AWARENESS AND EXTENT OF UTILIZATIONOF ONLINE INSTRUCTIONAL RESOURCES BY SECONDARY SCHOOL CHEMISTRY TEACHERS IN ONITSHA EDUCATION ZONE, ANAMBRA STATE

Dr Evelyn Obianuju Egolum; Dr Rebecca E. Chikendu; Chidimma H. Okonkwo
-eo.egolum@unizik.edu.ng; –re.chikendu@unizik.edu.ng; –okonkwo.ch@unizik.edu.ng
Department of Science Education, Nnamdi Azikiwe University, Awka

Abstract

Resources such as online instructional resources enhance students learning experiences and promote a deeper understanding of the concepts. The study investigated the level of awareness and extent of utilization of online chemistry instructional resources by chemistry teachers in Onitsha Education Zone of Anambra State. Three research questions guided the study. A descriptive survey research design was adopted for the study. The sample consisted of 45 chemistry teachers selected by purposive sampling from 18 secondary schools in Onitsha Education Zone that have computers and evidence of online resources for teaching and learning. A validated questionnaire that has a reliability coefficient of 0.79 using Cronbach Alpha technique was used as an instrument for data collection. The data collected were analyzed using percentages, mean and standard deviation. The findings show that the chemistry teachers used for the study were aware of some of the online instructional resources that can be used to teach chemistry such as Science direct, Encycolpaedia.com, Khan Chemistry and so on. They revealed that they are aware of some of them and so use them in teaching if available. It was recommended among others that schools and the government should train chemistry teachers to be aware of the online chemistry resources and be able to use them in teaching and learning.

Key Words: Chemistry, Online Instructional Resources, Awareness, Utilization, Online Chemistry Instructional Resources

Introduction

Chemistry can be defined as the composition, properties and uses of matter and the changes it undergoes as a consequence of the alterations in the composition of their molecules. To Itikpo, Friday & Delmang (2021), chemistry is a branch of science that deals with changes in matter. The knowledge of chemistry is important in the production of clothing and fertilizers used to increase food productivity. Chemistry plays a pivotal role in addressing global challenges such as climate change and sustainable resources (Smith & Nizza, 2022). Chemistry education plays an important role in enhancing the quality of teaching, research and development as well as ensuring that students are equipped with good knowledge to produce intensive goods and services to meet human needs for food, health care products and other materials aimed at improving the quality of life (Khanam (2018). Despite the importance and position chemistry occupies as a fulcrum on which other sciences hinge on for industrial and material development, secondary school chemistry students' achievement in SSCE of the subject in Anambra State is still not satisfactory. For instance the WEAC Chief Examiners' reports of 2018-2022 revealed general poor performance of students in the subject. This observed persistent unsatisfactory performance in chemistry could adversely affect the realization of the national goals for scientific and technological development.

Research studies have shown that several factors such as low self-efficacy and lack of self-motivation (Egolum & Mbaegbu, 2023); lack of modern chemistry textbooks and poor funding (Okunuga, 2021); lack of interest, lack of well-equipped laboratory, lack of prior knowledge of relevant mathematical concepts, overloaded curriculum and poor teaching methods employed by the

teachers in teaching (Egolum, Samuel & Okonkwo, 2021; Sibonama, 2021) are all influencing students performance in chemistry. The teaching approach/method that a teacher adopts is one of the factors that affect students' achievement in chemistry. This makes it imperative to use an approach for teaching that aims at enhancing understanding rather than promote memorization and juggling of facts. The traditional teaching methods used mainly by chemistry teachers are inappropriate today and so should be replaced with innovative ones because the students are easily exposed to the current trends in science and technology such as accessing the internet in order to enhance their knowledge and skills (Egolum & Igboanugo, 2019). This calls for innovative teaching approaches that could address the needs of the present day students (Ugwu & Nzewi, 2015) and make them actively involved throughout the lesson period. Advance in technology has brought instructional resources especially the projected and electronic materials to the forefront of the most radical tools of globalization and social development.

Instructional resources also known as instructional materials are the tools a teacher uses in teaching a lesson. According to Wikipedia (2023), instructional resources are any collection of materials including animate and inanimate objects and human and non human resources that a teacher may use in teaching and learning situations to help achieve desired learning objectives. To select instructional resources, ensure that the resources you select align with your lesson objectives, your course syllabus, your teaching philosophy, those you can handle effectively and the ones available. The resources selected also should appeal to the students in terms of reading level and style. There are different types of instructional resources and they can be grouped into two broad headings

1. Traditional resources- they include textbooks, reference books, lesson plans, workbooks, charts, flash cards, and supplementary reading materials
2. Graphic and interactive resources- they include physical objects, photographs, illustrations, charts, maps, graphs, multimedia, movies and games (Kurtz, 2021)

Instructional resources also include chalkboard, slides, science kits, magazines, slides, audio-visual aids, video disks, visual laboratory and online instructional resources. These resources help in the teaching and learning process in which both the teacher and the learner engage actively. Internet has brought a significant change in all works of life including education. The introduction of the use of internet in education has tremendously assisted teachers exposing them to a broad knowledge of their field at ease. One of the ways the internet has improved the teaching and learning process is through the use of online instructional resources thus the emergence of the World Wide Web (www) was the facilitator to online instructional resources. With the advent of computers and internet, there has been a growing cry among the teachers on loss of reading habits among students as they prefer to spend most of their time on their mobile screens (Ghodke, 2022).

Online instructional resources are any digital materials and tools that are designed to improve teaching and learning in an online or blended environment. These resources can take many forms including text-based materials, multimedia presentations, simulations, interactive activities and assessment. According to Khadijah et al, (2020), online instructional resources involves the implementation of advancements in technology, to direct, design and deliver the teaching content as well as facilitate two-way communication between students and the school. They can be accessed through various platforms and devices such as learning management systems, apps, websites and e-books. These online instructional resources can be used in teaching science subjects and in particular Chemistry. Examples of online instructional resources that can be used to teach Chemistry includes Goggle, YouTube, Khan academy, LinkedIn-learning, Organic ERS, Udemy, JOVE Science education, Microsoft teams, Zoom and Websites such as Science direct, Britannica, Wikipedia, Byjus and so on. Online instructional resources have a lot of advantages thus:

1. It can be accessed from anywhere and at any time with more flexibility in learning

2. It can be tailored to meet the learning needs and styles of individual students allowing them to learn at their own pace and in a way that works best for them.
3. It is more cost-effective than traditional textbooks and other learning resources/materials 4. It indulges in multimedia learning that is it incorporates various media such as audio, videos, interactive simulations and recordings, providing students with a more engaging and interactive learning experiences. In other words, online instructional resources are valuable tools for teachers and students providing them with more accessible, personalized and engaging learning experiences that can help them achieve educational goals.

The use of online chemistry instructional resources by chemistry teachers can have a positive impact on students' academic performance and motivation (Oyebola & Aladejana, (2018). Also Kavota & Kombal (2021) demonstrated that the use of online instructional resources enhanced students' engagement and motivation in the learning process. Some researchers such as Ogunniyi (2018) reported that a number of chemistry teachers are not computer literate in Nigeria and are not aware of most of the online instructional resources. On the other hand, Akinbola (2016) found out that most chemistry teachers in Nigeria were aware of the availability of online instructional resources for teaching chemistry but they do not actually utilize them in their teaching. It is important for chemistry teachers in Onitsha Education Zone to be aware of the availability and benefits of online instructional resources that can be used to teach chemistry so that they can utilize them effectively in the teaching and learning process. This will help to enhance the quality of chemistry educators in Onitsha Education Zone of Anambra state to be aware of the availability of different Online Chemistry instructional resources and use them in teaching. This will help to enhance the quality of Chemistry teachers in Onitsha Education Zone and thus improve students' performance in the subject.

Thus the researchers embark on this study to find out the level of awareness and extent of utilization of online chemistry instructional resources by chemistry teachers in secondary schools in Onitsha Education Zone and thus suggest strategies that will enhance their level of awareness and utilization of these resources

Research Questions

The following research questions guided this study

1. What is the level of awareness of online Chemistry instructional resources by secondary school Chemistry in Onitsha Education Zone?
2. To what extent do secondary school Chemistry teachers in Onitsha Education Zone utilize online Chemistry instructional resources?
3. What are the strategies that can enhance effective utilization of online Chemistry instructional resources by secondary school Chemistry teachers?

Research Methods

The design used for the sturdy was a descriptive research design. The area of the study was Onitsha Education Zone of Anambra State, Nigeria. The population for the study was all the chemistry teachers in the 31 secondary schools in Onitsha Education Zone. The sample size for the study was 45 Chemistry teachers drawn from 18 secondary schools out of the 31 public secondary schools in Onitsha Education Zone. Purposive sampling technique was used to select the the schools that participated for the study on the basis of those that have computers and evidence of some online resources for teaching and learning. Simple random sampling technique was used to select 45 Chemistry teachers from the selected schools.

The instrument used for data collection was a structured questionnaire titled "Awareness and Utilization of Online Chemistry Instructional Resources by Secondary School Chemistry Teachers

Questionnaire" (AUOCIRSSCTQ). The instrument had two parts A and B. Part A consisted of the bio-data of the respondents such as name of school and local government area while part B comprised of items on the level of awareness and utilization of online instructional resources by chemistry teachers in secondary schools. The instrument constructed on a four point Likert scale types of Strongly Aware (SA) = 4 points, Aware (A) = 3 points, Unaware (UA) = 2 points and Strongly Unaware (SUA) = 1 point was used to answer research question one. Also Very High Extent (VHE) = 4 points, High Extent (HE) = 3 points, Moderate Extent (ME) = 2 points and Low Extent (LE) = 1 point was used to answer research questions 2 and 3 while Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strongly Disagree (SD) = I point was used to answer research question 4

The face and content validity of the instrument was determined using three experts (two from science education department and one from educational foundation) from Nnamdi Azikiwe University Awka. The instrument was trial tested on chemistry teachers in five secondary schools in Awka Education Zone of Anambra State and a reliability coefficient of 0.83 was obtained using Cronbach Alpha technique. Administration of the instrument in the 18 schools selected for the study was done by the researchers. 45 questionnaires were administered to the respondents and were collected back and these served as the data for analysis. Percentages, mean scores and standard deviation were used to answer the research questions.

Results

The results were presented in tables according to the research questions

Table 1: Percentages and Mean Ratings of Respondents on the Level of Awareness of Online Chemistry Instructional Resources by secondary Chemistry teachers in Onitsha Education Zone

S/N	Online Chemistry Instructional Resources	SA (%)	A (%)	UA (%)	SUA (%)	Mean	Remark
1.	Science Direct.com	62.2	26.7	11.1	0	3.5	SA
2.	Khan Academy	40.3	24.4	22.2	13.1	3.0	A
3.	Chem. collective	33.1	40.0	14.6	12.3	2.9	UA
4.	Alchemies	55.6	20.0	22.2	2.2	3.3	A
5.	Merlot	46.7	28.9	4.4	20.0	3.0	A
6.	JCE Chemical Education Xchange	4.4	17.8	44.5	33.3	1.9	SUA
7.	Organic ERS	22.2	42.1	31.3	4.4	2.8	UA
8.	ACS Guide to Virtual Chemistry	15.5	15.6	37.8	31.1	2.2	UA
9.	PhET Interactive Stimulation	48.9	26.7	15.6	8.8	3.1	A
10.	JOVE science education	20.2	21,2	35.6	23.2	2.4	UA
11.	American Chemical Society	55.7	37.7	6.6	0.0	3.5	SA
12.	MIT open courseware chemistry	17.8	13.3	40.0	28.9	2.2	UA
13.	Wikipeadia.org	84..3	15.6	0.1	0.0	3.8	SA
14.	Explain everything IPAD App	17.8	22.2	44.4	15.6	2.4	UA
15.	Encyclopaedia.com	73.3	14.6	5.4	6.7	3.6	SA
	Grand mean					2.9	Aware

Data in table 1 show that items 6. 8 10 12 and 14 have mean scores below the cut-off point of 2.50 indicating that the respondents agreed that they are not aware of those online chemistry instructional

resources while items 1, 2, 3, 4, 5, 7, 9. 11, 13, and 15 with the mean scores above the cut-off point of 2.50 showing that the respondents disagreed that they are aware of the online chemistry instructional resources. The grand mean of 2.9 indicates that that the secondary school Chemistry teachers used for the study are aware of the online Chemistry instructional resources for the teaching of Chemistry.

Table 2: Percentages and Mean Ratings of the Respondents on the Extent to which Secondary School Chemistry Teachers Utilize Online Chemistry Instructional Resources in their Teaching

S/N	Online Chemistry Instructional Resources	VHE (%)	HE (%)	ME (%)	LE (%)	Mean	Remark
1.	Science Direct.com	77.8	17.9	4.3	0	3.7	VHE
2.	Khan Academy	33.3	26.7	17.6	22.4	2.6	ME
3.	Chem. collective	31.1	35.6	22.1	11.2	2.9	ME
4.	Alchemies	7.0	11.4	55.6	26.6	2.0	ME
5.	Merlot	10.0	7.8	66.7	15.5	2.1	ME
6.	JCE Chemical Education Xchange	0.0	16.1	47.4	36.5	1.9	LE
7.	Organic ERS	8.8	33.0	35.7	22.5	2.3	ME
8.	ACS Guide to Virtual Chemistry	2.1	22.5	53.1	22.3	2.0	ME
9.	PhET Interactive Stimulation	6.5	11.3	57.8	24.4	2.0	ME
10.	JOVE science education	4.2	33.5	48.9	13.4	2.3	ME
11.	American Chemical Society	8.7	15.6	46.9	28.8	2.0	ME
12.	MIT open courseware chemistry	18.0	6.5	53.3	22,2	2.2	ME
13.	Wikipeadia.org	71.2	15.6	6.7	6.6	3.4	HE
14.	Explain everything IPAD App	11.0	22.3	55.4	13.1	2.4	ME
15.	Encyclopaedia.com	48.7	28.9	15.8	6.5	3.2	HE
	Grand Mean					2.47	LE

Data in table 2 reveals that the chemistry teachers used for the study utilize very few online chemistry instructional resources to a very high extent such as Science direct (77.8%), they utilize Wikipaedia.org (71.2%) and Encyclopaedia.com (48.9%) to a high extent but they utilize most of them to a low extent such as MIT open courseware chemistry, American chemical society, ACS guide to virtual chemistry etc hence their grand mean was 2.47 indicating that the Chemistry teachers used for the study do not utilize the online Chemistry instructional resources to a high extent

Table 3: Mean Scores and Standard Deviations (SD) of Respondents on the Responses of Secondary School Chemistry Teachers on the Strategies for Effective Utilization of Online Chemistry Instructional Resources

S/N	ITEMS/ STRATEGIES	MEAN	SD	DECISION
1.	Teachers should get more students to come to office hours and be available for those of them that need help	2.56	1.26	Agreed
2.	Teachers should use tutorial to teach students how to use videos created for them by the teachers	3.04	1.03	Agreed
3..	There should be realistic expectations for online classes such as how much time an average student would need to put in each week to be successful	2.80	1.37	Agreed
4.	Start by keeping the contents simple and just focus on the essentials, then give students workload and break the units into episodes where each episode may take them one week to complete	2.93	1.38	Agreed

5. Teachers can give students card sorts because as they sort the random pile of cards, they are retrieving information and making connections between different representations of the concept	3.30	1.19	Agreed
6. Online activities should be designed to be completed synchronously in collaborative teams	2.66	1.25	Agreed
Grand Mean	2.89		Agreed

Data in table 3 reveals that the chemistry teachers used for the study agreed that all the strategies enumerated in the table are among the strategies that can make online chemistry teaching effective. The grand mean of 2.89 indicated they agreed most of the strategies in table 3 can improve Chemistry teachers awareness and use of instructional strategies in teaching and learning.

Discussion of Findings

Results of the study on table 1 shows that chemistry teachers used for the study were aware of most of the online chemistry instructional resources such as Science direct, Wikipaedia.org, Khan Academy etc. This might be because most of the teachers used are teaching in urban schools and their schools had evidence of online facilities. It might also be because of outbreak of Covid-19 in 2020 so most schools started using online resources in teaching. This finding is in disagreement with the findings of the study done by Abdullahi (2017) who found out that chemistry teachers used for his study were not aware of most of the online chemistry instructional resources may be because most of the teachers used were not computer literate. However some of the chemistry teachers used for the study agreed that they were not aware of some of the online chemistry instructional resources such as JSCE chemical education xchange, Explain everything IPAD, MIT open courseware etc. It was found out that those chemistry teachers were not even computer literate and this is in agreement with the findings of Ogunniyi (2018) who reported that a number a number of teachers were not computer literate and so were not aware of online instructional resources

Findings from research question 2 shows that chemistry teachers used for the study utilized only three of the online instructional resources mentioned above to a high extent in their teaching and the utilize most of them to a moderate extent and some to very low extent. This agrees with the findings of Akinbola (2016) who reported that most teachers in Nigeria were aware of the availability of online instructional resources for teaching chemistry and they do not actually utilize them in their teaching. Also Hamza et al (2024); Dogura & Dede (2021) reported that physics teachers in Kano state do not properly utilize the available ICT resources they have in their teaching. The chemistry teachers do not utilize most of the online chemistry instructional resources in their teaching because they do not know them or their schools have no steady available and accessible internet services to enable them use those resources.

Findings from research question 3 reveals that for effective utilization of online chemistry instructional resources, teachers should use tutorial to teach students how to use videos created by the teachers for online class; they should have expectations students should fulfill for each week by giving them workload for each week; they should keep the contents simple and allow collaboration among the students during the online teaching. This is in agreement with the suggestions given by Culles (2020) that teachers in an online class should provide realistic expectations for students and the online activities should be completed synchronously in collaborative terms.

Conclusion

Based on the findings, it was concluded that teachers teaching chemistry in secondary schools should use online chemistry instructional resources in their teaching because it helps to enhance their students learning and promote a deeper understanding of the subject. The use of online instructional resources is a valuable tool for teachers and students providing them with learning experiences that can help them achieve their educational goals and it has a positive impact on students' academic performance and motivation.

Recommendations

Based on the findings of the study, the following recommendations were made

1. Secondary schools teachers particularly Chemistry teachers should be advised to use available internet facilities and schools should ensure accessibility of online instructional resources to both teachers and students to enable them have access to online instructional resources
2. The federal and state ministries of education should create awareness about the usefulness of online instructional resources and make sure that they are used in teaching in both secondary and tertiary institutions
3. School administrators and professional bodies such as Science Teachers Association of Nigeria (STAN) should periodically organize workshops, conferences, webinars and seminars that will enlighten teachers on the effectiveness of online instructional teaching and how to use them in their teaching
4. Teacher training institutions should ensure they utilize online instructional resources in teaching prospective teachers so that they can use them effectively when they start their own teaching

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