

E-LEARNING: ITS IMPLEMENTATION IN HIGHER INSTITUTIONS IN NIGERIA.

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ABSTRACT

Advances in computer, communication and network technology have led to the evolution of new ways of learning generally grouped as, and termed e-learning. It is a name that came into existence not more than a decade ago though it was being implemented since the second half of the 20th century in its various sub forms.

E-learning is becoming a standard for learning in several higher institutions in various countries of the world.

This paper discusses the full meaning of e-learning, all its components and the impact of implementing e-learning in higher institutions in Nigeria.

KEYWORDS: Electronic-learning, components, online, virtual classrooms, computer based.

INTRODUCTION

E-learning, which stands for electronic learning, is simply learning mediated by electronic technology. All kinds of electronic devices, media or technology such as radio, telephony, satellite broadcast, computers, the Internet, employed since the mid twentieth century have assisted in different forms of learning. When personal computers came into existence and PCs were seen as valuable tools for computation and analyses, this led to computer assisted learning or computer based learning.

With the advent of the Internet, the World Wide Web came into existence and the web became valuable for research. Consequently, online learning or web-based learning came onto existence. Online learning has eventually been absorbed into e-learning. The necessary component for e-learning is a personal computer. In other words, without a PC there can be no e-learning.

Several authors and people think that e-learning and online learning are the same but they are not. E-learning is technology-based learning [1]. The term e-learning refers to the technology used in learning whereas online learning refers to the web or network utilised in learning. Online learning or web-based learning as it is sometimes called is just a subset of e-learning.

Some authors have defined e-learning as

- the use of network technology to design, deliver, select, administer and extend learning [2].
- the unifying term to describe the fields of online learning, web-based learning and technology-delivered instruction [3].
- a general term that refers to all training that is delivered with the assistance of a computer [4].
- an all-encompassing term generally used to refer to computer enhanced learning, although it is often extended to include

the use of mobile technologies such as PDAs (Personal Digital Assistants) [5].

- a wide set of applications and processes, which use all available media to deliver vocational education and training [6].
- any technologically mediated learning using computers whether from a distance or in face to face classroom setting (computer assisted learning) [7].

E-learning can be defined as the use of electronic technology/media, which includes computer, communication and mobile technologies to enhance and extend learning, deliver and access education and information.

To have a better understanding of e-learning, the various electronic media employed in e-learning can be illustrated diagrammatically as thus:

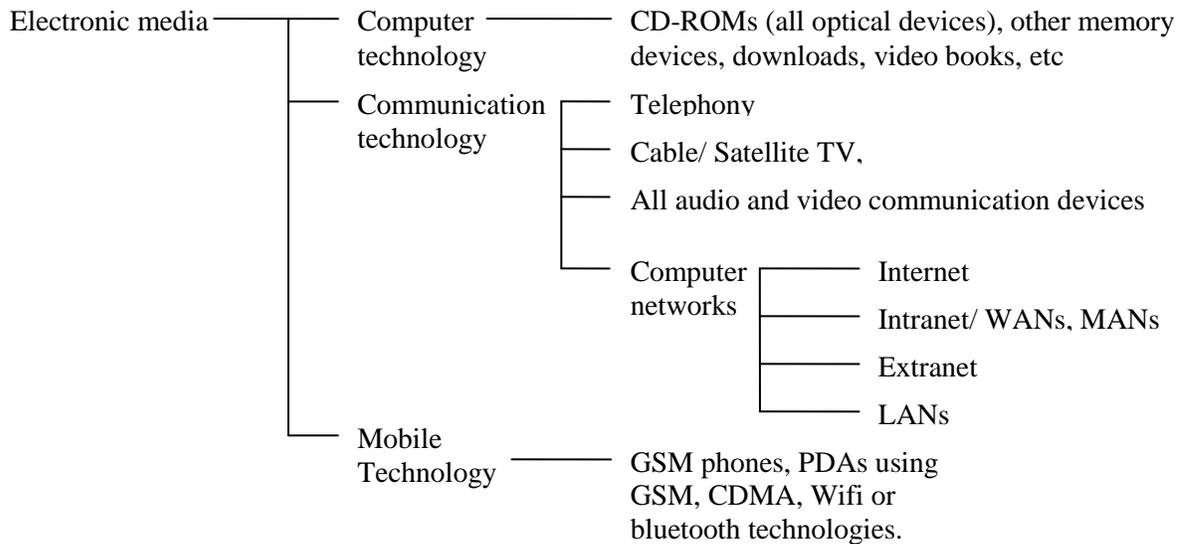


Fig 1: Illustration of the various forms of electronic media employed in e-learning

E-learning can take all forms of learning, the PC being the key component for learning. E-learning includes, but is not limited to the use of online applications like the email, instant messaging (online chats), virtual environments for learning or virtual classrooms, web-based teaching materials, teleconferencing, and the use of electronic devices such as PDAs, GSM phones, digital cameras, multimedia in storage devices, educational animations, computer aided assessments, all digital interactive software [8]. A virtual classroom is an intangible online-based classroom designed to mimic the real classroom.

One has to login to be part of the class. It is a real-time application.

E-learning can be online-based i.e. web-based, which could be Internet based or Intranet based, or off-line based, through stand-alone PCs. The PC could be used in combination with a multimedia projector in a lecture. PCs can be used to study CD-ROM based materials, or downloaded learning contents, downloaded video books. (A book presented in video form)

The communication technologies employed in e-learning can be synchronous or asynchronous [9].

Synchronous as the name implies is communication between two or more persons occurring at the same time. In

synchronous e-learning, the students and lecturer involved in the course log into the virtual platform at the same time. This is the case with video or teleconferencing, online chats, discussion forums, virtual classrooms, e-meetings, etc. Synchronous e-learning is done in real-time.

Asynchronous e-learning is a process where each student and lecturer logs in at different times. Instances of this are sending e-mails, updating message boards.

E-learning depends a lot on the level of technology utilised. In other words, technology is one of the key trends in e-learning.

COMPONENTS OF E-LEARNING

E-learning encompasses a lot of other components of learning supported by the technologies discussed above. The components are:

- Computer based learning (CBL)
- Online learning or web-based learning (WBL)
- Mobile learning (M-learning)
- Distance learning (D-learning)
- Asynchronous audio/video based learning (AAVBL)
- Digital interactive models (DIM)

These components seem to be all similar in meaning however they are all different from one another.

Computer based learning (CBL)

Computer based learning is simply learning with the use of a computer. This is the key component necessary for e-learning. It also includes the use of multimedia projectors, optical devices (CD-ROMs, DVDs, CD-RWs), video

books, learning in computer laboratories, etc.

Online learning (O-learning)

Online learning, which is also called web-based learning, is learning through the use of computer networks like the Internet, Intranet or LANs. Online learning is a subset of e-learning hence just one part of technology-based learning. The level of enhancement of online learning varies; it could be in the form of knowledge databases (database driven educational websites) that support just texts, graphics and email or a virtual learning environment like a virtual classroom that support more features like animations, online chatting and mentoring, etc. A good number of higher institutions are already offering their degree and certificate programs online [10] (online education).

Mobile learning (M-learning)

M-learning is having access to knowledge, learning materials, information or the delivery of learning content to students who are not in a fixed location through the means of mobile technologies [11] such as GSM, CDMA and mobile devices such as mobile phones, PDAs, digital cameras and applications like voicemail and even laptops. M-learning is also employed in O-learning.

Distance learning (D-learning)

This is learning from a distance. The key idea here is distance. It is the use of technology to gain access to knowledge or to deliver learning content to students who cannot be physically present at the venue of learning [12]. D-learning is supported online.

Audio and Video communication based learning (AAVBL)

This is an asynchronous learning carried out through the television and radio recordings or broadcast. Earlier forms of e-learning employed this mode of learning. This is employed in the military, hospitals, etc. It can be employed efficiently in higher institutions.

Digital interactive Models (DIM)

These are digital communication methods or processes that encourage human interaction among students and lecturer [13]. Interaction is a vital ingredient to learning. Digital interactive models can use synchronous or

asynchronous communication methods. Examples of DIM are electronic communication tools like e-mails, voice mails and electronic conferencing tools like online chatting (a virtual discussion platform to exchange real-time text messages), teleconferencing (a two-way real-time interactive communication using video/audio transmission devices). These digital interactive models make up for the face-to-face interaction that could be lacking in e-learning.

The components of e-learning can be related mathematically using a venn diagram as shown below in order to understand the relationships better.

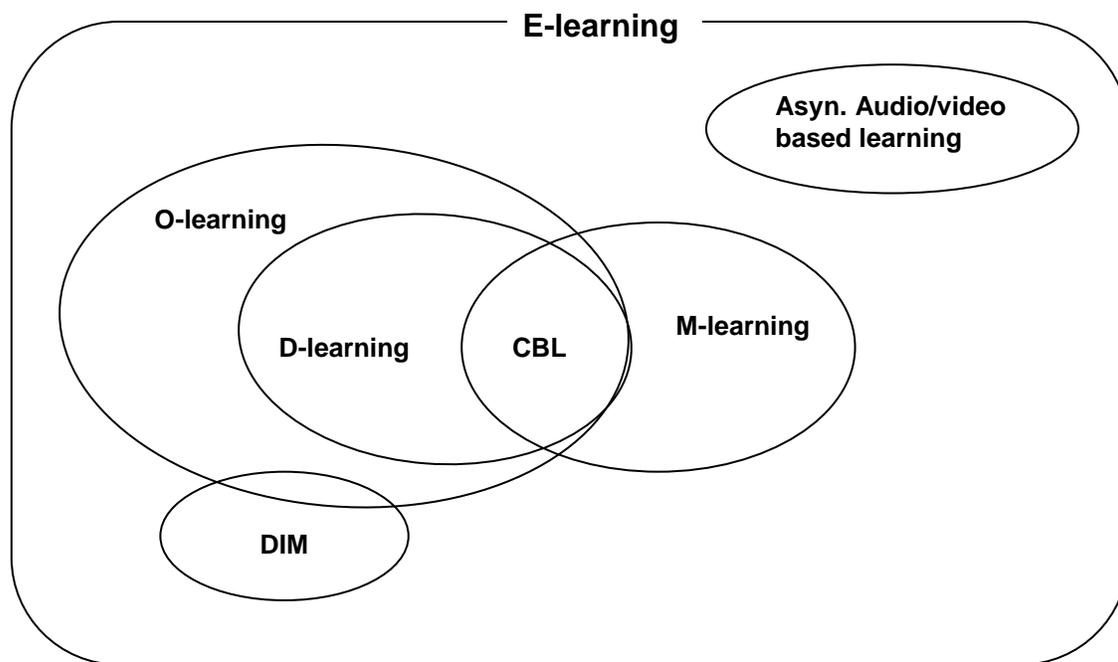


Fig 2: The components of e-learning illustrated in a Venn diagram

From the diagram it can be clearly seen that E-learning is the universal set having as members; computer based learning (CBL), distance learning (D-learning), mobile learning (M-learning), online learning (O-learning), asynchronous audio/video based learning and digital interactive models.

$$CBL \subset D\text{-learning} \subset O\text{-learning} \subset (M\text{-learning} \cup O\text{-learning})$$

$$E\text{-learning} = ((M\text{-learning} \cup O\text{-learning}) \cup DIM \cup AAV\text{-learning})$$

D-learning and M-learning have some properties in common

Hence, $(D\text{-learning} \cap M\text{-learning})$

O-learning and M-learning also have some properties in common

Hence, $(O\text{-learning} \cap M\text{-learning})$

O-learning and DIM too both have some properties in common

Hence, $(O\text{-learning} \cap DIM)$

BENEFITS OF IMPLEMENTING E-LEARNING IN HIGHER INSTITUTIONS IN NIGERIA

1. Learning becomes learner-centric rather than instructor-centric

Learning is personalised. This is because in the traditional classroom setting, the key focus in learning has always been the lecturer. The student's assimilation of content and overall performance excluding other factors has always depended on how well the teacher passed the knowledge, hence instructor-centric [14]. With e-learning, the focus is no longer on the teacher but the student who taking advantage of technology is able to have access to varied learning material besides what s (he) has been taught by the lecturer. The student has access to and can use lecture materials online, other learning materials related or not related to his/her field of study, educational databases online, video books, e-mails, video-conferencing, etc.

2. Enhanced and consistent delivery of lectures, administration of assessment and group projects

Through e-learning, the lecturer would be able to deliver lectures adequately. Consequently the students learn better.

Instance of this is when a lecturer uses multimedia projector in teaching or when students have access to computer. Lecture contents especially images are better presented in slides with real pictures than making horrible sketches on a chalkboard or white board.

Also, the learning content is easily managed, updated and consistently delivered to the students. The content is adapted to the students needs. It is easier for a lecturer to update and manage soft copies of his/her lecture notes than rewriting hard copies. It is also easy for lecturers to publish books or articles from soft copies of their lecture notes. With a virtual learning environment, it will be easy to administer assessments and group projects regularly.

3. Awareness of the institution/ Greater interaction and collaboration among lecturers and students

The usual case in Nigeria is that some lecturers in their various institutions do not know what is happening in other institutions especially in the developed countries. E-learning helps lecturers to be exposed and encourages greater collaboration among lecturers within and outside a university and among students too. As a result of the global village created by the web, lecturers can learn a lot from one another. It also facilitates communication among

students and gives them variety in learning experience.

E-learning makes the institution better known and creates opportunities for linkages and collaboration with other institutions in other countries. Students from other countries can collaborate with students from higher institutions in Nigeria; lecturers from other higher institutions can also deliver lectures online to students here in Nigeria or vice-versa, using a virtual classroom.

4. Self-paced learning, increased retention and better control over learning material

When student learns at his/her pace, learning becomes flexible [15] and convenient for the student compared to the traditional classroom setting where student has no other option but to go at the lecturer's pace. If a student is slow in learning and cannot catch up with the lecturer, the student can still have access to that lecture material afterwards and learn at his/her own pace. Hence, unnecessary stress is reduced and satisfaction increased.

As the learning is totally personalised to the individual learner it gives rise to higher retention of learning content and the student has better control over the learning process and understands better [16]. A serious student downloads the learning material and reads rather than learning once and for all in a classroom and forgotten afterwards. Also, the variation in the type of contents in a learning material such as a mixture of texts, images, sounds, flashy effects and any other multimedia help improve retention. So much text material without images, or

flashy effects can make students lack motivation in studying.

5. Cost effectiveness of e-learning.

When learning is solely online-learning, distance-learning, it eliminates travel costs, accommodation costs, saves money, time and other resources for the students involved in learning [17]. It is also a source of generating income for the higher institution as many students can enrol for studies in an institution.

6. Broad geographic reach/ No need for study leave

E-learning when it is online-learning or distance-learning removes the geographical barriers of learning for the students [18]. It enables one to acquire a degree from an institution without ever seeing the walls of that university. The benefits of this cannot be over emphasized. A parent for instance would not need to leave the family while going for further studies.

Someone can enrol for a post-graduate degree programme in a university in another country without having to apply for study leave. The employers may not even know an s (he) is doing a PG programme.

7. Education is available anytime, anywhere and anyhow.

This is termed "just-in-time learning" [19]. Students have the benefit of accessing learning contents, assessments, anytime and anywhere. This offers learning on demand and eliminates costs of having to travel to another institution's physical library to read books.

It is evident that e-learning has a lot of advantages but there are also drawbacks of e-learning as expected.

DISADVANTAGES OF IMPLEMENTING E-LEARNING IN HIGHER INSTITUTIONS IN NIGERIA

1. Time consuming development of lecture materials

It may not be easy for a lecturer to develop and upload lecture notes. The development of lecture material and the uploading is time consuming as a lecturer does not only upload word processed documents as a file attachment but has to adapt it to the virtual learning environment. The lesson content adapted for online learning may have images, effects, sounds incorporated in it to capture student's attention. Even if an ordinary text material would be uploaded to a virtual learning environment, it has to be uploaded in bits in order to help link the table of contents with the contents (a sort of hyperlinked lecture contents) and this takes a lot of time. Hence, adapting content for a virtual classroom may not be easy for Nigerian lecturers, as one has to learn how to use these tools. It would be much easier to deliver a two hours lecture using a white board to demonstrate and end the issue.

2. Lack of motivation in learning, cultural rejection and isolation

A successful running of e-learning would depend on the lecturers and students willingness to adopt e-learning. A student could lack motivation in learning as a result of poorly organised learning content. Also, e-learning that lacks digital interactive models would be reduced to a process of just accessing online educational databases.

The students would be losing a lot if sub-standard contents are published or uploaded in a virtual learning environment. This could happen if

lecturers lack lesson enhancement tools and are not trained on using these tools if available.

E-learning if not blended with face-to-face learning could reduce social and cultural interaction. For quality learning, knowledge has to be culturally and personally integrated [20, 21].

HUDDLES TO IMPLEMENTING E-LEARNING IN HIGHER INSTITUTIONS IN NIGERIA

1. Lack of Infrastructure and basic amenities

Infrastructure is the foundation on which e-learning is built [22]. Infrastructure, which includes technical infrastructure, building infrastructure all web accessible technologies, are needed to support and even enable e-learning in an institution. There is need for reliable computer networks, broadband connectivity, wireless local area networks or fibre-optic backbones to interconnect departmental and administrative buildings, faculties and connect all to the Internet.

The case is that many higher institutions in Nigeria do not even have internet connectivity of any form in the respective faculties talk less of having an extensive infrastructure that can support all the processes of e-learning. The infrastructure has to be reliable and secure. E-learning would not be efficient if servers are always down or if networks are prone to security threats and viruses.

In Nigeria, the basic needs for running many higher institutions are lacking. Faculties need more buildings for classrooms, lecturers' offices, administrative offices and laboratories. Implementing e-learning without these buildings would be like putting new wine into old wine skins.

2. Unavailability of steady and continuous power supply

The need for steady and continuous power supply cannot be over emphasized. It is a norm

to experience power failure everyday, and it is also common to have low voltage supply of power that does more harm than good. When power is not continuous and steady, the goal of accessing or delivering material anytime and anywhere is defeated.

3. High cost of implementing e-learning infrastructure

The cost of implementing e-learning infrastructure is high [23]. It may be cheaper to implement e-learning in developed countries because they are already advanced in computer technology. They already have Internet connectivity everywhere. In Nigeria, you can count the number of institutions that have an existing campus area network connected to the internet. Perhaps, they are just a few private universities.

It would cost a lot to start laying fibre-optics backbone, or constructing a wireless LAN in all departments and units of any large higher institution like University of Nigeria, Nsukka and Enugu campuses. Providing all web accessible infrastructures like routers, servers, computers, network access points, satellites, etc would incur a lot of expenses.

4. Expensive cost of web and software development and maintenance

Having the infrastructure for implementing e-learning is not enough. The cost for developing and maintaining web applications such as a virtual environment for e-learning (virtual classroom) and teleconferencing is large. The cost of purchasing bandwidth is high. A small bandwidth for not more than 60 computer systems could cost about 1.5 million per annum. Bandwidth

has to be purchased regularly and it has to adequately support bandwidth hungry Internet processes such as internet video conferencing (visual conferencing), virtual classrooms, downloads, all online services 24 hours daily, seven times a week, all year round.

Even if a university is sponsored to implement e-learning and also sponsored for a year's bandwidth, there will still be need to buy bandwidth periodically.

A CASE STUDY OF IMPLEMENTING E-LEARNING IN THE FACULTY OF ENGINEERING, UNIVERSITY OF NIGERIA, NSUKKA

There will be need to set-up the building, technical and system infrastructure in each of the five departments of the faculty of Engineering for e-learning to be adequately implemented. The five departments of the faculty are: Agric, Civil, Electrical, Electronic and Mechanical Engineering.

The building infrastructure includes the computer laboratories, provisions for air conditioners, lighting, constant and steady power supply as needed. The total number of students in the faculty or the average class size per department should also be taken into consideration when planning the building infrastructure.

The technical and system infrastructure refers to all that is needed to set-up the departmental local area networks, a wider area network for the faculty and even the Internet backbone (could be fibre-optic cables) for the Campus area network. This includes all networking hardware and software such as routers, Ethernet cables and jacks, switches, VSAT, bandwidth, servers, workstations (PCs), printers, UPSs, etc.

The components of e-learning that will be better implemented are:

- Computer based learning (CBL)
- Online learning

- Digital interactive models

Computer Based Learning: Goodbye to the era of the chalkboard

Implementation of computer based learning in the faculty would require purchasing multimedia projectors with accompanying laptops. Computer based learning is simply learning with the assistance of computers. This will require having well equipped computer laboratories where students can go to study and do their assignments at their spare time. It also includes the use of multimedia projectors in delivery of lectures in lecture halls. That would naturally say good-bye to the era of the chalkboard.

Multimedia projectors definitely work with computers, preferably laptops. This would require each department in the Faculty of Engineering owning 3 multimedia projectors plus 3 accompanying laptop for the third, fourth and final year classrooms. Then the faculty would need 2 multimedia projectors plus 2 laptops for the first and second year classrooms.

All the lecturer need do is to nicely prepare his lectures in a slide presentation, save it to his flash for delivering lectures.

When the faculty has internet connectivity, especially wireless, the students can link up to another university and have an online lecture.

Online learning/ web-based learning

The characteristic features of online learning is learning from anywhere at any time.

There is need for the following in order to implement online learning in the faculty of engineering:

- Broadband Internet Connectivity
- Departmental Local Area Network for each department
- Departmental websites and faculty website
- Departmental virtual classrooms
- Computer laboratories with Internet connectivity
- Departmental virtual/ digital libraries

Broadband Internet Connectivity

The applications to be supported online are bandwidth hungry. These are applications like virtual classrooms, website and database hosting, virtual/digital libraries, applications that involve file transfer and heavy downloads, all forms of Internet browsing.

Departmental Local Area Network (LAN) for each department

Each department would need a LAN. The different LANs can be interconnected to other LANs in the university forming a Campus Area Network.

Departmental websites and faculty website

There can be no online learning without an online interface for learning. Each department requires an online interface or in other words, a website. The faculty would also need a faculty website. All the sites would have a links to the university's website and vice versa.

The university should have a campus area network (CAN) which can enable staff and students of UNN to access the Internet and UNN's intranet from anywhere within the university. Staff can have access from their homes, students from their hostels. Anyone can access the net from any spot on campus with his/her laptop once the laptop is wireless network enabled.

An estimate of the cost of implementing e-learning in the Faculty on Engineering is detailed in the table below. This is an estimate done taking the average class sizes of the five departments into consideration.

Table 1: Estimated cost of implementing e-learning in the faculty of Engineering, UNN

INFRASTRUCTURE	QUANTITY						TOTAL QTY	UNIT COST(₦)	TOTAL COST (₦)	
	Departments					Fac-ulty				
	AG	CE	EE	ECE	ME					
Building infrastructure										
Air conditioners	1	2	2	4	3	2	16	120,000	1,920,000	
Industrial generator (150KVA)	1						1		5,799,900	
Computer laboratories (If not existing)	1	1	1	1	1	1	6	3,400,000	20,400,000	
Furniture									3,750,000	
Technical and system infrastructure										
VSAT	1						1		3,200,000	
1 year bandwidth	1						1		16,500,000	
Cyber café software	1	1	1	1	1	1	6	75,000	450,000	
VOIP gateway	1						1		745,000	
Servers	2	2	2	2	2	2	12	350,000	4,200,000	
Routers and all other Networking hardware									8,955,000	
Wireless fidelity access (Wi-fi)	2							160,000	320,000	
Workstations (computers)	9	20	23	40	33	20	145	76,000	11,102,000	
Multimedia projectors	3	3	3	3	3	2	17	240,000	4,080,000	
Laptops	3	3	3	3	3	2	17	190,000	3,230,000	
Heavy duty network printers (HP 5000N)	1	1	2	2	2	1	9	225,000	2,025,000	
UPSs	15	26	29	49	39	26	181	35,000	6,335,000	
Stabilizers (5 KVA)	3	3	3	3	3	3	18	7,500	135,000	
TOTAL COST										93,146,900

CONCLUSION

The goal of e-learning is to enhance learning and efficiently deliver knowledge. The power of e-learning is in its content and delivery [24]. E-learning has not come to substitute the physical classroom learning in higher institutions. It is only an e-learning extremist that would make proposals of abolishing all physical classrooms in an institution and make everything virtual.

Some people are critical of e-learning and believe that it can in no way replace the traditional classroom setting because face-to-face contact is necessary for learning or impacting knowledge on students [25]. However, e-learning should not be seen as a set of processes limited to virtual classrooms. The use of virtual classrooms is only one part or a subset of e-learning. The use of optical disks such as CD-ROMS, DVD disks, CD-RW disks,

video books, downloadable materials and lesson notes, computers in a laboratory by students for analyses, multimedia projectors by the lecturer/instructor in a physical classroom for lecturing, reading lesson notes online and the use of virtual classrooms, recently incorporated in a virtual environment for learning are all parts of e-learning.

Digital interactive models like teleconferencing [26] also provide a face-to-face contact when there cannot be a physical face-to-face contact as in online-learning. E-learning has been improving over the years and standards have been set to incorporate digital interactive tools in e-learning.

Online-learning and distance learning being subsets of e-learning require a dynamic virtual classroom for learning. Learning in an institution is not just for students that are geographically located within the town or city or province in which the university is situated. With e-learning, students all over the world can be admitted in a university, and they do not have to be living nearby.

The delivery of e-learning to distant or online students would depend on the quality of the virtual environment for learning [27]. The virtual classroom should be built much like a physical classroom and digital interactive models well incorporated to compensate for the face-to-face contact that would be lacking.

However, a lot of emphasis should be laid on making e-learning a blended learning [28]. That is adding a life instructor to online learning. This easily encourages discussions and reviews about certain topics among

students and lecturers. In addition to what students are taught in class, they should always go online and access learning materials, do group assessments and submit online.

The implementation of e-learning would definitely revolutionize the delivery of knowledge in higher institutions in Nigeria.

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