



## Chemistry Teachers' Awareness and Utilization of Virtual Learning Environment in Teaching and Learning in Maiduguri Metropolis, Borno state

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### Abstract

The study investigated Chemistry Teachers' awareness and utilization of Virtual Learning Environment in Teaching and Learning. A Descriptive Survey research design with a sample of 44 chemistry teachers from public Secondary Schools of Maiduguri Metropolis, Borno state was adopted for the study. Validated Chemistry Teachers' Awareness and Utilization of Virtual Learning Environment (CTAUVLE) was used as data collection instrument. The reliability coefficient of CTAUVLE is 0.72 determined using Cronbach method. Mean and standard deviation was used for data analysis. The results of the study among others revealed that chemistry teachers are not aware of and do not utilize Virtual Learning Environment tools for teaching and learning. Following recommendations were made from the study: the educational stakeholders should make efforts to provide ICT tools to the secondary schools, provide in-service and on the job ICT training for the chemistry teachers. This will facilitate teaching and learning of chemistry via Virtual Learning Environment.

**Keyword:** Awareness, Chemistry, Utilization, Virtual Learning Environment

### Introduction

Sometimes chemistry teachers and students were forced to shut down the schools due to the insurgency or disease outbreak, for example, Covid 19 pandemic. The study aimed to ascertain the level of awareness of utilization of virtual learning environment by the chemistry teachers in the lesson delivery. Chemistry deals with the study of matter and transformations that it undergoes. Kolumuc and Terkin, (2011) defined chemistry as the study of matter, the changes it undergoes and the explanation of chemical phenomena of everyday life. Because of the contributions it has made to fields of study like biology, physics, and agricultural science, among others, it is regarded as the foundation of science. However, chemistry is one of the science disciplines that is seen to be the hardest to comprehend, hence fewer students choose to enroll in it (Cardellini, 2012). The failure rate has remained relatively high despite the critical role and importance of chemistry (AlMahdawi, Sechnghore, Ambrin, & Belbase, 2021).

There are many factors that contributed to poor students' academic performance. Hassan et al., (2015) reported that background of the students, lack of skilled teachers, conventional teaching methods, and poor instructional materials are possible factors that could contribute to students' poor achievement in chemistry. Sausan, Saputro, and Indriyanti, (2020) and Njoku and Eze-odurukwe, (2015) opined that the

abstractness of chemistry is one of the major factors that led to poor academic achievements among students. Moreso, United Nations International Children's Emergency Fund (UNICEF, 2019) reported that the student's performance in chemistry in Borno state has been below average because of tragic insurgency experienced by the state for more than a decade and this led to the school closure in most parts of the state. Information and Communication Technology (ICT) could be used to remove the abstractness of some difficult chemistry concepts and as a platform for online programs to reduced students' exposure to insurgency and school closure.

ICT has become the fundamental building block of the 21<sup>st</sup> Century and made today's world a global village. ICT is the application of technological devices and softwares to collect, generate, store, retrieve, and share data and information. Ajayi (2009) defined ICT as the technology tools for gathering, collating, and communicating information. It is also providing new capabilities for online training and development which is required by the education sector (Mahajan, 2016). Following are some ICTs' usage in scientific lesson delivery, according to Abdulrahman et al. (2020): (i) ability to turn abstract concepts into concrete contents (ii) ability to present large volumes of information within a limited time with less effort (iii) ability to stimulates students' interest in learning and (iv) provides the teacher with the ability to know students



position in learning. ICT facilities could also be used for virtual learning environment (VLE) whereby teachers and students communicate with one another online and through computer software and other technical means.

VLE is a collection of teaching and learning resources created to improve student learning by incorporating computers and the Internet. VLE is a platform for collaboration that improves the delivery of learning (Şenel, 2016). It is a form of technology that improved how well students learned by employing a variety of teaching and learning resources, including computers and internet. VLE should also be used to describe the elements that allow students and teachers to engage in online interactions of various kinds, including distance on-line learning (the Joint Information Systems Committee, JISC, 2000). According to Nwabude, Ogwueleka and Irhebhude, (2020), One idea that shifts the boundary of knowledge acquisition in today's educational environment is the usage of virtual learning environments for teaching and learning. These environments can provide excellent prospects for supporting a variety of learning approaches

VLEs are technologically-driven classrooms that support self-directed and self-regulated learning and enables students to not be tied to a specific facility or to a specific time or place (Uzoamaka, 2017). This in turn, provide an opportunity for studying at home despite insurgency and other factors that could prevent traditional teaching and learning process.

The VLE is a set of Web and mobile applications that let students access their courses at any time and from any location. Features that encourage collaboration, such as leaderboards, wikis, blogs, chat rooms, and virtual classrooms innovative lesson delivery, such as flipped classrooms and gamified instruction. While a flipped classroom flips the conventional homework-first, discussion-later structure, gamifying classes is innovative and entertaining. In-class use of synchronous and asynchronous learning. For instance, a teacher might meet with students for the first 15 minutes of class to go over concepts before sending them out to do their work as they can. sharing of resources. The course materials are made to be shared and accessed from any location.

VLE can also be used as a multimedia tool for removing abstractness of chemistry and as instructional materials in teaching and learning. Additionally, by incorporating computers and the Internet into the educational process, it improves students' learning experiences (Pem, Dorji, Tshering &

Dorji, 2021). The main elements of a VLE are curriculum mapping (dividing the curriculum into manageable chunks for assessment and assignment), student tracking, online support for teachers and students, electronic communication (email, threaded discussions, chat, Web publishing), and links to external curriculum resources on the Internet. A teacher or student identification number (ID) is given to each individual in the VLE. The teacher/ facilitator sees what a student/learner sees, but the teacher can create or modify curriculum content and track student performance in addition to seeing what students can see. VLE allows teachers, students and parents to use various mobile devices such as smartphones and tablets to access it. Students can answer questions given by teachers at their home using smartphones or computers (Hamid, Peng, Shaharom, Ter, & Raman, 2018; Alves, Miranda, & Morais, 2017).

There are a number of commercial VLE software packages available, including Blackboard, google classroom, WebCT, EdModo, among others. Allen and Seaman (2013) argued that providing teachers with training and experience in online teaching is of great importance to the future of teaching and learning in this 21<sup>st</sup> century as the number of online courses is increasing. Sheffield, McSweeney, and Panych (2015) found that the graduate future teachers experienced increased awareness, competence and confidence toward teaching via virtual learning environment. An assessment of Awareness Level of E-Learning Classroom Strategies of University Lecturers was conducted by Bianca et al. in 2021. It was found that the University Integrated Science Lecturers were partially aware of the e-learning tools as well as the strategies to facilitate e-learning. Some studies found that there is a problem of lack of awareness of ICT facilities by teachers particularly in underdeveloped countries and the facilities are not utilized (Tella et al, 2017; Amusa & Atinmo, 2016; Agbatogun, 2013)

According to a study by Alves, Miranda, and Morais (2017) on the Impact of Virtual Learning Environments on Students' Performance, there are generally encouraging signs about students' access to virtual learning environments and the relationship between such access and their performance. Awogbami (2020) reported that teachers on average achieved a significant level of knowledge transfer through the use of ICT facilities. This will facilitate integrating virtual learning environment into teaching and learning.

The area of this study (Borno state) has been experiencing Boko Haram insurgency for more than a decade and schools have not been properly run. And sometimes the secondary schools were closed by force. In order to reduce school closure due to the insurgency there is a need to adopt strategy such as teaching and learning via Virtual Learning Environment that will allow the students and teachers to interact without physical contact. Thus, this study tries to examine the level of awareness of chemistry teachers on Virtual Learning Environments as a platform for teaching and learning during insurgency and a tool for removing abstractness of some chemistry concepts.

### Purpose of the study

1. To determine level of the chemistry teachers' awareness of the available Virtual Learning Environments in teaching and learning of chemistry
2. To determine the strategies adopted by chemistry teachers in adopting Virtual Learning Environments in teaching and learning of chemistry
3. To determine the level of chemistry teachers' utilization of Virtual learning Environments in teaching and learning

### Research Questions

1. What is the level of chemistry teachers' awareness of the virtual learning environment's tools for teaching and learning?
2. What are the strategies adopted by the chemistry teachers in adopting virtual learning environments in teaching and learning of chemistry?
3. What is the level of chemistry teachers' utilization of virtual learning environments in teaching and learning?

### Methods

The study adopted a descriptive survey research design. A descriptive survey research design is the

research design that aimed at collecting data for the purpose of describing the characteristics, features or facts about a population (Ezeh, 2015: Cresswell, 2012). The population of the teachers is 44 chemistry teachers in government-owned secondary schools in Maiduguri Metropolis, Borno state. All chemistry teachers formed the sample of the study and this is based on the recommendation of Moneer (2017), who stated that when the population size is small or when a census study is the focus of the researcher, the whole population can be used for such study.

The Chemistry Teachers' Awareness and Utilization of Virtual Learning Environment (CTAUVLE) was used as the instrument for data collection. CTAUVLE consist of two sections, sections A and B. Section A solicited information on the biodata of the respondents while section B solicited information on the research questions.

The items on level of awareness on Virtual Learning Environment facilities and strategies to facilitate teaching and learning of chemistry were structured on a 4-point Likert scale: Very Much Aware (VMA) – 4 points; Aware (A) – 3 points, Not aware (NA) – 2 points; Very Much Not Aware (VMNA) – 1 point while items on utilization of Virtual Learning Environment Facilities in teaching and learning of chemistry were structured on a four point Likert's scale of: Very Much Utilized VMU – 4 points, Utilized (U) – 3 point, Not Utilized (NU) – 2 points, and Very Much Not Utilized (VMNU) – 1 point. The instrument was face validated by the experts from Chemistry Education and Measurement and Evaluation units of the Department of Education, University of Maiduguri. The comments and suggestions of these experts were incorporated into the final draft of the instrument.

The instrument was trial tested on 20 chemistry teachers drawn from private secondary schools in Maiduguri Metropolis. The Cronbach alpha reliability index of 0.72 was established and this indicates that the instrument is reliable and appropriate for the study.

### Results

**Table 1: Descriptive statistics of the chemistry teachers' level of awareness of virtual learning tools**

S/N	Item Statement	Mean	SD	Decision
1	Internet tools such as websites, blog	1.40	0.50	VMNA
2	Computers/Phones/smartphones	3.20	0.58	A
3	Google collections such as Google forms, Doc, slides etc)	1.45	0.7	VMNA
4	Microsoft Office such as MS Word, PowerPoint, Excel, Access, among others)	2.80	1.0	A

5	Statistical packages e.g SPSS, AMOS, R	3.0	0.8	A
6	WhatsApp, Facebook, Twitter, Telegram	3.58	1.2	VMA
7	Internet search engines e.g google, Amazon etc	3.60	0.92	VMA
8	video conference apps such as Zoom, Skype, Google Meet etc	1.55	1.30	NA
9	Virtual classroom apps such as Google classroom, EdModo, Edulastic, Eduplanet etc	1.45	0.57	VMNA
<b>Cluster Mean</b>		<b>2.27</b>	<b>0.84</b>	<b>NA</b>

Table 1 displayed the level of chemistry teachers' awareness on some of the virtual learning environment tools. Item 6 and item 7 have mean scores within the range of 3.50 – 4.00 which is very much aware. This implies that the chemistry teachers are very much aware of the availability of those items. Item 2, item 4 and item 5 have mean scores of the range of 2.50-3.49 which is agree. This suggests that the chemistry teachers are informed about the availability of these Virtual Learning Environment Facilities. Item 4 and

item 8 have mean score of 1.50-2.49 which fall within the range of not agree. This suggests that chemistry teachers are not aware of the availability of these Virtual Learning Environment tools. Item 1, item 3 and item 9 have mean scores that fall within the range of 1.0-1.49 i.e very much not aware (VMNA), This shows that chemistry teachers are very much not aware of the availability of these facilities. Cluster has a grand mean of 2.27 which falls under the mean rating of not aware.

**Table 2: Descriptive statistics of the strategies employed by chemistry teachers to facilitate the use of Virtual Learning Environment for teaching and learning**

S/N	Item Statement	Mean	SD	Decision
1	Internet tools	1.50	0.50	NA
2	Computer/iPad/Tablet/smart phones etc	1.65	0.60	NA
3	Google collections such as Google forms, Doc, slides etc	1.80	0.9	NA
4	Microsoft Office such as MS Word, PowerPoint, Excel, Access, etc	3.0	1.10	A
5	Statistical packages e.g SPSS, AMOS, R	1.90	0.9	NA
6	WhatsApp, Facebook, Twitter, Telegram	3.70	1.3	VMA
7	Internet search engines e.g google, Amazon etc	3.45	1.2	A
8	video conference apps such as Zoom, Skype, Google Meet etc	1.80	1.0	NA
9	Virtual classroom apps such as Google classroom, EdModo, Edulastic, Eduplanet etc	1.45	0.57	VMNA
<b>Cluster Mean</b>		<b>2.25</b>	<b>0.89</b>	<b>NA</b>

Table 2 displayed the level of chemistry teachers' awareness on some of the virtual learning environment tools. Items 4 and 7 had mean ratings within the range of 2.50-3.49 (A) which implies that the teachers are aware of these tools for facilitating teaching and learning via Virtual Learning Environment. Items 1, 2, 3, 5 and 8 have mean rating of 1.50-2.49 (NA) which means that the chemistry teachers are not aware of these for facilitating teaching and learning through Virtual Learning Environment. Items 6 and 9 have

mean rating within the range of 1.0-1.49 (VMNA), This shows that the chemistry teachers are very much not aware of these facilities as strategies for teaching and learning via virtual learning environment. The items have a cluster mean of 2.25 which falls under the mean rating of not aware. This indicates that the chemistry teachers are generally not aware of these facilities as strategies for facilitating teaching and learning through Virtual Learning Environment.

**Table 3: Descriptive statistics of the chemistry teacher's utilization of Virtual learning Environment for teaching and learning**

Item Statement	Mean	SD	Decision
1 Internet tools	1.30	0.90	VMNU
2 Computer/iPad/Tablet/smart phones etc	1.75	0.47	NU
3 Google collections such as Google forms, Doc, slides etc	1.25	1.0	VMNU



4	Microsoft Office such as MS Word, PowerPoint, Excel, Access, etc	3.4	1.2	U
5	Statistical packages e.g SPSS, AMOS, R	1.75	0.80	NU
6	WhatsApp, Facebook, Twitter, Telegram	3.70	1.3	VMU
7	Internet search engines e.g google, Amazon etc	3.58	1.2	VMU
8	video conference apps such as Zoom, Skype, Google Meet etc	2.1	1.1	NU
9	Virtual classroom apps such as Google classroom, EdModo, Edulastic, Eduplanet etc	1.37	0.60	VMNU
<b>Cluster</b>		<b>2.24</b>	<b>.95</b>	

Table 3 displayed the level of chemistry teachers' utilization of some of the virtual learning environment tools. Items 6 and 7 have mean ratings within the range of 3.50 – 4.00 (VMU). This means that the chemistry teachers utilize these tools for teaching and learning. Item 4 have mean rating within the range of 2.50-3.49 (U) which implies that the chemistry teachers utilized these tools for teaching and learning. Items 5 and 8 have mean rating of 1.50-2.49 (NU) which means that the chemistry teachers do not utilize these tools for facilitating teaching and learning. Items 1, 3 and 9 have mean rating within the range of 1.0-1.49 (VMNU), This shows that chemistry teachers do not very much not utilize these facilities for teaching and learning of chemistry via virtual learning environment. The items have a cluster mean of 2.24 which falls under the mean rating of not utilize. This indicates that the chemistry teachers do not utilize these tools for facilitating teaching and learning through Virtual Learning Environment.

## Discussion

One of the major findings of this study is that chemistry teachers are much aware of the availability of internet search engines and social media platforms as virtual learning environment tools, are aware of the availability of computers and smart phones, Microsoft Office such as MS Word, PowerPoint, Excel, Access as tools for virtual learning environments, and are not aware of google collections such as DOC, Form etc, video conference apps, e.g Zoom, skype etc and virtual learning environment softwares such as EdModo, Google Classroom, Edulastic etc. as Virtual learning Environment Tools for teaching and learning of chemistry. The chemistry teachers are not aware of the aforementioned facilities for teaching and learning of chemistry in virtual form could be attributed to the fact that the facilities require information and communication skills which most of them do not possess them. In addition, the instability of the chemistry teachers due to Boko Haram insurgency might have been also attributed to their unawareness

of these facilities. This result is in agreement with the result of the study carried out by Bianca et al (2021), Tella et al, (2017), Amusa and Atinmo, (2016) and Agbatogun, (2013) who found that teachers are not aware of the ICT facilities.

The result of this study reveals that chemistry teachers are aware of internet search engines, social media and Microsoft collections as strategies for facilitating teaching and learning through Virtual Learning Environment. However, they are very much not aware of Statistical packages e.g SPSS, AMOS, R, Internet tools, video conference apps, e.g Zoom, skype etc and virtual learning environment softwares such as EdModo, Google Classroom, Edulastic. This could be attributed to teachers' inability to access internet due to lack of data, electricity, skills for operating the VLE facilities.

This finding is in disagreement with the finding of Bianca et al (2021) who found that integrated lecturers are aware of the ICT facilities as the strategy for facilitating e-learning training. The reason for the disagreement in the finding of this study and Bianca et al's study might be attributed to the exposure of participants in the studies. The present study was conducted with the chemistry teachers who do not have skills and exposure compare to the lecturers who teach in tertiary institutions.

Another interesting finding of this study is that chemistry teachers do not utilize most of the Virtual Learning Environment tools in teaching and learning. The teachers only utilize Microsoft office packages such as MS word, Excel, etc and internet search engines such as google, Amazon, among others. The few tools utilised by the teachers could be attributed to the accessibility of these facilities by everyone. Internet search engines, for instance, google is the most used search engine which is known by almost everybody.

The result of this study agrees with the finding of the study carried out by Tella et al, (2017), Amusa and Atinmo, (2016) and Agbatogun, (2013) who reported that ICT facilities were under-utilized for teaching and



learning by the teachers. This could be attributed to the lack of awareness and technical know-how of the teachers on the availability and capacity of ICTs in teaching and learning of chemistry.

### Conclusion

In this study, chemistry teachers' awareness and utilization of Virtual Learning Environment tools was explored with the aim of motivating teachers to teach virtually to reduce school closure and easing some chemistry concepts. This in turns, ameliorate the issue of unsatisfactory achievement in the chemistry. The study revealed that chemistry teachers are not aware of the available Virtual Learning Environment Tools, and do not adopt them as strategies for facilitating teaching and learning. Furthermore, it was revealed that VLE tools are under-utilized by chemistry teachers. Therefore, to reduce frequent school closure due to insurgency and ameliorate unsatisfactory achievement in chemistry, all educational stakeholders (i.e., government officials, school principals, and chemistry teachers) should devise a vigorous array of strategies to ensure adequate provision and utilization ICT/VLE tools for chemistry instruction in the secondary schools

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