference resources of their universities, Performance is defined as the grades or marks that students receive in tests or examinations taken at tertiary institutions as well as their accomplishments in terms of expertise and knowledge acquisition.

Students' academic performance is impacted by e-learning due to improved knowledge retention, increased motivation, immediate feedback on test results, development of students' potential, improved study habits, as well as development of sanitary conditions. E-learning is used to describe using a computer to provide all or a portion of a course, whether it be in a classroom or entirely

online (Amphina, 2020).

E-learning also affects the standard of children's education. Quality consists of outstanding worth, readiness, suitability, excellence, and high social standing (Yagrinho, 2020). When students exhibit positive attitudes in their activities, academic skills, good personal knowledge and abilities, dedication and perseverance, discipline, hard work, respect for others, awareness, accomplishment, passion for the chosen course, collaboration, and teamwork it is clear that their learning is effective (Mauri, Begona, & Maestre, 2021; Gray, 2021 & Lewis, 2017).

In Nigeria nowadays, "many public colleges have begun embracing e-learning, notably for the first year students," and computer-based exams (CBT) are taken for general education courses. For the most part of tertiary institutions' online learning resources are sadly inadequate (Amphina, 2020). Furthermore, the use of e-learning has improved face-to-face instruction, exam performance, exam cheating and misconduct, information communication technology (ICT) proficiency, user typing speed, internet processing, information retrieval from compact discs, exposure to efficient computer resource use, knowledge and self-development. Also, it has made the internet accessible, making it simple to update information, allowing for online evaluation forms being filled, improving training effectiveness and time savings, and enabling cross-platform use (Gokhe 2022, Esen & Azubike, 2022 Aboderin, 2015).

The level of e-learning is still at a low ebb despite efforts to improve it due to insufficient funding, an unstable power supply, the expensive ICT facilities (computers & internet), the absence of expertise of lecturers, the need for adequate preparedness and readiness by institutions of higher learning, and a lack of training for online tutors, poor network issues, technological knowledge gaps, Wi-Fi access issues, a lack of funds to purchase airtime, management and staff attitudes, the pricey nature of e-learning platforms, the absence of necessary teaching and instructional materials to support successful teaching and learning. insufficient e-learning training and seminars, poor network service by network providers, the ongoing closure of institutions due to strikes, and a lack of podium are all contributing factors, exam cheating, loss of

human contact, bandwidth restrictions, social isolation among students, team building problems, emotional problems, and unwillingness to change. Due to the aforementioned reasons, some academic institutions found it challenging to completely embrace this transition, making continuing education via e-learning medium impractical (Nwachukwu, Ugwu & Wogu, 2021).

E-learning is a computerized learning system that uses the internet for the convenience of both students and instructors (Adeoye, Adanikin & Adanikin, 2020). E-learning is the process of conveying information through electronic, audio, and/or videotapes, satellite TV, and CD-ROMs. It also encompasses virtual learning, online classrooms, and digital teamwork (Ukoha, 2007 cited in Amphina, 2020). In an e-learning procedure, a bigger number of recipients are educated at the same or different times while the facilitator and students conduct classes online utilizing electronic devices. According to the aforementioned definitions, e-learning is the use of Information and Communication Technology (ICT) tools or equipment throughout the learning process to improve student's learning and academic staff lecturing method in tertiary institutions.

E-learning Implementation
The process of turning an idea from a concept into reality is referred to as implementation. The use of online learning for teaching and learning is referred to as "e-learning implementation" in academic institutions. Implementing e-learning successfully necessitates the use of synchronous online learning, asynchronous online learning, off-line learning, use of adequate e-learning tools, power sources, technological know-how, positive attitudes, and intentions, as well as public/societal willingness, financial promptness, student/teacher readiness, training keenness, equipment quickness, and Wi-Fi connection speediness (Nwagwu, 2020). A good implementation policy, electricity supply, internet connection, phone lines, quick access to websites, a large number of computers to be connected to the internet, instructional materials (CD ROMs), e-books, and adequate tutorial support are all required for successful implementation of e-learning (Egolum, 2021). A sufficient budget, moral principles, readiness, a steady/constant power supply, internet data, data bundles, and internet connectivity will be required

for the full implementation of e-learning (Olanrewaju, Adebayo, Omotosho & Olajide, 2021). Ideal performance in our tertiary institutions will be made possible by the effective deployment of e-learning.

Academic performance.

It simply refers to a student's action of completing a successful accomplishment or performance in learning. Knowledge retention for a longer period, which enables the achievement of higher grades, is one of the measures of a student's academic performance (Egoigwe, Nnedinkpa, Madu & Prince, 2020). The accomplishment of short- or long-term educational goals, such as skill acquisition, competencies, and attributes students should acquire upon completion of their course or program, as well as the development of potential for rigorous academic studies and research. Good study habits, participation in training or seminars, and academic success are all indicators of a student's success in the classroom (Indeed Career Guide, 2022). Academic performance could also be measured through exams or continuous assessments. There is no consensus on how it should be evaluated or what components make up the most crucial body of knowledge. For instance, issues affecting students' academic progress include motivation, learning skills, self-control, diligence, self-efficacy, perseverance, individual differences, and academic excellence.

Theoretical Framework

In this study, two main theories-the Dependency theory and the Theory of Technological Determinism-were used. Thorstein Veblen proposed technological determinism in (1929). E-learning is a major social force for change because it alters how people teach and learn, communicate with one another, and think. Thorstein Veblen essentially stated that the tenets of technological determinism are that technology "defines the form of a civilization, is the driving force of culture in a society, and dictates the trajectory of people's history" (Communication theory, 2021). In contrast to the aforementioned, Karl Marx stated that technical advancement results in novel methods of production in a society, which in turn affect its cultural, political, and economic components, finally transforming society itself (Bimber, 1990).

Applying this idea to our research, it is important to emphasize that, in the modern world, technology heavily influences how well-off a country is. Thus, the utilization of e-learning as a method of teaching is gradually replacing traditional face-to-face teaching and learning. Our educational system is steadily altering as a result, and it is also having an impact on our social, economic, and political environment. This is significant because e-learning has become popular around the world to save the educational system. Thus, e-learning has established itself as the new norm, and any country that does not adopt it risks being excluded from global social, political, and economic interactions.

Empirical Review

Shehu (2018), examined the role of the distance learning system in National Development (A study of the National Open University of Nigeria (NOUN) to determine the impact that online education has had on NOUN students at the Kwara State College of Arabic and Islamic Legal Studies in Ilorin, Nigeria. In-depth interviews were used in the study to collect data from the respondents. The results showed that while infrastructure at NOUN is lacking, distance learning has been able to address the issue of student admittance to universities to some extent. When compared to in-person classes, distance learning at NOUN is more affordable and practical.

Aboderin (2019) examined the relationship between online interaction and the academic performance of distance e-learners at a Nigerian University. The study's goal was to determine whether online contact with distance learners in study centres at NOUN in the states of Lagos, Ekiti, Oyo, Ondo, and Ogun, with 13 different study centres in Nigeria's South-West geopolitical region. The study used a descriptive survey approach and found that three types of interactions-learner-content interactions, learner-instructor interactions, and learner-learner interactions-affected online students' academic performance. The study came to the conclusion that the learner-learner interactions, which improve the academic performance of the students in the study centres, were the most successful of the three types of interactive learning.

Statement of the Problem

However, the low impact of e-learning affects the

performance of Nigeria's tertiary institutions as there are problems of poor use of online learning in tertiary institutions, decreased students' academic achievement, inefficiency in teaching, sparse quality of students' learning, inadequate e-learning tools, poor research output, inadequate result feedback to students, incapacity of lecturers, delayed publication of students' examination result, poor student progression, delayed result feedback to students, low graduation rates. Relying on the foregoing, many tertiary institutions in Nigeria are facing lots of academic backlog because they have fallen behind in finishing the academic year.

Objectives of the Study

The study's main objective was to examine effect of e-learning on the academic performance of students of tertiary institutions in Nigeria
Specifically it sought to:

(i) Ascertain the extent of e-learning implementation by tertiary institutions in Nigeria.
(ii) Investigate how e-learning affected academic performance of students in tertiary institutions in Nigeria.

Scope of the study

The study focused on effect of e-learning on academic performance of students of tertiary institutions in Nigeria. The content scope determined the extent of implementation of electronic learning in higher education, on how variables such as e-learning affected the academic performance of students. The unit of analysis covered the selected public university students and lecturers. The study was limited to the public universities in the South Eastern States of Nigeria.

Research Questions

The following were the study's research questions:
(i) What is the extent of e-learning implementation in tertiary institutions in Nigeria?
(ii) To what extent has e-learning affected the academic performance of students in tertiary institutions in Nigeria?

The study's hypotheses included the following:

(I) E-learning has been efficiently implemented in the tertiary institutions in Nigeria.
(ii) There is no significant difference between e-learning and academic performance of students in tertiary institutions in Nigeria

Methodology

Research Design:

The study used a survey research design approach. It used a structured designed questionnaire in collecting data from respondents. This method was chosen in order to make reference to observable facts as they exist in higher institutions.

Area of Study:

Public universities in the South Eastern States of Nigeria were used for the study because many were faced with lots of academic backlog of work and fell behind in finishing the academic year due to the closure of these tertiary institutions in 2020 with regards to the issue of Covid-19: Abia State University, Uturu (ABSU), Michael Okpara University of Agriculture, Umudike (MOUAU), Abia State; Anambra State University, Akwa (ANSU); Nnamdi Azikiwe University (NAUA), Awka; Ebonyi State University (EBSU), Abakaliki; Alex Ekwueme Federal University, Ndufu Alike Ikwo (FUNAI), Ebonyi State, Enugu State University of Science and Technology (ESUT) Enugu, University of Nigeria, Nsukka (UNN), Enugu State, Imo State University (IMSU) Owerri and the Federal University of Technology, Owerri (FUTO), Imo State, all located in the South Eastern States of Nigeria.

Population of the Study:

Students and academic staff from the ten (10) public universities in the five South Eastern States of Nigeria made up the study's target group.

Table 3.1: Population Distribution

Institution	Students	Academic Staff	Total Population	Student Ratio	Staff Ratio
ABSU	20,400	807	21,207	0.962	0.038
MOUAU	15,000	1,510	16,510	0.908	0.091
ANSU	14,999	2,500	17,499	0.857	0.143
NAUA	40,000	2,100	42,100	0.950	0.049
EBSU	15,302	911	16,213	0.944	0.056
FUNAI	11,000	118	11,118	0.989	0.011
ESUT	18,401	691	19,092	0.964	0.036
UNN	36,000	1,700	37,700	0.955	0.045
IMSU	16,608	1,101	17,709	0.938	0.062
FUTO	25,250	1,100	26,350	0.958	0.042
TOTAL	212,960	12,538	225,498		

Source: Academic Planning Dep artments of the public universities, Scientific Index, Linkedin.com and Wikipedia Uni-Rank. 2022.

Determination of Sample Size:
Size of the sample, 399 was determined using Taro Yamane method (1967).

Taro Yamane Formula:

$$n = \frac{N}{1+N(e)^2}$$

Where

n = Desired example dimension

N = populace extent under study

e = Level of significance of error or limit of tolerable error assumed to be 5% or 0.05

1 = Unity (always constant in value).

Therefore

$$n = \frac{225,498}{1+225498\,(0.05)^2}$$

$$n = \frac{225,498}{1+225,489\,(0.0025)}$$

$$n = \frac{225,489}{1+563.7}$$

$$n = \frac{225,489}{564.7}$$

$$n = 399.3$$

$$n = 399$$

Table 3.2: Sample Size Distribution

University	Population	Population Per	Sample	Percentage
ABSU	21,207	0. 094	38	21207/225498 = 09 %
MOUA	16,510	0.073	29	16510/225498 = 07%
ANSU	17,499	0. 077	31	17499/225498 = 08 %
NAUN	42,100	0.186	74	42100/225498 = 18%
EBSU	16,213	0.071	29	16213/225498 = 07 %
FUNAI	11,118	0.049	20	11118/225498 = 0 5%
ESUT	19,092	0.084	34	19092/225498 = 08 %
UNN	37,700	0.167	67	37700/225498 = 17%
IMSU	17,709	0.078	31	17709/225498 = 0 9%
FUTO	26,350	0.116	46	26350/225498 = 12%
TOTAL	225,498		399	100%

Basis: Field study, 2021.

Table 3.3: Sample Size Return Rate

Categories of Distribution	Questionnaire to be distributed	Questionnaire Returned	Percentage
Academic staff	23	23	6%
Students	376	352	94%
Total	399	375	100%

Origin: Field review 2021.

Sampling techniques:
The study used a simple random technique in which every member of the population had an equal probability of being chosen.

Instrument for data collection:
In order to gather information from the respondents (students) in the public universities in Nigeria's South Eastern States, a structured 20-item questionnaire titled, "E-learning and students' academic performance of tertiary institutions were used.

Validity of the instrument:
The researcher's supervisor and professionals from Faculty of Management Sciences, Enugu State University of Science and Technology, Enugu (ESUT), ensured face validity and content validity. Corrections were made, and the instruments were reorganized in keeping with the advice of the specialists.

Reliability of the Instrument:
The test-retest methodology was used to assess the reliability of the instrument. Respondents from ten public universities in the South Eastern States of Nigeria were pilot tested. Within three days, and the correlation coefficient of the instrument was established.

Methods of Data Analyses:
The mean score was used in the study's analysis. In order to test the hypothesis, the Z-test method was adopted for the study. SPSS Version 16.0. The Z-test decision rule: Reject the null hypothesis and accept the alternate hypothesis if the computed Z-value is greater than the critical Z-value (i.e. Zcal>Zcritical).

Assumptions: Level of significance = 0.05. Utilizing frequency distribution and mean score, the data were examined. The questions included mean scores of Very High (VH), High (H), Don't Know (DK), Low (L), and Very Low on a five-point Likert scale. The following ratings were given on a five-point scale:
I. VH = 5 points
H = 4 points.
3. DK = 3 points
iv. L = 2 points, and
VL = 1 point.
The midpoint of the scale, 2.50, served as the basis for the decision rule. As a result, responses to items were classified as high or positive when the mean score was 2.50 or higher and low or negative when the mean score was lower than 2.50.

Result.
Research question I: What is the extent of e-learning implementation in tertiary institutions in Nigeria**.**

Table 4.1: Showing the responses on e-learning implementation in tertiary institutions

S/N	Items: Performance of E-e-learning	VH	H	DK	L	VL	Ɛ Fx	X	Decision
1	E-learning was efficiently implemented because virtual classrooms where lecturers and students engaged for direct communication were used in teaching and learning in your institution.	30 (150) 8%	40 (160) 10.7%	35 (105) 9.3%	120 (240) 32%	150 (150) 40%	375 (805)	2.1	Rejected
2	Online lessons and knowledge which allowed teaching material to be shared through forums, emails, etc were put into action in your institution.	40 (200) 10.7 %	35 (175) 9.3%	20 (60) 5.3%	120 (240) 32%	160 (160) 42.7 %	375 (835)	2.2	Rejected
3	The teachers at your university taught students using digital tools like CDs and the internet.	35 (175) 9.3%	35 (140) 9.3%	5 (15) 1.3%	130 (260) 34.8%	1170 (70) 45.3 %	375 (760)	2.0	Rejected
4	Blended learning which allowed for both traditional face-to-face contact education and online learning was adopted in your institution	30 (150) 8%	40 (160) 10.7%	30 (90) 8%	125 (2500) 33.3%	150 (150) 40%	375 (800)	2.1	Rejected
5	E-learning tools such as laptops, desktop computers, print scanners, telephones, network software, projectors and others were adequate for instructions in your institution.	20 (100) 5.3%	24 (96) 6.4%	6 (18) 1.6%	150 (300) 40%	175 (175) 46.7 %	375 (689)	1.8	Rejected
	Grand mean	155 (775)	174 (731)	96 (288)	645 (1290)	805 (805)	1875 (1875)	10.2 (2.0)	Rejected

Source: Field study, 2022.

The questionnaire item 1 from Table 4.1showed that e-learning was not efficiently implemented in tertiary institutions. This was due to the responses from 8% and 10.7% of the respondents that ticked 'very high and high' respectively to the assertion as against 32% and 40% which were 'low and very low responses that indicated that e-learning was inefficiently implemented because virtual classroom where facilitators and learners connect in direct communication was not applied in public universities in Nigeria. While 9.3% responses were 'don't know'.

Questionnaire item 2 indicated that online teaching and learning which allowed teaching material to be shared through forums, emails, etc were not put into action in tertiary institutions. This was because 10.7% and 9.3% of the respondents answered 'very high and high' respectively with the assertion as against 32.7% and 42.7% of the respondents with 'low and very low responses. While 5.3% of the respondents had don't know responses.

Questionnaire item 3 of Table 4.1 revealed that lecturers did not employ digital resources like CDs and the use of the internet for teaching students in tertiary institutions. This was due to the fact that 9.3% and 9.3% of the people ticked 'very high and high respectively with the statement. While 34.8% and another 45.3% marked 'low and very low' respectively with the assertion. And, 1.3% of the populace indicated 'don't know.

In questionnaire item 4, it revealed that blended learning which allowed for both traditional face-to-face contact learning and virtual learning was not applied in educating undergraduates in tertiary institutions. This was because 8% and 10.7% of the responses received was marked 'very high and high' respectively with the assertion as against 33.3% and 40% of the respondents that ticked 'low and very low' respectively. While 8% of the respondents indicated don't know.

In questionnaire item 5, it showed that e-learning tools such as laptops, desktop computers, mobile phones, network software and others were inadequate for instructions in public universities. This was because 5.3% and 6.4% of the respondents consented to 'very high and high' responses respectively with the statement as against 40% and 46.7% of the respondents that consented to 'low and very low responses respectively. While 1.6% of the respondents had 'don't know' responses. It showed that the majority of the respondents believed that e-learning were not efficiently implemented in tertiary institutions in the South Eastern Nigeria.

Research question 2:
To what extent has e-learning affected the academic performance of students in tertiary institutions in Nigeria?

Table 4.2: Showing the responses on the extent e-learning affected the academic performance of students in tertiary institutions in Nigeria.

S/N	Items: Academic Performance of Students	VH	H	DK	L	VL	ЄFx	X	Decision
6	There is no significant difference between e-learning and academic performance of students in tertiary institutions.	15 (75) 4%	45 (180) 12%	35 (105) 9%	150 (300) 40%	130 (130) 35%	375 (790)	2.1	Rejected
7	E-learning enhanced knowledge retention for a longer period of time and disallowed making of better grades.	99 (495) 26.4%	107 (428) 28.5%	13 (39) 3.5%	94 (188) 25.1%	62 (62) 16.5%	375 (1212)	3.2	Accepted
8	E-learning increased students' motivation to learn due to its appealing material presentation, ease of access, clear information, and provision of quick feedback.	180 (900) 48%	150 (600) 40%	2 (6) 0.5%	27 (34) 7.2%	16 (16) 4.3%	375 (1576)	4.2	Accepted
9	E-learning developed students' potential for rigorous academic studies and research.	200 (1000) 53.3%	160 (640) 42.7%	1 (3) 0.2%	10 (20) 2.7%	4 (4) 1.1%	375 (1667)	4.4	Accepted
10	E-learning boosted students' problem-solving abilities, experiences, and ideas.	156 (780) 41.6%	203 (812) 54.2%	2 (6) 0.5%	8 (16) 2.1%	6 (6) 1.6%	375 (1620)	4.3	Accepted
	Grand mean	650 (3250)	665 (2660)	53 (159)	289 (558)	218 (218)	1875 (6845)	18.2 (3.6)	Accepted

Source: Field survey, 2022

From questionnaire item 6 of table 4.2, it indicated that there is significant difference between e-learning and academic performance of students in tertiary institutions. This is because 4% and 12% of the respondents consented to 'very high and high' respectively; while 40% and 35% of the respondents' responses were low and very low respectively indicating that there is significant difference between e-learning and academic performance of students in tertiary institutions. And, 9% of the respondents ticked 'don't know' in the statement.

In questionnaire item 7 of table 4.2, it indicated that e-learning affected the performance of students as it enhanced their knowledge retention for a longer period and allowed the making of better grades in tertiary institutions. This is because 26.4% and

28.5% of the respondents consented to 'very high and high' respectively that e-learning enhanced knowledge retention for a longer period while 25.1% and 16.5% of the respondents' responses were low and very low respectively. And, 3.5% of the respondents ticked 'don't know' in the statement.

Questionnaire item 8 revealed that e-learning increased students' motivation to learn due to its appealing material presentation, ease of access, clear information, and provision of quick feedback in tertiary institutions. This is because 48% and 40% of the respondents declared 'very high and high respectively that e-learning increased students' motivation to learn due to its appealing material presentation, ease of access, clear information, and provision of quick feedback as against the 7.2% and 4.3% of the respondents that are 'low and very low' respectively. While 0.5% of the respondent's statements were 'don't know'.

In questionnaire item 9 of table 4.2 revealed that e-learning developed students' potential for rigorous academic studies and research in tertiary institutions. This is because 53.3% and 42.7% of the respondents marked 'very high and high' that e-learning developed students' potential for rigorous academic studies and research as against 2.7% and 1.1% of the respondents that declared low and very low responses respectively. While 0.2% of respondents were 'don't know' responses.

Questionnaire item 10 revealed that e-learning boosted students' problem-solving abilities, experiences, and ideas in tertiary institutions. This is because the 'very high and high' responses of the respondents were 41.6% and 54.2% respectively and e-learning boosted students' problem-solving abilities, experience, and ideas as against the 'low and very low responses of the respondents which were 2.1% and 1.6% respectively. While 'don't know' responses were 0.5%.

It proved that the bulk of the respondents held that e-learning certainly affected the student's academic performance in tertiary institutions in Nigeria.

Test of hypothesis one:
E-learning has been efficiently implemented in the tertiary institutions in Nigeria.

Questionnaire Item number 1	VH	H	DK	L	VL	Total
E-learning was efficiently implemented because virtual classroom where lecturers and students engage for direct communication was applied in teaching and learning in the tertiary institutions in Nigeria.	30 (8%)	40 10.7%)	30 (8%)	125 (33.3%)	150 (40%)	375 (100%)

Source: Field Survey, 2022

Expected frequency (E) $= \dfrac{375}{75} = 75$

All mathematical calculation is done and presented in the table below:

Responses	Observed Frequency (0)	Expected Frequency (E)	$0-E$	$(0-E)^2$	$\dfrac{(0-E)^2}{E}$
VH	30	75	-45	1025	27
H	40	75	-35	1225	16.3
DK	30	75	-45	2025	27
L	125	75	40	2500	33.3
VL	150	75	75	5625	75
Total	375	375		13400	178.6

Source: Field Work, 2022

Therefore,
the calculated chi-square value of $x^2 = 178.6$

To compute the degree of freedom (df),
the formula is:

df = (C-1)(R-1)
      (5-1) (4-1)
       4 x 3
df = 12

Critical value at 12, df = 21.03
Therefore, since the calculated chi-square value of

x = 178.6 is greater than the critical value at 21.03, the hypotheses which says e-learning was efficiently implemented because virtual classroom where lecturers and students engage for direct communication was applied in teaching and learning in tertiary institutions in Nigeria was rejected.

Table 4.5: Normalizes z-score for mean responses

S/N	Questionnaire Item One	Sample size	Mean	Std, Deviation	Z-value	Table Z-value $(Z_{0.05})$	Decision
I	E-learning was efficiently implemented because virtual classroom where lecturers and students engage for direct communication was applied in teaching and learning in the tertiary institutions in Nigeria.	375	75	115.76	1.2	0.11	Rejected

Source: Author's Compilation, 2022

Decision Rule:
If the calculated Z-value is greater than the critical Z-value that is (Zcal>Zcritical), the null hypothesis is rejected and the alternate hypothesis is accepted.

Assumptions: Level of significance = 0.05

Results:
Table 4.5 showed the Z-score for the responses to the questionnaire items computed and juxtaposed with the table Z-value of ±0.11 at a 0.05 significance level. The analysis indicated that the hypothesis that e-learning was efficiently implemented because virtual classrooms where lecturers and students engage in direct communication were applied in teaching and learning in the tertiary institutions in Nigeria was rejected at 0.05 significance level as the calculated Z-value of ±1.2 exceeded the critical Z-value of ±0.11. Since the calculated Z-value of ±1.2 is greater than the table Z-value of ±0.11, we, therefore, reject the alternate hypothesis. As a result, the null hypothesis was accepted, stating that e-learning was inefficiently implemented in tertiary institutions in Nigeria.

Test of hypothesis two:
There is no significant difference between e-learning and academic performance of students in tertiary institutions in Nigeria.

Questionnaire Number 6	VH	H	DK	L	VL	Total
There is no significant difference between e-learning and student's academic performance in tertiary institutions in Nigeria.	15 (4%)	45 (12%)	35 (9%)	150 40%)	130 (35%)	375 (100%)

Source: Field Survey, 2022.

Expected frequency (E) = 375 = 75
                            75

All mathematical calculation is done and presented in the table below:

Responses	Observed Frequency (0)	Expected Frequency (E)	0-E	$(0-E)^2$	$\dfrac{(0-E)^2}{E}$
VH	15	75	-60	3600	48
H	45	75	-30	900	12
DK	35	75	-40	1600	21.3
L	150	75	75	5625	75
VL	130	75	55	3025	40.3
Total	375	375		14750	196 .6

Source: Field Work, 2022

Therefore, the calculated chi-square value of $x^2 = 196.6$

To compute the degree of freedom (df), the formula is:

$$df = (C-1)(R-1)$$
$$(5-1)\ (4-1)$$
$$4 \times 3$$
$$df = 12$$

Critical value at 12, df = 21.03

Therefore, since the calculated chi-square value of $x = 196.6$ is greater than the critical value at 21.03, the null hypothesis which says that there is no significance difference between e-learning and students academic achievement in the tertiary institutions in Nigeria was rejected.

Table 4.6: Normalizes Z-score for mean responses

S/N	Questionnaire Item 2	Sample size	Mean	Std, Deviation	Z-value	Table z - value $(Z_{0.05})$	Decision
I	There is no significance difference between e-learning and students' academic achievement	375	75	121.4	1.14	0.87	Rejected

Source: Author's Compilation, 2022

Table 4.6 showed the Z-score for the responses to the questionnaire items computed and juxtaposed with the Z-table value of ± 0.87 at a 0.05 significance level. The analysis indicated that the null hypothesis that there is no significant difference between e-learning and students' academic achievement was rejected at a 0.05 significance level as the computed Z-value of ± 1.14 exceeded the table value of ± 0.87. Since the calculated Z-value of ± 1.14 is greater than the table Z-value of ± 0.87, we, therefore, reject the null hypothesis and accept the alternate hypothesis. The statistical significance indicated that there is a significant difference between e-learning and students' academic achievement in tertiary institutions in the era of Covid-19 in Nigeria.

Discussion of findings:
The study critically examined the effect of e-learning on the students' academic performance of tertiary institutions in Nigeria. It observed that e-learning was not completely implemented in the public universities in the South Eastern States of Nigeria. It was uncovered that virtual classroom where lecturers and students engage in direct communication was not applied in teaching and learning; that online teaching and learning which allowed materials to be shared through forums, and emails, was not put into action, that the use of digital resources like Compact Disc Read Only Memory (CD-ROMs) and the internet in teaching students were seldom applied; blended learning which allowed for both traditional face-to-face contact learning and virtual learning was not adopted; students were unable to source information from the digital reference resources of their university libraries. Student's academic performance in tertiary institutions was positively affected by e-learning for the fact that e-learning helped students in the universities to perform better

academically, enhanced students' knowledge retention for a longer period of time and allowed them making of better grades, increased students' motivation due to its appealing material presentation, ease of access, clear information, and provision of quick feedback developed students' potentials for rigorous academic studies and research and helped students developed better study habits.

Recommendations:
The study recommends as follows;
There is a need to encourage students to acquire practical knowledge that will enable them to gain competitiveness when they enter the labor market which is a good argument for even more implementation of e-learning, the quality of students' learning, and a blooming performance of tertiary institutions.

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