



Challenges of E- Learning by Chemistry Students During the First Wave of Corona Virus Lockdown in Nigeria

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ABSTRACT

This study discussed the challenges of E-learning by Chemistry students during the first wave of corona virus lockdown in Nigeria. The study concentrated in Awka South Local Government Area of Anambra State. A descriptive survey research design was used to carry out the study. The population sample of the study comprised of 114 Chemistry students (44 males and 70 female) that participated in E-learning during the first wave of corona virus in Nigeria. Three research questions were formulated for the study and two hypotheses. The instrument used was developed by the researcher known as E-Learning Challenges by Chemistry Students (ECCS) which was scrutinized by two experts from Department of Science Education one from Chukwuemeka Odumegwu Ojukwu Uli Campus and another from Nnamdi Azikiwe University Awka with reliability of 0.75 using Cronbach Alpha technique. The questionnaires were distributed by the researcher. Mean and standard deviation were used to answer the research questions while t-test was used to test the null hypotheses. The result revealed that there is a statistical significance difference between male and female chemistry students response to ECCS in favour of female students and there is also a statistical significance difference between urban and rural chemistry students response to ECCS in favour of urban students. Based on these findings conclusions and recommendations were made.

Keywords: Science learning, Science education, Science literacy, Chemistry, E-learning, Corona virus, Self regulated learning theory

Introduction

Science learning is conducted primarily in three types of learning environment: Classroom, laboratory and outdoors (Deshmukh, Forawi & Jariswal, 2012). The importance of Science Classroom Learning Environment (SCLE) has been recognized by many researchers and teachers in the past two decades. The specific criteria for science learning environment will depend on many factors, such as the need of the students and the characteristics of the science program (National Research Council, 1996). Based on this, online learning can also contribute to a good learning of science and can bring about good science education standards through proper designing and effective utilization of technology (Deshmukh, Forawi & Jaiswal, 2012).

Science education literacy is of prime importance in the development of students. Each and everyone have to develop this literacy level to deal with the changes in the transient world. Science education is the basis for informed participation in a technological society, a part of a continuing process of education, a preparation for the world work and a means for students' personal development. Science education which chemistry as a subject is part of is essential to solving various problems along with the ever evolving technology in the world (Ezeliora & Obikezie, 2017). According to Chikendu, Obikezie and Eke (2021), Chemistry is a branch of science that deals with the study of nature, composition and properties of matter, as well as the change matter undergoes under different conditions. Furthermore, Chemistry deals with the study of the environment and explains things that are happening in it. Samuel and Uyaelumuo (2017) opined that chemistry offers a lot of importance to humanity which includes in production of fertilizer, insecticides, herbicides use for increase in food production, production of cloth and clothing materials and so on. Chemistry literacy is of benefit to students to deal with the various problems they face in their daily life. Chemistry contributes to the theoretical base for science literacy especially in senior secondary schools as well in production of ammunitions for defense and security (Chikendu, Obikezie & Eke 2021; Samuel & Uyaelumuo 2017).

Scientific literacy is connected to innovation and viable technologies. It is beneficial industrial platforms leading to sustainable economic development. It is conveniently to say that chemical processes are the pillars for sustainable development in industries and played major role in the world economy (Ezeliora & Obikezie, 2017). This may be one of the reasons why the World Health Organisation announces general learn at home which Chemistry is part of it for Chemistry students during the world lockdown due to COVID-19. During this period so many online learning and App which has being in existence was brought into lime light; such as Zoom, Snapchat, E - learning and so on

(Ezeliora & Obikezie 2017; Obikezie, Abumchukwu & Eke, 2020).

E- Learning is a learning system based on formalised teaching but with the help of electronic resources. According to Obikezie et al. (2020) E-learning can also be termed as a network enabled transfer of skills and knowledge, and the delivery of education is made to a large number of recipients at the same or different times and different locations which made it to have so many advantages. Advantages of E-learning as outlined by Clover (2017) includes; Ability to link the various resources in several varying formats, It is a very efficient way of delivering courses online, due to its convenience and flexibility, the resources are available from anywhere and at any time, Everyone, who are part time students or are working full time, can take advantage of web-based learning, Web-based learning promotes active and independent learning, As you have access to the net 24x7, you can train yourself anytime and from anywhere also, It is a very convenient and flexible option; above all, you don't have to depend on anyone for anything, Not only can you train yourself on a day to day basis, but also on weekends or whenever you have the free time to, there is no hard and fast rule, Through discussion boards and chats, you are able to interact with everyone online and also clear your doubts if any and the video instructions that are provided for audio and video learning can be rewound and seen and heard again and again if you do not happen to understand the topic first time around.

The disadvantages of E-learning are; Most of the E- learning assessments are limited to questions that are only objective in nature, there is also the problem of the extent of security of E- learning programs, the authenticity of a particular student's work is also a problem as E-learning just about anyone can do a project rather than the actual student itself and the assessments that are computer marked generally have a tendency of being only knowledge-based and not necessarily practicality-based (Clover 2017; Ezeliora & Obikezie 2017). Despite these disadvantages, the advantage seems to be more useful especially in developing countries of the world (Clover, 2017). The advantages as stated by these researchers, E- learning has its impact in academic achievement, interest and retention among young students' in the areas of improved students perceptions, communication, quality of education, critical thinking, self-learning and so on. Also E-learning shows that greater knowledge may be impacted to students' satisfaction especially in higher education (Edeh, Nwafor, Ezeanya, Nkiruka & Ani, 2020).

In an E- learning environment, especially where there is availability of functional gadgets like computer, laptop, I pad, Android phone, the role of learning change from teacher being physically present in a class to being on guide at the side of learners especially during visual E-learning. Most times, this E- learning is done visually, especially during holiday through electronic visual lesson, example in the recent corona virus first wave lockdown. Such new roles for E- learning requires training and support for effective learning, provided there is no technical issues or challenges especially during holidays. Also it provides an avenue for distance learning provided the individual learners involved are computer literate (Shahzad, Hassan, Aremu, Hussain & Lodni, 2020). During the period of corona virus first wave lockdown, students underwent distance learning exercise to help stop the spread of the virus.

Corona virus disease 2019 also known as COVID-19 is defined as illness caused by a novel Coronarous now (SARS-COV2; formerly called 2019-n COV) which was first identified amid on outbreak of respiratory illness cases in Wuhem City, Huber Province, China (Anjorin 2020). It was initially reported to the World Health Organisation on December 31, 2019 (WHO2020). On January 30, 2020, the WHO declared corona virus 2019 a global pandemic, which led to total lockdown in all economic activities in most countries including Nigeria. Because of the above development, teachers and students were mandated to actively participate in E- learning which ministry of education and some non - governmental organizations helped in training and advocating for it especially in science related subjects like chemistry to control the spread of the virus. E- Learning of science related subject like chemistry has helped to reach wide set of students in the field of teaching (Okafor & Nnorom, 2017). E- Learning in chemistry as a subject may have positive impact on both teachers and students from a face to face learning to a wide range of students in a particular time (Deshmukh, Forawi & Jaiswal, 2012).

In another development, study has shown that despite positive impact on instructors through E- learning that most recipients, participants and students do have challenges in e-learning than face-to-face learning. Study of Lauren, Jennifer and Magenta (2004) revealed that participants in face-to-face courses and E- learning courses that generally, participants have higher satisfaction with face-to-face courses than E-learning courses. This study was done in the area of nursing and health science. However studies by Blackwell, Roack and Baker (2002), Hong, Las and Holton (2013), Klinger (2013) reported that most participants were satisfied with E-learning courses and learning environments they had gone through because they have heard about it before participating in it which made it easier for the students. This study was done in communication science. According to research by Shahzad, Hassan, Aremu, Hussain and Lodni (2020) said that female participant in north Malaysia shows greater percentage in achievement, interest and retention than their male counterpart when taught by E-learning during COVID - 19 eras. Egbo, Okoyezu, Ifeanocho, Uchekukwu and Onwumere (2011) supported with the opinion that female business students in University of Nigeria Nsukka show more interest and achieve better than their male counterparts when taught through E-learning. In contrary Ramirez, Arenas and Rondan (2015) opine that gender has no effect in achievement, interest and retention when taught through E- learning unless a particular gender is given more attention in provision of basic amenities during the E- learning especially in science related subjects like chemistry. They also opined that students show great achievement, interest and retention in E- learning provided they are computer literate, being time conscious and have inward motivation.

In addition, they further asserted that if E- learning is well inculcated in education, it can definitely help Chemistry students in developing good understanding of scientific concepts through the advantages offered by latest web design. Gallo (2007) and Strachota (2003) reported

that characteristics, such as gender, location, age, computer skill and other computer packages could be challenging factors that students may face in E-learning especially in the areas of science related subjects Kumar (2015). He further outlined some challenges that students faced in E-learning as thus: Adaptability struggle, Technical Issues differences, Computer literacy, Time management and Self motivation. Thus this study wish to find out the extent the above issues were challenges of Chemistry students during corona virus lockdown in Awka South Local Government Area of Anambra State, Nigeria.

Maureen (2015) in one of the E-learning educational theory postulated a theory called Self Regulated Learning Education Theory (SRLET). She said in all educational contexts, every effort must be made to ensure that learners succeed. This involves pedagogical considerations, understanding learner background and approaches to learning, instructor skill, computer skills and course or subject design and management which is more in women than men. E-learning present its own set of factors related to success such as a less structured experience for the learners since they (students and teachers) do not meet regularly in a classroom. Others include a possible learning curve related to course delivery technologies, which is a potential concern for both learners and instructors, different strategies for sheering interaction and discussing informal than would be present in face-to-face context and specific to teachers, the need to adapt and expand on traditional face-to-face instructional tools. In effect, invoice E-learners and instructors must be prepared and supported in this new learning endeavor which is essential to learner (Ezeliora & Obikezie, 2017). While success for students in any learning context, and particularly in distance learning, is dependent on a number of factors, not all of which are within the control of an instructor, much can be done to anticipate and alleviate challenges inherent in E-learning studies. Similarly, instructors who have a solid understanding of E-learning approaches and the ability to apply them to E-studies will be able to provide a more positive learning outcome for their students and fully enjoy their learning experience (Maureen, 2015).

Self-Regulated Learning Educational Theory (SRLET) is a theory that can be used to maximize effective use of E-learning to provide learners with the needed scaffolding to manage their learning. The concept of SRLET has been applied to the teaching and learning process to increase student achievement across age, educational levels and delivery modes. SRLET is most commonly defined as the ability to control the elements and circumstance that affect learning. According to Maureen (2015) SRLET have been used by many educators in Arts and Humanities but science educators and teachers mostly in pure science subjects need to use it most to enhance learning in the field. Okafor and Nnorom (2017) said that SRLET in E-learning motivate the learners to take charge of their own learning and to relate between knowledge and its application to the various contents of their lives through online lesson. With the numerous benefits attributed to E-learning via distance teaching and learning through Self-Regulated Learning Educational theory approach, the researchers sought to investigate, challenges of E-learning faced by Chemistry students during the first wave of corona virus lockdown in Nigeria.

Purpose of this Study

The purpose of this study is to determine the challenges of e-learning by Chemistry students during corona virus first wave lockdown in Awka South Local Government Area, Anambra State Nigeria. Specifically, the study sought to determine the following:

1. The challenges of Chemistry students during E-learning in first wave of corona virus lockdown in Nigeria.
2. Whether male and female students encounter the same challenges
3. Challenges peculiar to urban and rural areas

Research Questions

Three research questions guided the study

1. What are the challenges encountered by Chemistry students during E-learning in the first wave of corona virus lockdown?
2. To what extent do male and female Chemistry students' encountered challenges in E-learning during first wave of corona virus lockdown in Nigeria?
3. How has location impacted on the challenges encountered by Chemistry students during E-learning in the first wave of corona virus lockdown in Nigeria

Hypothesis

Two hypothesis were formulated to guide the study

1. There is no significant difference in the challenges encountered by male and female Chemistry students in E-learning during first wave of corona virus lockdown in Nigeria.
2. There is no significant difference in the challenges encountered by urban and rural Chemistry students in E-learning during the first wave of corona virus lockdown in Nigeria.

Methodology

The design of the study is descriptive survey research design. It is suitable for this study because the study only sort the opinion of the students on the challenges during the first wave of corona virus pandemic. According to Ezeliora, Ezeokana, Patrick, Nweke, Inyega, Matula, Inyega Okpoko, Alumode, Agu and Nwankwo (2011) a survey is a study which seeks to document and describe what exists or the present status of existence or absence of what is being investigated. The study was carried out in Awka South Local Government Area of Anambra State, Nigeria. 150 secondary school chemistry students were randomly chosen from 5 co educational schools in the local government. Three schools from urban areas of the local government while two schools from the rural areas. Out of 150 questionnaires distributed to the students, 114 were collected 36 were rejected due to manipulations in responds by the students. 44 male and 70 female chemistry students were used for the study. The instrument use for data collection is a questionnaire developed by the researcher named E-learning Challenges Of Chemistry Students (ECCS). ECCS has section A which sought information on the bio data of the students while the rest of the questionnaire is grouped into adaptability struggle extent, technical issues, computer literacy, time management and self motivation. A four point rating scales of strongly agree (SA) = 4 point, Agree (A) = 3 point, Disagree (D) = 2 point and strongly disagree (SD) = 1 point were provided for response by the students in section B. The instrument was face validated by two experts one from Department of Science Education Nnamdi Azikiwe University Awka and the other from Department of Science Education Chukwuemeka Odumegwu Ojukwu University Uli Campus. The instrument has a reliability value of 0.75 determined using Cronbach Alpha. Mean was used to answer the research questions while t-test was used to test the hypotheses. Mean value equal to and above 2.5 was accepted while mean value below 2.5 was disagree.

Results

Research Question 1 What are the challenges encountered by Chemistry students during E-learning in the first wave of corona virus lockdown?

Table 1 Mean Responses of Challenges Chemistry Students Encountered in E-Learning During First Wave of Corona Virus Lockdown in Nigeria

	ADAPTABILITY STRUGGLE EXTENT	SA	A	D	SD	STD	X	DECISIO N
1.	I have been involved in E-learning studies before corona virus pandemic	28	44	30	12	1.6	2.7	A
2.	I have not been involved in any E-learning before corona virus.	14	40	26	34	1.6	2.7	A
3.	I have not heard about E-learning studies before.	18	14	44	38	1.4	2.1	D
4.	It is easier for me to adapt to the E-learning studies in chemistry during the first wave of corona virus	14	30	28	34	1.4	2.0	D
5.	I am comfortable with E-learning chemistry studies.	22	30	46	16	1.6	2.5	A
6.	I am uncomfortable with E- learning chemistry during corona virus first wave lockdown	22	40	38	14	1.7	2.8	A
	GRAND STD DEV & X					1.55	2.5	A
TECHNICAL ISSUES								
7.	I have access to computer for E-learning during the period of corona virus.	38	16	38	22	1.6	2.5	A
8.	I have access to Android phone for E-learning during of corona virus.	34	52	12	16	1.7	2.9	A
9.	There is always power supply during E- learning.	20	30	40	14	1.5	2.4	R
10.	I have access to data for E-learning during the period.	20	38	44	12	1.5	2.5	A
11.	My gadget never developed fault during the period of E- learning.	16	46	38	14	1.6	2.6	A
12.	I don't have issue operating my gadget during the E-learning.	36	44	22	12	1.7	2.9	A
13.	I don't have network issues in E-learning during corona virus first wave.	18	36	44	16	1.5	2.5	A
	GRAND STD DEV & X					1.6	2.6	A
COMPUTER LITERACY								
14.	I have computer knowledge before the corona virus first wave lockdown.	50	42	10	12	1.7	3.0	A
15.	I have knowledge to source information in the internet.	26	68	12	8	1.7	3.0	A
16.	I understand E-learning training before the corona virus first wave lockdown in Nigeria.	32	18	58	10	1.6	2.6	A
17.	I have knowledge of CD storage system in Chemistry.	20	34	44	16	1.6	2.5	A
18.	You have knowledge of digital image.	34	50	22	8	1.7	2.9	A
19.	During E-learning i can make use of computer tools like joy stick to draw Chemistry structure.	36	32	38	8	1.7	2.8	A

TECHNICAL ISSUES

7.	I have access to computer for E-learning during the period of corona virus	34	10	16	10	1.7	3.0	A	
8.	I have access to Android phone for E-learning during corona virus first wave lockdown.	22	40	6	2	1.8	3.2	A	
9.	There is always power supply during E-learning	16	20	20	14	1.6	2.5	A	
10.	I have access to data for E-learning during the period.	16	28	24	2	1.7	2.8		
11.	My gadget never developed fault during the period of E- learning.	8	32	26	4	1.6	2.6	A	
12.	I don't have issue operating my gadget during the E-learning	28	30	8	4	1.8	3.2	A	
13.	I don't have network issues in E-learning during corona virus.	14	20	28	8	1.6	2.6	A	
GRAND STD DEV & X							1.7	2.8	A

COMPUTER LITERACY

14.	I have computer knowledge before the corona virus first wave lockdown.	36	26	4	4	1.8	3.3	A	
15.	I have knowledge to source information in the internet.	16	46	4	4	1.8	3.1	A	
16.	I understand E-learning training before the corona virus first wave lockdown in Nigeria.	26	12	36	0	1.7	3.0	A	
17.	I have knowledge of CD storage system in Chemistry.	14	26	26	4	1.6	2.7	A	
18.	You have knowledge of digital image.	26	34	10	0	1.8	3.2	A	
19.	During E-learning i can make use of computer tools like joy stick to draw Chemistry structure.	26	22	20	2	1.7	3.0	A	
20.	I can balance Chemistry equation during E-learning in corona virus first wave.	14	30	20	6	1.6	2.7	A	
21.	I have knowledge of video referencing in E-learning studies	22	28	18	2	1.7	3.0	A	
GRAND STD DEV & X							1.7	3.0	A

TIME MANAGEMENT

22.	I am always online with my e-instructor during corona virus first wave.	28	18	18	6	1.7	3.0	A	
23.	I mange my time well whenever I am tested during the corona virus first wave lockdown E-leaning.	32	26	10	2	1.8	3.3	A	
24.	I mange my time well during assignment in the corona virus first wave lockdown E-learning.	34	22	14	0	1.8	3.3	A	
GRAND STD DEV & X							1.8	3.2	A

SELF MOTIVATION

25.	I am always available for Chemistry E-learning studies.	32	20	16	2	1.8	3.4	A
26.	I learn more chemistry concepts with E-learning.	20	24	22	4	1.7	2.9	A
27.	I always complete my task during the corona virus.	24	30	12	4	1.8	3.1	

28.	I always complete my assignment on chemistry during the corona virus first wave lockdown	16	40	12	2	1.7	3.0	A
29.	I always feel encouraged to be engaged in chemistry e-learning during the corona virus first wave lockdown in Nigeria.	20	32	18	0	1.7	3.0	A
GRAND STD DEV & X						1.7	3.1	A

Table 2 above indicated that female chemistry students during the first wave of corona virus admitted that they had no issues in the adaptability struggle extent, technical issues, computer literacy, time management and self motivation with agree point of grand mean at 2.5,2.8,3.0,3.2 and 3.1 respectively and grand standard deviation at 1.6,1.7,1.7,1.8, and 1.7 respectively.

Table 3 Mean and Standard Deviation Responses of Male Chemistry Students on Challenges Encountered in E-Learning During First Wave of Corona Virus Lockdown in Nigeria

ADAPTABILITY STRUGGLE EXTENT		SA	A	D	SD	STD DEV	X	DECISION
1.	I have been involved in E-learning studies before corona virus.	8	12	18	6	1.6	2.5	A
2.	I have not been involved in any of E-learning before corona virus	4	12	10	18	1.4	2.1	D
3.	I have not heard about E-learning studies before	6	6	14	18	1.4	2.0	D
4.	It is easier for me to adapt to the E-learning studies in chemistry during the first wave of corona virus	2	12	12	18	1.4	1.9	D
5.	I am comfortable with E-learning chemistry studies	6	6	22	10	1.5	2.2	D
6.	I am uncomfortable with E-learning chemistry during corona virus first wave lockdown	12	16	12	4	1.8	3.1	A
GRAND STD DEV & X						1.5	2.3	D
TECHNICAL ISSUES								
7.	I have access to computer for E-learning during the period of corona virus	4	6	22	12	1.4	2.0	D
8.	I have access to Android phone for E-learning during corona virus first wave lockdown.	12	12	6	14	1.6	2.5	A
9.	There is always power supply during E-learning	4	10	20	10	1.4	2.2	D
10.	I have access to data for E-learning during the period.	4	10	20	10	1.5	2.2	D
11.	My gadget never developed fault during the period of E-learning.	8	14	12	10	1.6	2.5	A
12.	I don't have issue operating my gadget during the E-learning	8	14	14	8	1.6	2.5	A
13.	I don't have network issues in E-learning during corona virus.	4	16	16	8	1.5	2.4	D
GRAND STD DEV & X						1.5	2.3	D
COMPUTER LITERACY								
14.	I have computer knowledge before the corona virus first wave lockdown.	14	16	6	8	1.7	2.8	A
15.	I have knowledge to source information in the internet.	10	22	8	4	1.7	2.9	A
16.	I understand E-learning training before the corona virus first wave lockdown in Nigeria.	6	6	22	10	1.5	2.2	D
17.	I have knowledge of CD storage system in Chemistry.	6	8	18	12	1.5	2.2	D

18.	You have knowledge of digital image.	8	16	12	8	1.6	2.5	A
19.	During E-learning i can make use of computer tools like joy stick to draw Chemistry structure.	10	10	18	6	1.6	2.5	A
20.	I can balance Chemistry equation during E-learning in corona virus first wave.	8	10	20	6	1.5	2.3	D
21.	I have knowledge of video referencing in E-learning studies.	4	24	10	6	1.6	2.6	A
	GRAND STD DEV & X					1.5	2.5	A

TIME MANAGEMENT

22.	I am always online with my e-instructor during corona virus first wave.	4	4	22	14	1.4	2.0	D
23.	I mange my time well whenever I am tested during the corona virus first wave lockdown E-leaning.	10	22	12	0	1.7	2.9	D
24.	I mange my time well during assignment in the corona virus first wave lockdown E-learning.	12	18	12	2	1.8	3.2	A
	GRAND STD DEV & X					1.6	2.7	A

SELF MOTIVATION

25.	I am always available for Chemistry E-learning studies.	6	14	20	4	1.6	2.5	A
26.	I learn more chemistry concepts with E-learning.	4	10	18	12	1.4	2.1	D
27.	I always complete my task during the corona virus.	10	20	10	4	1.7	2.8	A
28.	I always complete my assignment on chemistry during the corona virus first wave lockdown	12	14	14	4	1.7	2.8	D
29.	I always feel encouraged to be engaged in chemistry E-learning during the corona virus first wave lockdown in Nigeria.	14	12	12	6	1.7	2.8	A
	GRAN STD DEV & X					1.6	2.6	A

Table 3 above indicated that male chemistry students during the first wave of corona virus in Awka south local government area of Anambra State admitted that they had problems in the adaptability struggle extent and technical issues, with disagree grand mean point at 2.3 and 2.3 respectively. Standard deviation point of 1.5 and 1.5 respectively. In computer literacy time management and self motivation they agree with grand mean point at 2.5,2.7 and 2.6 respectively with grand standard deviation at 1.5,1.6,and 1.6 respectively.

RESEARCH QUESTION 3 How has location impacted on the challenges encountered by Chemistry students during E- learning in the first wave of corona virus lockdown in Nigeria?**Table 4 Mean and Standard Deviation Responses of rural chemistry students that participated in E- learning during the first wave of corona virus lockdown in Nigeria**

ADAPTABILITY STRUGGLE EXTENT	LOCATION	SA	A	D	SD	STD DEV	X	DECISION	
1.	I have been involved in E-learning studies before corona virus.	R	8	12	18	6	1.6	2.5	A
2.	I have not been involved in any of E-learning before corona virus	R	4	12	10	18	1.4	2.1	D
3.	I have not heard about E-learning studies before	R	6	6	14	18	1.4	2.0	D
4.	It is easier for me to adapt to the E-learning studies in	R	2	12	12	18	1.4	1.9	D

5.	chemistry during the first wave of corona virus I am comfortable with E-learning chemistry studies	R	6	6	22	10	1.5	2.2	D
6.	I am uncomfortable with E- learning chemistry during corona virus first wave lockdown GRAN STD DEV & X	R	12	16	12	4	1.8	3.1	A
							1.5	2.3	D

TECHNICAL ISSUES

7.	I have access to computer for E-learning during the period of corona virus	R	4	6	22	12	1.4	2.0	D
8.	I have access to Android phone for E-learning during corona virus first wave lockdown.	R	12	12	6	14	1.6	2.5	A
9.	There is always power supply during E-learning	R	4	10	20	10	1.5	2.2	D
10.	I have access to data for E-learning during the period.	R	4	10	20	10	1.5	2.2	D
11.	My gadget never developed fault during the period of E-learning.	R	8	14	12	10	1.5	2.5	A
12.	I don't have issue operating my gadget during the E-learning	R	8	14	14	8	1.6	2.5	A
13.	I don't have network issues in E-learning during corona virus. GRAN STD DEV & X	R	4	16	16	8	1.5	2.4	D
							1.5	2.3	D

COMPUTER LITERACY

14.	I have computer knowledge before the corona virus first wave lockdown.	R	14	16	6	8	1.7	2.8	A
15.	I have knowledge to source information in the internet.	R	10	22	8	4	1.7	3.1	A
16.	I understand E-learning training before the corona virus first wave lockdown in Nigeria.	R	6	6	22	1	1.5	2.2	D
17.	I have knowledge of CD storage system in Chemistry.	R	6	8	18	12	1.5	2.2	D
18.	You have knowledge of digital image.	R	8	16	12	8	1.9	2.5	A
19.	During E-learning i can make use of computer tools like joy stick to draw Chemistry structure.	R	10	10	18	6	1.6	2.5	A
20.	I can balance Chemistry equation during E-learning in corona virus first wave.	R	8	10	20	6	1.5	2.3	D
21.	I have knowledge of video referencing in E-learning studies. GRAN STD DEV & X	R	4	24	10	6	1.6	2.6	A
							1.6	2.5	A

TIME MANAGEMENT

22.	I am always online with my e-instructor during corona virus first wave.	R	4	4	22	14	1.4	2.0	D
23.	I mange my time well whenever I am tested during the corona virus first wave lockdown E-leaning.	R	10	22	12	0	1.7	2.9	D
24.	I mange my time well during assignment in the corona virus first wave lockdown E-learning. GRAN STD DEV & X	R	12	18	12	2	1.8	3.2	A
							1.6	2.7	A

SELF MOTIVATION

25.	I am always available for Chemistry E-learning studies.	R	6	14	20	4	1.6	2.5	A
26.	I learn more chemistry concepts with E-learning.	R	4	10	18	12	1.4	2.1	D
27.	I always complete my task during the corona virus .	R	10	20	10	4	1.7	2.8	A
28.	I always complete my assignment on chemistry during the corona virus first wave lockdown	R	12	14	14	4	1.7	2.8	D
29.	I always feel encouraged to be engaged in chemistry e-learning during the corona virus first wave lockdown in Nigeria.	R	14	12	12	6	1.7	2.8	A
							1.6		
	GRAN STD DEV & X							2.6	A

Table 4 above indicated that rural chemistry students during the first wave of corona virus in Awka south local government area of Anambra State admitted that they had problems in the adaptability struggle extent and technical issues, with disagree grand mean point at 2.3 and 2.3 respectively. Standard deviation point of 1.5 and 1.5 respectively. In computer literacy time management and self motivation rural chemistry students in Awka south local government area agree with grand mean point at 2.5, 2.7 and 2.6 respectively and grand standard deviation at 1.5, 1.6, and 1.6 respectively.

Table 5 Mean and Standard Deviation Responses of urban chemistry students that participated in E-learning during the first wave of corona virus lockdown in Nigeria

ADAPTABILITY STRUGGLE EXTENT	LOCATION	SA	A	D	SD	STD DEV	X	DECISION
1. I have been involved in e-learning studies before corona virus.	U	20	32	12	6	1.7	2.9	A
2. I have not been involved in any of E-learning before corona virus.	U	10	28	16	16	1.6	2.5	A
3. I have not heard about e-learning studies before	U	12	8	30	20	1.5	2.2	D
4. It is easier for me to adapt to the E-learning studies in chemistry during the first wave of corona virus	U	12	18	16	16	1.4	2.1	D
5. I am comfortable with E-learning chemistry studies	U	16	24	24	6	1.6	2.7	A
6. I am uncomfortable with E-learning chemistry during corona virus first wave lockdown	U	10	24	26	10	1.6	2.5	A
						1.6		
	GRAN STD DEV & X						2.5	A
TECHNICAL ISSUES								
7. I have access to computer for e-learning during the period of corona virus	U	34	10	16	10	1.7	3.0	A
8. I have access to Android phone for e-learning during corona virus first wave lockdown.	U	22	40	6	2	1.8	3.2	A
9. There is always power supply during E-learning	U	16	20	20	14	1.6	2.5	A
10. I have access to data for E-learning during the period.	U	16	28	24	2	1.7	2.8	A
11. My gadget never developed fault during the period of E-learning.		8	32	26	4	1.6	2.6	A
12. I don't have issue operating my gadget during the E-learning	U	28	30	8	4	1.9	3.2	A

13.	I don't have network issues in e-learning during corona virus.	U	14	20	28	8	1.6	2.6	A
							1.7	2.8	A
	GRAN STD DEV & X								
COMPUTER LITERACY									
14.	I have computer knowledge before the corona virus first wave lockdown.	U	36	26	4	4	1.8	3.3	A
15.	I have knowledge to source information in the internet.	U	16	46	4	4	1.8	3.1	A
16.	I understand e-learning training before the corona virus first wave lockdown in Nigeria.	U	26	12	36	0	1.7	3.0	A
17.	I have knowledge of CD storage system in Chemistry.	U	14	26	26	4	1.6	2.7	A
18.	You have knowledge of digital image.	U	26	34	10	0	1.9	3.2	A
19.	During E-learning i can make use of computer tools like joy stick to draw Chemistry structure.	U	26	22	20	2	1.7	3.0	A
20.	I can balance Chemistry equation during E-learning in corona virus first wave.	U	14	30	20	6	1.6	2.7	A
21.	I have knowledge of video referencing in E-learning studies.	U	22	28	18	2	1.7	3.0	A
							1.7	3.0	A
	GRAN STD DEV & X								
TIME MANAGEMENT									
22.	I am always online with my e-instructor during corona virus first wave.	U	28	18	18	6	1.7	3.0	A
23.	I mange my time well whenever I am tested during the corona virus first wave lockdown e-leaning.	U	32	26	10	2	1.8	3.3	A
24.	I mange my time well during assignment in the corona virus first wave lockdown e-learning.	U	34	22	14	0	1.8	3.3	A
	GRAN STD DEV & X						1.8	3.2	A
SELF MOTIVATION									
25.	I am always available for Chemistry E-learning studies.	U	32	20	16	2	1.8	3.4	A
26.	I learn more chemistry concepts with E-learning.	U	20	24	22	4	1.7	2.9	A
27.	I always complete my task during the corona virus.	U	24	30	12	4	1.8	3.1	A
28.	I always complete my assignment on chemistry during the corona virus first wave lockdown	U	16	40	12	2	1.7	3.0	A
29.	I always feel encouraged to be engaged in chemistry e-learning during the corona virus first wave lockdown in Nigeria.	U	20	32	18	0	1.7	3.0	A
							1.7	3.1	A

Table 5 above indicated that urban chemistry students in Awka south local government area of Anambra states during the first wave of corona virus admitted that they had no issues in the adaptability struggle extent, technical issues , computer literacy, time management and self motivation with agree point of grand mean at 2.5,2.8,3.0,3.2 and 3.1 respectively and grand standard deviation at 1.6,1.7,1.7,1.8, and 1.7 respectively.

H₀₁ There is no significant difference in challenges encountered by male and female chemistry students in E-learning during first wave of corona virus lockdown in Nigeria.

Table 6: T- test analysis of male and female students response to ECCS

	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
FEMALE	4.087	3	.026	524.00000	115.9927	932.0073
MALE	6.239	3	.008	330.00000	161.6609	498.3391

In the above Table number 6, the mean difference of female Chemistry student is 524 while that of male Chemistry students is 330. In this case the mean difference of male Chemistry students is lower than that of their female counterpart. Looking at the confidence interval of the difference, female Chemistry students has lower value of 115.9927 and upper value of 932.0073, and that of male Chemistry students is 161.6609 and 498.3391 respectively. This however is an indication that female Chemistry students have higher percentage of mean value than their male counterpart.

Therefore, null hypothesis is rejected alternative hypothesis accepted which uphold that there is a significant difference in challenges encountered by male and female Chemistry students in E-learning during corona virus first wave lockdown in Awka South Local Government Area Nigeria in favour of female Chemistry students.

H₀₂ There is no significant difference in the challenges encountered by urban and rural chemistry students in E - learning during first wave of corona virus lockdown in Nigeria

Table 7: Mean, Standard Deviation and Standard Error Mean of Urban and Rural Chemistry students responses in E- Learning

	N	Mean	Std. Deviation	Std. Error Mean
URBAN	70	524.0000	256.41113	128.20556
RURAL	44	330.0000	105.79225	52.89612

Table 8: T- test analysis of urban and rural students response to ECCS

	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
URBAN	4.087	3	.026	524.00000	115.9927	932.0073
RURAL	6.239	3	.008	330.00000	161.6609	498.3391

In the above table number 7, urban Chemistry students has mean of 524.000, Std Deviation of 256.41113 and Std Error Mean of 128.20556 while the rural Chemistry students has mean of 330.000 Std Deviation of 105.79225 and Std Error Mean of 52.89672 respectively showing difference in significant in both group. Also in table number 8 indicated that T critical is higher than .05 level of significance showing different in significance level.

Therefore, null hypothesis is rejected alternative hypothesis accepted which uphold that there is a significant difference in challenges encountered by urban and rural Chemistry students in E-learning during corona virus first wave lockdown in Awka South Local Government Area Nigeria in favour of urban Chemistry students

Discussion

The results of the findings are discussed under the following sub-headings:

- 1. The challenges of Chemistry students during E- learning in the first wave of corona virus lockdown in Nigeria.**
- 2. Whether male and female students encounter the same challenges.**
- 3. Challenges peculiar to urban and rural areas.**

The challenges of Chemistry students during E- learning in the first wave of corona virus lockdown in Nigeria:

Information presented in Table 1 was based on challenges of Chemistry students during E- learning in the first wave of corona virus lockdown in Nigeria. The findings in Table 1 indicates that Chemistry students in Awka South Local Government Area of Anambra State have heard about E- learning studies before because all of them rejected that they have not heard about E- learning studies before. Also Chemistry students rejected that it is easier for them to adapt to the E- learning studies in Chemistry during the first wave of corona virus. They also rejected that there is always power supply during E- learning. Finally in table one; the students accepted every other itemized question. The finding is in line with the studies by Blackwell, Roack and Baker (2002), Hong, Las and Holton (2003), Klinger (2003) and Young and Norgard (2006). These researchers reported that most participants were satisfied with E-learning courses and learning environments they had gone through because they have heard about it before participating in it which made it easier for them. This could be as a result of the environment because urban areas in the local government seem to have more access to internet than the rural areas. Also

students in urban areas are more exposed to internet and more computer literate due to availability of E-learning facilities in the area. In another development, the studies are in consonance with the findings of Ramirez, Arenas and Rondan (2015) which stated that students show great achievement, interest and retention in E-learning provided they are computer literate, being time conscious and have inward motivation.

Whether male and female Chemistry students encounter the same challenges

The findings in Table 2 and 3 indicate that both genders rejected that they have not heard about E-learning studies before and it is easier for them to adapt to the E-learning studies in Chemistry during the first wave of corona virus. Furthermore in Table 3 only male Chemistry students rejected ten more item questions based on their responses. These more positive responses by female chemistry students in area may be as a result of indication that the students are closer to E-learning facilities like phone and also, may be their loved ones and family keep them up to date in internet than the male chemistry students in the areas.

The study is in consonance with Jennifer and Magenta (2004) which revealed that students perform better in face-to-face courses and E-learning courses not minding the gender. Also the findings are in consonance with Shahzad, Hassan, Aremu, Hussain and Lodni (2020) which stated that female participants in north Malaysia shows greater percentage in achievement, interest and retention than their male counterpart when taught through E-learning during COVID - 19 era. The study is also in line with Egbo, Okoye, Ifeanocho, Uchechukwu and Onwumere (2011) which stated that female business students in University of Nigeria Nsukka show more interest and achieve better than their male counterparts when taught through E-learning. These could be as a result of keen interest of female students to internet facilities

Challenges peculiar to urban and rural areas

The findings in Table 4 and 5 indicate that both locations rejected that they have not heard about E-learning studies before and it is easier for the two locations to adapt to the E-learning studies in Chemistry during the first wave of corona virus. Furthermore in Table 4 only rural Chemistry students rejected items like have not been involved in any E-learning before corona virus, comfortable with E-learning Chemistry studies, have access to computer for E-learning during the period of corona virus, steady power supply during E-learning, access to data for E-learning during the period, network issues in E-learning during corona virus, understand E-learning training before the corona virus first wave lockdown, knowledge of CD storage system in Chemistry, use of E-learning studies to balance Chemistry equations, being online with my E-instructor during corona virus first wave, manage my time well during assignment in the corona virus first wave lockdown E-learning, learn more Chemistry concept with E-learning and complete my assignment on Chemistry during the corona virus first wave lockdown. This could be as a result of more and functional internet facilities that is more available in urban areas of the local government than that of the rural areas.

The findings in Table 4 and 5 are in contrast with Self Regulated Learning Education Theory (SRLET) which was explored by Maureen (2015) as thus, in all educational contexts, every effort must be made to ensure that learners succeed. This involves pedagogical considerations, understanding learner backgrounds and approaches to learning, instructor skill, computer skills and course or subject design and management. The findings in Table 4 and 5 are also in accordance with Gallo (2007) and Strachota (2003) which reported that characteristics, such as gender, location, age and packages could be a challenge that are facing students in E-learning especially in the areas of Chemistry and other science subjects. From Table 6; one sample test, there was a significant difference in challenges encountered by male and female Chemistry students in E-learning during corona virus first wave lockdown in favour of female. In another development, there is a significant difference in the challenges encountered by urban and rural Chemistry students in E-learning during first wave of corona virus lockdown in Nigeria as it is in Table 7 and 8. The finding could be as a result of differences in computer literacy and technical issues like access to computer, laptop, Ipad, Android phone which the female students seem to have more access and computer literate than their male counterpart or could be as a result of these modern gadgets been more accessible to urban students than to rural students (Shahzad, Hassan, Aremu, Hussain & Lodni 2020).

Conclusion

From the findings of this study, the following conclusions were drawn; Chemistry students in Awka South Local Government Area in Anambra State do not experience much challenges in E-learning during corona virus first wave lockdown. They only had little challenges in adaptability struggle and network issues which is technical issues differences. The male Chemistry students admitted that they are not provided with data or the alternative for E-learning during corona virus first wave lockdown. The research also shown there was a significant difference in challenges encountered by male and female Chemistry students in E-learning during corona virus first wave lockdown in which female have the higher percentages of mean value than their male counterpart. The finding also revealed that there was a significant difference in challenges encountered by urban and rural Chemistry students in E-learning during the first wave of corona virus lockdown in Awka South Local Government Area of Anambra state Nigeria in favour of urban Chemistry students.

Recommendations

From the findings to this study, the following recommendations were made

1. Practicing Chemistry teachers should undergo E-learning training and workshops because it fosters E-learning activities.
2. Chemistry students should be exposed to E-learning at least once or twice while in a term especially students in rural areas.
3. School should impose compulsory E-learning training to every Chemistry student especially the male and rural students.
4. Government should invest more on information and communication technology including modern technology to avoid network failures and to create more employment opportunities to her citizens

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