Assessing the Integration of E-Learning Platforms in Achieving Effective Teaching and Learning of Chemistry in Colleges of Education in South-East Nigeria, A Case Study of Anambra and Imo States

Ibe, Franklin Nnanna

Department of Chemistry, Nwafor Orizu College of Education, Nsugbe Anambra State
Email: frankibe89@gmail.com/+2348133900848

ABSTRACT

The study assessed the integration of e-learning platforms in achieving effective teaching and learning of Chemistry in colleges of education in South-East Nigeria, particularly Anambra and Imo State. The research design was descriptive survey research design. The study was guided by four research questions and one hypothesis. The population of the study was 302, which consisted of both lecturers and students from two colleges of Education in Anambra and Imo states; 137 from Nwafor Orizu College of Education Nsugbe and 165 from Alvan Ikoku Federal college of Education, Owerri. Simple random sampling technique was used to select 180 students and lecturers for the study. The instrument for data collection was a structured questionnaire titled "Effectiveness of E-learning Platforms in Teaching and Learning of Chemistry in Colleges of Education" (EEPTLCCE). To ensure the validity of the instrument the researcher submitted the questionnaire to two experts in Chemistry and measurement and evaluation departments, in Nsugbe and Owerri. The reliability coefficient was established at 0.81 using test-retest method. Mean, standard deviation, frequency and percentage were used to answer the four research questions, while t-test statistic was used to answer the hypothesis at 0.05 level of significance. The findings of this study among others showed that the e-learning platforms such as WhatsApp Teaching and Google Classroom are commonly used in the teaching and learning of Chemistry in colleges of education and also enhances/improves the understanding of Chemistry. Also, possible solutions to encourage e-learning usage in teaching and learning of Chemistry in colleges of education were also revealed. Conclusion and recommendations were made among others is that adequate fund should be allocated for the development of e-Learning platforms in colleges of education. Lecturers and students should be adequately trained at cheaper or no cost for proper usage of e-learning platform facilities.

Key words: Chemistry, Colleges of Education, E-learning, E-learning platforms, Pedagogy, Teaching and Learning.

INTRODUCTION

The 21st century is characterized as being a knowledgeable age, prompting many educational institutions, particularly the tertiary system, to consider capacity building, skills development and knowledge construction as a requisite in preparing students for the digital environment. Thus, the introduction of new technologies into mainstream tertiary education is expected to penetrate and transform teaching and learning across the curriculum (Rusu & Tudoset, 2015) including Chemistry. Today, we live in a technology and media-driven environment, marked by access to an abundance of information, technology tools and resources that have penetrated every area of modern society and revolutionized every aspect of our social and cultural lives, including education (Marry, 2018). The constantly changing educational landscape has seen a growing popularity of new technologies in institutions of higher learning. This has caused a paradigm shift in education, which now envisages a new type of teaching and learning culture that demands new technology integration with pedagogy in teacher education programmes. However, the planning and integration of new technology in education is becoming more complex due to rapid changes in technology (Muoneke, 2013). In order to keep up with the demands of the present educational environment, it is necessary to ensure that successful and sustainable new technology integration takes place in institutions of learning, especially in Tertiary institutions, enabling lecturers and students to make use of new technology in their professional practice. The primary goal of any educational system is to produce students that have been nurtured to meet the demands of civil society.

Chemistry teaching is supposed to be result and students centred, and this can only be achieved when using the appropriate approach and resources in teaching the students. General chemistry is a compulsory requirement for students studying science and its related disciplines in the tertiary institutions. As a result, the population of students offering such courses is large, creating several impediments associated with teaching and learning. Also, an overpopulated class size creates a huge challenge to effective teaching and learning. This has consequently required the need to have a brain shift and change in outlook in the manner in which the course ought to be conveyed (Songkram, 2015). The predominant difficulties require the mix of electronic learning (E-learning) in the education and learning of science as it appears to be an exit from this quagmire.

One of the trending educational tools in the market today is the e-learning system, which is used as an alternative to traditional learning. E-learning connects two areas like learning and the use of technology. The internet has become one of the vital ways to make Available online at available resources for research and learning for both lecturers and students to share and acquire information. Numerous studies have shown that e-learning is a more effective way of teaching and learning in our modern technological world and in the era of the present COVID-19 pandemic and also that e-learning integration is at the lowest limit. Operationally, e-learning is the process of learning that occurs between a student and teacher over the internet while utilizing digital technologies. The type of computer system or program being used is referred to as the "platform." Knowledge is transferred from teachers to students during the process of teaching and learning. Therefore, in order to actualize the teaching and learning of Chemistry, the integration of e-learning platform is of great importance.

E-learning Platforms

Electronic learning platforms (e-learning platforms) are used to offer instructional programs to distant learners (Arkorful & Abaidoo, 2015). It is an online learning platform that emerges in a formal context and utilizes a variety of multimedia technologies. Electronic hardware and software support this system either offline or online. A personal computer is usually used for delivering training or computer-enhanced learning related to e-learning (Songkram, 2015). Other communication technologies deliver learning based on tutorials, learning support systems, and online lectures (Edeh et al, 2020). It is based on technology for improving classroom engagement through positive environment, where students are deliberately engaged in online tutorials for completing a task assigned to them. E-learning platform ensures that students are completely involved as learning takes place together with texts, videos, sounds, collaborative sharing, and interactive graphics. It enhances the quality of teaching and learning, report the need for higher institutions for maintaining competitive advantage, and access to education and training in this globalizing marketplace for students (Songkram, 2015). The digital tools are available on the internet network, and the e-learning platforms are digital media-based technology. Educators and students alike benefit from the accessibility of e-learning platforms. Teachers' and students' daily lives have been revolutionized by e-learning platforms (Kattoua et al., 2016). According to research, using an e-learning platform improves students' attitudes toward homework and its value in the educational process (Benta et al., 2014). During the COVID-19 lockdown, e-learning platforms proved to be extremely beneficial to students and teachers, as many institutions relied on them for remote education.

These e-learning platforms include the following Blackboard, DigitalChalk, Moodle, Sakai, Canvas, Educadium, Thinkific, Skillshare, TED-Ed, Codeacademy, Alison, Peer 2 Peer University, WhatsApp teaching, zoom cloud, Google classroom, Edmodo, teleconferencing, teaching through radio programs, teaching through television, text message-based instruction, teaching through e-mail, among others. But in this study, it will be narrowed to WhatsApp teaching, Zoom cloud, Google classroom and video teleconferencing. The utilization of diverse e-teaching platforms stems from the fact that different topics and abilities need to be taught and developed. Educators created many e-teaching platforms with the goal of incorporating students more in the teaching-learning process. This is considered very important and there is a need to get these platforms into the classrooms (Kattoua et al., 2016). However, on the importance of e-learning in teaching and learning chemistry, Bergmam & Sams (2014) advocate that the utilization of mobile learning devices can avail the Chemistry students the opportunity of making use of the various information and interactive functions in the internet to unleash their creativity, construct knowledge and strengthen self-directed learning so as to become long-life learners with 21st century perspective and competency in information literacy. They further note that students are expected to develop understanding of various experimental techniques and chemical analysis through different learning and teaching activities other than real-time demonstration and hands-on experience in practical lessons, instruction in mode of multimedia can also serve as a useful tool to familiarize chemistry students with the experimental techniques and methods. The researchers are hoping that this would also lead to progress not only in Chemistry course but in the other areas of human endeavors.

E-learning and Pedagogy

E-learning can be viewed as an alternative to the face-to-face teaching method or as a complement to it. E-learning usually allows the student a greater choice as well as responsibility for their own learning (Muoneke, 2013). E-learning can change the methods of learning and has the capability to overcome the barriers of time, distance and economics (Bada et.al, 2021). E-learning can be viewed as "disruptive technology" and as a new paradigm for learning (Dhawan, 2020). Disruptive technologies look at problems in completely new and creative ways. E-learning challenges the traditional ways of teaching and learning, enables new alliances between various educational and commercial entities and presents new ways of solving old problems. For example, the role of teachers is likely to change from importers of knowledge to facilitators of knowledge gaining process.

E-learning can be either be synchronous or asynchronous. Synchronous means that the real time communication is implemented such as video conferencing, teleconferencing and on-line chat programme. Asynchronous indicates that other means of communication that are utilized do not require real time response. Examples include: e-mail, blogs and on-line forums.

Benefits of E-learning

E-learning has substantial benefits and offers unique opportunities for people who might otherwise have limited access to education and training. It incorporates innovative and creative approaches to instruction and provides unprecedented access to resources and information. The following according to Okure (2018) are some benefits of E-Learning to education:

- E-Learning is student centered. The learner is the core of any e-learning system. Materials and activities are designed with the needs and interests of the learner in mind. Students assume control of their learning experience and use it to suit their own specific needs.

- E-Learning is self-directed and self-paced. Learners control the amount of time they spend on any particular topic. This allows learners to spend additional time on difficult items before moving on or to skip material they already understand. This "individualized" approach usually allows learners to complete their education and training faster than in traditional courses.

- E-Learning is interactive and hands-on. The use of a variety of multimedia in e-learning increases students' involvement and reinforces the learning experience. This leads to increased retention and a stronger grasp of the subject at hand.

- E-Learning is flexible. Learning can take place anytime and anywhere, as long as the necessary equipment is accessible. The logistics and expense of face-to-face education and training can be extremely limiting when students are separated by distance. E-learning also allows physically or otherwise challenged students to more fully participate.

- E-learning provides consistent and effective training. All of the target learners can participate simultaneously and receive the same information, reducing the variability introduced through multiple sessions in different locations.

Statement of the Problem

Traditional methods of teaching and learning are no longer responding to the needs of students nor increase their achievement and performance of students. Major stakeholders in education believe that using the traditional ways in teaching is the main reason of the backwardness, weakness, low interest and poor achievement of many students. According to available reports, schools and colleges which do not utilize digital technologies in learning and teaching will be left behind in the educational market (Muoneke, 2013). Additionally, in the worlds of education, business, and governance, knowledge about the use of new technologies in the classroom is growing to the point, where using words alone just to express ideas, skills, and attitudes to educate students is fruitless (Olatunji, 2020). The growing complexity of instructional methods, as well as the need for innovative, varied, and expected responses to national and school-based problems, necessitate a new, more comprehensive approach to science education (Edeh et al., 2016). The Chemistry students in colleges of education are not very technologically confident, and therefore need much technological support, they are not used to the e-learning culture which makes the requirements for interactivity, presence and support extremely important.

Chemistry and Science students in general can only achieve their educational goal when there is provision of relevant resources, effective and efficient for their learning. E-learning platform are of great help in fulfillment of lecturers and students' educational needs. The use of new technologies such as e-learning platform in teaching and learning of Chemistry can make a difference in terms of school educational achievement and performance. Over the years there's been decline in the standard of Chemistry being taught in colleges of education, especially in south-east of Nigeria. The standard is dropping on a regular basis, and it has affected the quality of Chemistry graduates being produced. This has been greatly attributed to the poor usage of new technologies (e-learning platform) in the schools. Lecturers' little knowledge to the use of new technologies such as e-learning platform in teaching and learning of Chemistry has also contributed to the decline in the standard of education. Catherine & Edward, (2022) believed that using e-learning platform will promote academic achievement and connect students with real life; encourages and motivates them to prepare and communicate in the class. Majority of the lecturers are novice to E-learning platform usage, thus affecting teaching and learning process. Therefore, it is against this background, the researcher wants to investigate the integration, usage and effects of e-learning platforms in teaching and learning of Chemistry in Colleges of Education in South-East Nigeria, a case study of Nwafor Orizu College of Education Nsugbe and Alvan Ikoku Federal College of Education Owerri.

Research Questions

The following research questions guided the study:

1. What type of e-learning platforms are commonly used in teaching and learning of Chemistry in colleges of education in South East Nigeria?

2. To what extent are e-learning platforms used in the Teaching and Learning of Chemistry in colleges of education in South East Nigeria?

3. What are the challenges that affect the use of e-learning in teaching and learning of Chemistry in colleges of education in South East Nigeria?

4. What are the possibilities for improving the use of e-learning in teaching and learning of Chemistry in colleges of education in South East Nigeria?

Research Hypothesis

The following research hypothesis guided the study.

1. There is no significant difference in the types of e-learning platforms use in teaching and learning of Chemistry in colleges of education in South East.

Theoretical Framework

Vygostky's social constructionism: Vygostky's social constructionism is based on the belief that people learn best when they are engaged in a social process of constructing an artifact for others (Cole and Foster, 2008). E-learning contents are designed to lead a learner through the content, providing a wide ever-increasing set of interactions, experiences, assessments, and simulations. E-learning instructions are built around collaboration. It is interactive

in nature. It can be studied alone or by collaboration with others. It assumes that knowledge (as meaning and understanding) is socially constructed. Learning takes place through conversations about content and grounded interaction about problems and actions. Advocate of social learning claim that one of the best ways to learn something is to teach it to others. However, an increasing array of tools calls for a proper integration of e-learning instructions in the curriculum of colleges of education in Nigeria. The essential purpose is to employ modern computer technology to help solve problems in the area of challenges arising from the population boom, the complexity of Chemistry information to be taught and learned, the need for computer aided Chemistry and shortage of experienced lecturers in the area of chemical reaction. In educational programmes therefore, it is very pertinent to provide lecturers with up-to-date information on variety of e-learning tools and instructions on the proper use of them in teaching Chemistry in colleges of education and other tertiary institutions of learning (Elameer & Idrus, 2010). Since the world is globally changing technologically, no longer Chemistry-teacher centered. It is highly important that Chemistry lecturers should employ the modern way of handling Chemistry especially in the use of computer Chemistry software like digital storytelling presentation. This is also applicable to lecturers and students of Chemistry.

METHODOLOGY

The study adopted a descriptive survey design and was carried out in colleges of education in Anambra and Imo States. The population of the study comprises both lecturers and students in Anambra and Imo State. One hundred and eighty (180) respondents (165 students and 15 lecturers) were randomly selected across two eastern states in Nigeria; Anambra and Imo States. Two sources of data collection were used in this study in order to answer the research questions. The instrument was administered to the students and lecturers with the help of research assistants from each of the participating schools. A validated questionnaire titled "Effectiveness of E-learning Platforms in Teaching and Learning of Chemistry in Colleges of Education" (EEPTLCCE)., (for students and lecturers) designed by the researcher. The reliability of the questionnaire was established before use. The questionnaire contained items on three different forms: firstly, two-point scale of Utilized (U = 2points) and Not utilized (NU =1point); four-point scale of Very High Extent (VHE = 4points), High Extent (HE = 3points), Low Extent (LE = 2points), Very Low Extent (VLE = 1point) four-point scale of Strongly Agree (SA = 4 points), Agree (A = 3 points), Disagree (D = 2 points) and Strongly Disagree (SD = 1 point). Mean, standard deviation, frequency and percentage were used to answer the four research questions, while t-test statistic was used to answer the hypothesis at 0.05 level of significance. The interpretation of the mean for the extent e-learning platforms are used in the teaching and learning of chemistry in colleges of education in South East Nigeria was done using the real limit of numbers as follows; low extent (2.49 and below); moderate extent (2.50-3.49) and high extent (3.00-4.00). Also, the interpretation of the percentage with respect to the types of e-learning platforms commonly used in teaching and learning of Chemistry in colleges of education in South East Nigeria was that any item whose frequency percentage is from 50% and above was considered as being utilized while those from 49.9% and below was considered not utilized. Moreover, any item with a mean rating of 2.5 and above indicated a positive response or agreement while items with mean rating of 2.49 and below indicated a negative response or disagreement.

ANALYSIS OF DATA AND PRESENTATION OF RESULTS

Research Question One:

What types of e-learning platforms are commonly used in teaching and learning of Chemistry in colleges of education in South East Nigeria?

Table 1: Frequencies and percentages of the types of e-learning platforms are commonly used in teaching and learning of Chemistry in colleges of education in South East Nigeria

S/N	Item	Utilized		Not Utilized		Remarks
		F	%	F	%	
1.	WhatsApp Teaching	112	62.2	68	37.8	Utilized
2.	Zoom Cloud	76	42.2	104	57.8	Not Utilized
3.	Google Classroom	128	71.1	52	28.9	Utilized
4.	Video Teleconferencing	72	40.0	108	60.0	Not Utilized

The result in Table 1 shows the frequencies and percentages of the types of e-learning platforms are commonly used in teaching and learning of Chemistry in colleges of education in South East Nigeria. The Table reveals that 2 out of the 4 listed types of e-learning platforms have a frequency percentage of 50 and above. This shows that the types of e-learning platforms commonly used in teaching and learning of Chemistry in colleges of education in South East, Nigeria includes WhatsApp Teaching and Google Classroom. Conversely, the remaining 2 items out of the 4 types of e-learning platforms listed have frequency percentages below 49.9. This indicates that Video Teleconferencing and Zoom Cloud are the types of e-learning platforms not used in teaching and learning of Chemistry in colleges of education in South East Nigeria. Therefore, it can be deduced that the types of e-learning platforms commonly used in teaching and learning of Chemistry in colleges of education in South East, Nigeria includes WhatsApp Teaching and Google Classroom, whereas, Video Teleconferencing and Zoom Cloud are not used in teaching and learning of Chemistry in colleges of education.

Research Question Two:

To what extent are e-learning platforms used in the Teaching and Learning of Chemistry in colleges of education in South East Nigeria?

Table 2: Mean and standard deviation of the extent e-learning platforms are used in the Teaching and Learning of Chemistry in colleges of education in South East Nigeria

S/N	Item	Mean	SD	Remark
5.	We use e-learning platform in teaching and learning of Chemistry.	2.82	0.88	Moderate Extent
6.	The use of interaction through electronic mail in teaching and learning of Chemistry.	2.58	0.92	Moderate Extent
7.	The use of chat software for discussion in class.	2.63	0.87	Moderate Extent
8.	The use of power point in delivering lectures	2.32	0.84	Low Extent
9.	The use of on-line spreadsheets and data analysis software for sharing and analyzing data.	2.42	0.91	Low Extent
10.	The use of e-learning facilities to create, give, receive and grade students' assignments and test on-line	3.07	0.76	Moderate Extent
11.	The use of e-learning for pre-class preparation (sourcing material for lesson note development) and for research (sourcing material for assignment)	2.61	0.92	Moderate Extent
12.	The use of digital drop boxes for file sharing and written data	3.01	0.84	Moderate Extent
13.	The use of simulation in teaching and learning Chemistry	2.75	0.91	Moderate Extent
14.	The use of Chemistry software to draw molecular structures	2.60	1.08	Moderate Extent
15.	There are interrupted wifi service in my school	2.53	0.98	Moderate Extent
16.	We have software for the IUPAC nomenclature of compounds and complexes	2.47	1.05	Low Extent
17.	We have an electronic advanced periodic table in my school	2.46	1.04	Low Extent
18.	The use of animation in teaching and learning	2.63	0.90	Moderate Extent
	Overall mean and Standard Deviation	**2.64**	**0.58**	**Moderate Extent**

The result in Table 2 shows that items 8, 9, 16 and 17 were to a low extent while items 5, 6, 7, 10, 11, 12, 13, 14, 15 and 18 were to a moderate extent. Moreover, 2.64 and 0.58 were obtained as the overall mean score and standard deviation respectively. This indicates that e-learning platforms are used in the teaching and learning of Chemistry in colleges of education in South East, Nigeria to a moderate extent. To determine if there is any significant different between the mean scores of lecturers and students on the extent e-learning platforms are used in the teaching and learning of Chemistry in colleges of education in South East Nigeria, hypothesis one below was formulated.

Hypothesis One:

There is no significant difference between the mean scores of lecturers and students on the extent e-learning platforms are used in the teaching and learning of Chemistry in colleges of education in South East Nigeria.

Table 3: Summary of t-test statistics of the significant difference between the mean scores of lecturers and students on the extent e-learning platforms are used in the teaching and learning of Chemistry in colleges of education in South East Nigeria

Group	N	Mean	SD	Std. Error Mean	Df	T	Sig.	Decision
Lecturers	15	2.75	.70	.18014	178	.766	.445	Not Sig.
Students	165	2.63	.57	.04431				

The result in Table 3 shows that the t-test for independent samples assuming equal variance revealed that $t(178) = .766$, $p = 445$ ($p>0.05$). Therefore, the hypothesis was not rejected since the probability value is greater than 0.05 level of significance. This indicates that there is no significant difference between the mean scores of lecturers and students on the extent e-learning platforms are used in the teaching and learning of Chemistry in colleges of education in South East Nigeria. Hence, both lecturers and students agree that e-learning platforms are used in the teaching and learning of Chemistry in colleges of education in South East Nigeria to a moderate extent.

Research Question Three:

What are the challenges that affect the use of e-learning in teaching and learning of Chemistry in colleges of education in South East Nigeria?

Table 4: Mean and standard deviation of the challenges that affect the use of e-learning in teaching and learning of Chemistry in colleges of education in South East Nigeria

S/N	Item	Mean	SD	Remark
19.	Inadequate ICT infrastructure e.g computer software(s) and computer accessories.	3.12	0.77	Agree
20.	Lack of time to spend in using e-learning platform due to teaching workload	2.62	1.01	Agree
21.	Irregular electricity supply hampering the utilization of e-learning.	3.17	0.82	Agree
22.	High cost of installing and maintaining of the gadgets required for e-learning.	3.00	0.73	Agree
23.	Lack of internet service knowledge among some Chemistry lecturers and students.	2.72	0.91	Agree
24.	Dearth of skilled manpower for implementation and management of available e-learning facilities for impacting knowledge.	3.61	0.54	Agree
25.	Inadequate training of lecturers on how to integrate e-learning gadgets especially related to educational technology	3.57	0.50	Agree
26.	Resistance to change from traditional pedagogical methods to more innovative, technology-based teaching and learning methods by lecturers and students.	3.67	0.47	Agree
27.	Inability to design didactic rules in e-learning.	3.33	0.47	Agree
28.	Lack of ready access to internet, (insufficient bandwidth)	3.49	0.55	Agree
29.	The browsing speed in Nigeria is relatively slow, hence it discourages the use of internet in teaching and learning.	3.34	0.57	Agree
30.	High cost of personal computer, laptop, software, internet and their technical support.	3.67	0.53	Agree

The result in Table 4 reveals that all the items 19-30 were accepted as they were above the mean cut-off points of 2.50. This indicates that the challenges that affect the use of e-learning in teaching and learning of Chemistry in colleges of education in South East Nigeria include inadequate ICT infrastructure, lack of time to spend in using e-learning platform due to teaching workload, irregular electricity supply, high cost of installing and maintaining of the gadgets required for e-learning, lack of internet service knowledge among some chemistry lecturers and students, dearth of skilled manpower for implementation and management of available e-learning facilities for impacting knowledge, inadequate training of lecturers on how to integrate e-learning gadgets, resistance to change from traditional pedagogical methods to more innovative, technology-based teaching and learning methods by lecturers and students, inability to design didactic rules in e-learning, lack of ready access to internet, slow browsing speed in Nigeria and high cost of personal computer, laptop, software, internet and their technical support.

Research Question Four:

What are the possible solutions for improving the use of e-learning in teaching and learning of Chemistry in colleges of education in South East Nigeria?

Table 5: Mean and standard deviation of the possible solutions for improving the use of e-learning in teaching and learning of Chemistry in colleges of education in South East Nigeria

S/N	Item	Mean	SD	Remark
31.	There should be an awareness campaign on the benefits of e-learning within and outside the institution	3.12	0.77	Agree
32.	Students' examination should be conducted online under their lecturer's supervision	2.62	1.01	Agree
33.	The students tutor marked assignment (TMA) should be online-based so as to encourage e-learning usage.	3.17	0.82	Agree
34.	The unit cost of computers/ laptops should be subsidized to boost procurement.	3.00	0.73	Agree
35.	Steady power supply should be provided in the institutions by the management	2.72	0.91	Agree
36.	Government should provide tertiary institutions with adequate funds for ICT/e-learning facilities maintenance	3.61	0.54	Agree

37.	Regular in-service training of lecturers should be provided for them to upgrade their ICT knowledge/skills	3.57	0.50	Agree
38.	Regulation of internet subscription should be enforced by the Nigeria communication commission (NCC) to encourage users	3.67	0.47	Agree
39.	Network providers should make serious effort to improve the bandwidth sizes for more network speed.	3.33	0.47	Agree
40.	Enough time should be created in the timetable for the use of e-learning platform	3.49	0.55	Agree
41.	There is need for provision of WAN, MAN, LAN networks in all the institutions	3.34	0.57	Agree
42.	The colleges should establish an online coursework open to download course materials.	3.67	0.53	Agree

The result in Table 5 reveals that all the items 31-42 were accepted as they were above the mean cut-off points of 2.50. This indicates that the possible solutions for improving the use of e-learning in teaching and learning of Chemistry in colleges of education in South East Nigeria include the creation of awareness on the benefits of e-learning within and outside the institution, ensuring that students' examination are conducted online under the supervision of lecturers, ensuring that the students tutor marked assignment (TMA) are online-based as to encourage e-learning usage, subsidizing the unit cost of computers/laptops to boost procurement, provision of steady power supply in the institutions by the management, provision of adequate funding for ICT/e-learning facilities maintenance by the government, provision of regular in-service ICT training of lecturers, enforcement of the internet subscription regulation by the Nigeria communication commission (NCC) to encourage users, improvisation of bandwidth sizes of network providers to improve network speed, creation of enough time in the timetable for the use of e-learning platform, provision of WAN, MAN, LAN networks in all the institutions and establishment of an online coursework that is open for the students to download course materials in the colleges of education.

Summary of Major Findings

Based on the analysis of data, the following findings were made:

- The finding revealed that the types of e-learning platforms commonly used in teaching and learning of Chemistry in colleges of education in South East, Nigeria includes WhatsApp Teaching and Google Classroom.

- The findings of the study showed that e-learning platforms are used in the teaching and learning of Chemistry in colleges of education in South East, Nigeria to a moderate extent.

- Further analysis revealed that there is no significant difference between the mean scores of lecturers and students on the extent e-learning platforms are used in the teaching and learning of Chemistry in colleges of education in South East Nigeria; as both lecturers and students agree that e-learning platforms are used in the teaching and learning of Chemistry in colleges of education in South East Nigeria to a moderate extent.

- The finding also showed challenges that affect the use of e-learning platform in teaching and learning of Chemistry in colleges of education, some of these challenges include inadequate ICT infrastructure, lack of time to spend in using e-learning platform due to teaching workload, irregular electricity supply, high cost of installing and maintaining of the gadgets required for e-learning, lack of internet service knowledge among some chemistry lecturers and students e.t.c.

- , The findings of the study also revealed some possible solutions for improving the use of e-learning in teaching and learning of Chemistry in colleges of education.

Conclusion

The present study investigated assessing the integration of e-learning platforms in achieving effective teaching and learning of chemistry in colleges of education in south-east Nigeria. There is a pacing need to integrate e-learning platform in the teaching and learning of chemistry in colleges of education for both students and lecturers so as to enhance effective teaching and learning of Chemistry. The finding has revealed that the types of e-learning platforms commonly used and more effective in teaching and learning of Chemistry in colleges of education in South East, Nigeria includes WhatsApp Teaching and Google Classroom. From this study, it is pertinent to know that E-learning platform is a key device for improving teaching and learning of Chemistry in collages of Education. But there are still some challenges revealed by this study that hinder the effective use of e-learning platform in teaching and learning of Chemistry in colleges of education in south east Nigeria, such challenges includes; inadequate ICT infrastructure, lack of time to spend in using e-learning platform due to teaching workload, irregular electricity supply, high cost of installing and maintaining of the gadgets required for e-learning, lack of internet service knowledge among some chemistry lecturers and students, e.t.c. The finding also showed that the possible solutions for improving the use of e-learning in teaching and learning of Chemistry in colleges of education in South East Nigeria include the creation of awareness

on the benefits of e-learning within and outside the institution, ensuring that students' examination are conducted online under the supervision of lecturers, provision of adequate funding for ICT/e-learning facilities maintenance by the government e.t.c. Based on the above, it can easily be concluded that e-learning platform has more prospects for the near future, as the majority of respondents revealed that e-learning platform has helped them to overcome the problem of a shortage of learning resources, and they feel that e-learning will make teaching and learning generally more effective.

Recommendations

Based on the findings and conclusions drawn from the study, it proffers some recommendations that can be followed in order to fulfill the implementation of e-learning platform in teaching and learning of Chemistry in colleges of education in south east Nigeria.

- There should be a systematic strategy to be followed to implement e-learning platform.

The researchers highly recommend collaboration with other colleges that have achieved advanced steps in e-learning platform application.

- There should be budget for establishing an integrated e-learning facilities and e-learning should be prioritized, as well as other necessary requirements.

- Policy makers and curriculum planners should enhance the educational computer knowledge which is a viable option for improving the use of e-learning platform. This should be done through in-service training, workshops and conferences.

- Engaging professional computer technology staff is a vital step in order to maintain e-learning and support lecturers and students, so the quick support should be provided to avoid user disruption.

- Training and retraining programmes should be organized so as to familiarize chemistry lecturers and students with e-learning functionalities and improve their self-confidence in using it.

- There should be constant supply of electricity to colleges or generating plants as alternatives, for effective use of ICT facilities in case of power failure.

- Adequate monitoring, supervision and regular check should be placed on e-learning facilities supplied to colleges by organizations.

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