UNIZIK ORIENT JOURNAL OF EDUCATION

Vol. 12 No. 1 September, 202 ISSN: 0794-9525

TEACHERS' COMPETENCE IN THE USE OF ICT FOR CHEMISTRY INSTRUCTION IN NSUKKA LOCAL GOVERNMENT AREA IN THE PERIOD OF SOCIO-POLITICAL AND ECONOMIC UNCERTAINTY

[1]Onah, Anthonia Ebere (Ph.D), [2]Nwafor, Stephen Chinedu (Ph.D) and [2]Nnoli, Juliana Nkiru (Ph.D)

[1]Department of Science Education, University of Nigeria, Nsukka, Enugu State, Nigeria

[2]Department of Science Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria

Vol. 12 No. 1 September, 202 ISSN: 0794-9525

Abstract

The study investigated teachers' competence in the use of ICT for Chemistry instruction in Nsukka Local Government Area of Enugu State in the period of socio-political and economic uncertainty. A survey research design was adopted for the study. Three research questions guided the study. The population comprised 33 Chemistry teachers who also formed the sample size. The study used a questionnaire titled "Questionnaire on Chemistry Teachers Competence on the Use of Information Communication Technology (CTCIUICT)" as the instrument for data collection. Cronbach Alpha method was used for testing the reliability of the instrument and a reliability index of 0.93 was obtained. Mean and standard deviation were used to analyse the data obtained. The findings revealed that Chemistry teachers are not competent in the use of ICT, as they are incompetent in the use of chemDraw and chemSketch to draw chemical structure, use animation and spreadsheet softwares, use of powerpoint, excel, virtual softwares for chemistry practical among others. However, they are competent in the use of word processor, smartphones, printer and laptop to make lesson notes among others findings. Based on the findings, the researchers recommended among other things that Chemistry teachers should be regularly trained in the use of ICT in the teaching and learning of Chemistry for their preparation in a period of socio-political and economic uncertainty.

Keywords: Teachers ICT Competence, Chemistry Instruction, socio-political and economic uncertainty

Vol. 12 No. 1 September, 202 ISSN: 0794-9525

Introduction

The past 20 years in Nigeria have witnessed different socio-political and economic uncertainties. From the period of militancy in the Niger-Delta, to the havoc caused by the Bokoharam terrorist and the recent menace of the Unknown gunmen in South-East, Nigeria. According to Verkhivker (2016), economic and political uncertainty increases social security spending and presents the most uncertainty for financial markets leading to slower economic growth. This economic slowdown Verkhivker maintained naturally manifests itself into slower productivity, uncertainty in labour markets and the trajectory of economic growth have important effects on the decision-making of voters. Socio-political and economic uncertainties have lead to the closure of schools so many times in Nigeria, thereby, leading to the disruption of school program and the quest for Nigeria to join the developed nations of the world. The development of the country cannot be achieved without adequate and effective Chemistry instruction.

Chemistry is a branch of science that deals with the composition, structure, and properties of substances and of the transformations that they undergo. All substances, whether they are created artificially or naturally, are made up of one or more of the roughly 100 different types of atoms known as elements. Atoms are the fundamental building blocks of chemical substances, and are made up of more basic particles. Chemistry, therefore, is the study of various atoms, molecules, crystals and other aggregates of matter whether in isolation or combination which incorporates the concept of energy and entropy in relation to spontaneity of chemistry process (Nnoli, 2022).

Chemistry is a natural science subject that is vital for preparing and producing scientists and technologists which are essential for technological breakthrough and national development. Nwafor, Ezeanya and Onuigwe (2024) defined Chemistry as the study of matter, its composition, characteristics and reactions. It involves anything about matter. According to Ojukuku (2010), Chemistry is a branch of science that deals with the study of matter; its structure, composition, properties and the changes it undergoes. Chemistry meets the majority of a country's labor needs. In addition to being fundamental to many other scientific fields like astronomy, geology, paleontology, biology, and medicine, chemistry is required to comprehend the natural world. Chemistry is a subject that man may learn about and understand, to assist him make judgments about a variety of issues that impact him, his community, and the rest of the world (Nwafor, Ogbonna & Agugu, 2022). Our basic needs for food, clothing, shelter, energy, health, and clean air, water, and soil are all dependent on chemistry. Thus, it is impossible to overstate the role that chemistry plays in a country's advancement in science, technology, and economy. In order to provide effective and efficient chemistry education and instruction, particularly in our secondary schools, a strong foundation is required, using Information and Communication Technology (ICT) as specified in the curriculum.

Chemistry instruction refers to the teaching and learning of knowledge pertaining to the field of Chemistry. According to Aji (2022), Chemistry instruction is the education involving the teaching and learning of Chemistry. It plays a significant role in improving 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. It is focused on disseminating information about the characteristics, elements, changes, and interactions of matter. Since Chemistry promotes scientific literacy, Baidoo (2023) opined that effective Chemistry instruction develops students' critical thinking and problem-solving skills that are necessary for research and innovation, using different technologies that can

benefit society as a whole. Current educational policy as seen in the Federal Republic of Nigeria (FRN) suggested that chemistry instruction should be taught using ICT in order to meet the fast technological developing world (Federal Ministry of Education, 2014). As there is a campaign on the use of ICT in education all over the world. Moreover, Nwafor, Ibe and Muoneke (2022) and Khanam (2018) averred that Chemistry instruction should be made more relevant by the teachers using ICT in order to better motivate their students and improve their interest in the subject. This implies that the use of ICT could help to motivate and enhance students' interest in Chemistry. Also, Coleman, Gibson, Cotten, Howell-Moroney and Stringer (2016) posited that the adequate use of ICT in teaching-learning process will help to create a learner centred and more interactive environment and thus making the teachers facilitators of the transfer of knowledge.

Information and communications technologies (ICTs) are resources used to transmit, store, create, share or exchange information. According to Nwafor, Ogbonna and Agugu (2022), "Information and Communications Technology (ICT) refers to technology which can be hardware or software used in gathering, accessing, storing and communicating information to achieve a given purpose". According to Kwache (2017), ICT is a broad word that covers any communication device or application, including satellite systems, radios, televisions, cell phones, computers, networks, hardware, and software, among other things, as well as a variety of related devices and applications. The findings of Al-Hariri & Al-Hattami (2017) and Ghavifekr & Rosdy (2015) shows that there is a strong correlation between students' use of technology, engagement, and academic success. Additionally, technology use positively affects students' methods of thinking. Ellermeijer and Tran (2019) further state that, in comparison to traditional teaching methods, the use of ICT in Chemistry instruction enhances the quality of knowledge and makes it more applicable, less challenging, and more tied to real-world problems. Hence the need of ICT as a tool which can enhance students' knowledge as well as learning experience and prompt the need for more scientific investigations by both the teachers and the students. Consequently, Igboanugo, Igboegwu, Attah and Okonkwo (2020) stressed the need for Chemistry teachers to ensure the integration of ICT in the teaching of Chemistry instruction for effective curriculum delivery. Hence, there is need for chemistry teachers to be competent in the use of ICT for Chemistry instruction.

Competencies are the knowledge, skills, abilities, and behaviors that supports both individual and organizational performance. Poelmans, Truyen, and Stockman (2012) describe teachers' competency as having a high degree of proficiency in using a relevant body of information to influence predetermined learning outcomes in addition to their understanding of that body of knowledge. Therefore, a teacher's competencies are the abilities and knowledge that enable them to successfully accomplish the declared objectives of education. It is a crucial ability that plays a pivotal role in bridging the so-called digital divide. Thus, in order to be a proficient teacher, one must possess the necessary abilities, disposition, and knowledge as well as the ability to understand the issue in its context and have a repertory of potential courses of action. A significant difference can be achieved if they are adequately trained in every action that is feasible within their repertory. Notwithstanding their level of education, teachers might become more competent in using ICT through utilization, experience, and their overall capacity for learning and adaptation. For ICT to be used effectively to teach and learn chemistry in secondary schools, there are some areas in which chemistry teachers need to be extremely proficient. These areas include computer booting, internet, animation, PowerPoint, MS Excel, Microsoft word, computer simulations,

Chemsketch, ChemDraw, interactive whiteboard, projector, desktop, laptop, smart phone, printer etc (Naah & Mayeem, 2020).

Most science instructors are capable of using ICT to teach science subjects, according to Gideon and Ogologo (2021). In the words of Buseri (2010), in order to keep up with the swift advancement of science and technology, it is necessary to have teachers who are not only well-versed in their subjects but also have the flexibility to carry out their responsibilities in a variety of ways including the use ICT. Hence, the introduction of ICT in teaching and learning in secondary schools. Most Chemistry teachers show less interest in the use of ICT in chemistry instruction according to Nwafor, Ibe and Muoneke (2020) which could be due to their poor competency, hence, they do not use it in chemistry instruction. Moreover, Odukwe and Nwafor (2022) and Onyi, Njoku and Nwafor (2022) opined that chemistry teachers lay more emphasis on chemistry instruction using the convention lecture method and neglecting the practical activity methods which ICT could contribute greatly to through the teachers. This negligence and shy-away attitude from activity-oriented method of teaching has led to abstraction which makes the student less active in class and more prone to rote memorization. Therefore, chemistry teachers need to adopt the use of ICT and be competence in its use in order to increase students' achievement and interest in the subject especially in a period socio-political and economic uncertainty. Teachers' ICT competence is therefore a priority for effective learning of chemistry, hence, the need for this study.

Purpose of the Study

The main purpose of the study was to investigate teachers' competence in the use of ICT for Chemistry instruction in Nsukka Local Government Area in the period of socio-political and economic uncertainty. Specifically, the study sought to:

1. Determine Chemistry teachers' competences in the use of ICT for Chemistry instruction.
2. Examine the problems of chemistry teachers in the use of ICT for Chemistry instruction in secondary schools.
3. Find out the solutions to the problems of chemistry teachers in the use of ICT for Chemistry instruction?

Research Questions

The following research questions guided the study:

1. What are the Chemistry teachers' competences in the use of ICT for Chemistry instruction?
2. What are the problems of chemistry teachers in the use of ICT for Chemistry instruction in secondary schools?
3. What are the solutions to the problems of chemistry teachers in the use of ICT for Chemistry instruction?

Method

The study adopted a descriptive survey research design. The population of the study consisted of 33 Chemistry teachers in all the government owned secondary schools in Nsukka Local Government Area of Enugu State. The entire 33 Chemistry teacher were used for the study. The instrument for data collection was titled "Questionnaire on Chemistry Teachers Competence on the Use of Information Communication Technology (CTCIUICT)". The instrument comprised of three sections representing the three purposes of the study. Section A consisted of the 14 items while section B was made up of 9 items and section C comprised 8 items, all based on the four point rating scale of Strong Agree (SA) – 4 points; Agree (A) –

3 points, Disagree (D) – 2 points and Strongly Disagree (SD) – 1 point. The instrument was validated by three experts two from Chemistry Education Unit and one expert from Measurement and Evaluation Unit all from the Department of Science Education, Faculty of Education, University of Nigeria, Nsukka, Enugu State. The reliability index of 0.93 was obtained using Cronbach Alpha. The research questions were answered using mean and standard deviation. A benchmark mean of 2.50 was accepted while 2.49 and below were rejected. Therefore, any item with a mean rating of 2.50 and above indicated a positive response or agreement while items with mean rating of 2.49 and below indicated a negative response or disagreement.

Results

Research Question One

What are the Chemistry teachers' competences in the use of ICT for Chemistry instruction?

Table 1: Mean ratings and standard deviation of responses of Chemistry teachers' competence in the use of ICT for Chemistry instruction

S/N	Item	Mean	SD	Remark
1.	Able to use word processor to create, edit and produce a simple document for a specific purpose(e.g. Ms word)	3.21	0.70	Agree
2.	Using presentation software(Ms PowerPoint) for lesson delivery	1.76	0.61	Disagree
3.	Using animation software (e.g. Ms media and flash, author-wave director) to create animation	1.76	0.61	Disagree
4.	Using spreadsheet software to make charts, graphs and tables	1.73	0.72	Disagree
5.	Using simulation software for virtual chemistry practical activities	1.56	0.52	Disagree
6.	Using chemDraw to draw chemical structures	1.00	0.40	Disagree
7.	Using chemSkech to draw structures of molecular shapes and chemical bonding in 2D and 3D	1.00	0.40	Disagree
8.	Using a spreadsheet(Ms Excel)to do a simple calculations	1.52	0.51	Disagree
9.	Using ICT tools to conduct tests and examination	2.30	1.05	Disagree
10.	Using interactive white board to teach effectively	1.97	1.07	Disagree
11.	I can use a projector to display notes visibly in the class	2.20	0.97	Disagree
12.	I can use laptop to make notes for lessons	3.48	0.62	Agree
13.	I can use a smartphone to access information online	3.45	0.63	Agree
14.	I can use printers to print texts, graphics and diagrams	3.39	0.56	Agree
	Total	**2.21**	**0.68**	**Disagree**

The results in Table 1 show that chemistry teachers are not competent in the use ICT for chemistry instruction. The finding shows that out of the 14 items listed, that the Chemistry teachers were only competent in 4 items namely the use of word processor, smartphones and laptop to make lesson notes as the mean scores were above the mean benchmark of 2.50. Moreover, the Table shows that Chemistry teachers are not competent in the use of chemDraw and chemSketch to draw chemical structure, use animation and spreadsheet softwares, use of PowerPoint, excel, use of virtual softwares for chemistry practical and use of ICT tools to conduct test and examination, use of projector to display notes visibly in the class, use printers to print texts, graphics and diagrams as there mean score were below the mean benchmark of 2.50.

Research Question Two

What are the problems of chemistry teachers in the use of ICT for Chemistry instruction in secondary schools?

Table 2: Mean ratings and standard deviation of the problems of chemistry teachers in the use of ICT for Chemistry instruction in secondary schools

S/N	Item	Mean	SD	Decision
15.	Lack of sufficient ICT skill training opportunities	3.48	0.51	Agree
16.	Lack of ICT learning equipment, tools and resources in secondary schools	3.42	0.56	Agree
17.	Lack of expert ICT operators	3.52	0.66	Agree
18.	Poor/low-speed internet services in secondary schools	3.45	0.56	Agree
19.	Frequent power disruption	3.55	0.57	Agree
20.	Lack of softwares	3.52	0.51	Agree
21.	Insufficient time to engage in ICT training	3.52	0.62	Agree
22.	Teachers reluctant towards teaching with new technology	3.48	0.51	Agree
23.	Lack of confidence to use ICT for teaching	3.52	0.51	Agree

Table 2 shows that items 15 – 23 were above the mean benchmark of 2.50 and hence were all accepted as the problems of chemistry teachers in the use of ICT for Chemistry instruction in secondary schools. This indicates that lack of sufficient training skill opportunities, lack of ICT learning equipment, tools, and resources, lack of expert ICT operators, poor or low-speed internet services, frequent power disruption, lack of softwares, insufficient time to engage in ICT training, teachers reluctance towards teaching with new technology and lack of confidence to the use of ICT for teaching are the problems of chemistry teachers in the use of ICT for Chemistry instruction in secondary schools.

Research Question Three

What are the solutions to the problems of chemistry teachers in the use of ICT for Chemistry instruction?

Table 3: Mean ratings and standard deviation of the solutions to the problems of chemistry teachers in the use of ICT for Chemistry instruction

S/N	Item	Mean	SD	Decision
24.	Provision of more ICT laboratory with more tools and equipment for teaching and learning	3.52	0.51	Agree
25.	Having a constant power supply	3.48	0.57	Agree
26.	Course loads should be reduced to create time for ICT skill training	3.52	0.51	Agree
27.	Teachers should be open-minded towards teaching with new technology	3.55	0.50	Agree
28.	Purchase of high bandwidth with high internet speed	3.58	0.61	Agree
29.	Purchase of genuine software and regular update of software	3.42	0.48	Agree
30.	Employment of expert ICT operators	3.67	0.45	Agree
31.	There should be training programmes for Chemistry teachers in the use of ICT for teaching	3.73	0.57	Agree

The result in Table 3 shows that all the items 24-31 were accepted as the solutions to the problems of chemistry teachers in the use of ICT for Chemistry instruction. This is because their mean scores are above the stated mean benchmark of 2.50. This indicates that the possible remedies to the problems faced by the chemistry teachers in the use of ICT for chemistry instruction are provision of an ICT laboratory with more tools and equipment for teaching and learning, constant power supply, teachers being open-minded towards teaching with new technology, purchasing of softwares and high bandwidth with high internet speed, employment of ICT expert and training of Chemistry teachers on the use of ICT.

Discussion

The findings of the study revealed that, chemistry teachers in senior secondary schools in Nsukka Local Government Area in Enugu State are not competent in the use ICT for chemistry instruction. The finding shows that Chemistry teachers are not competent in the use of chemDraw and chemSketch to draw chemical structure, use animation and spreadsheet softwares, use of powerpoint, excel, virtual softwares for chemistry practical and ICT tools to

conduct test and examination among others. However, they only show competency in the use of word processor, smartphones, printer and laptop to make lesson notes. This may be as a result of lack of interest by the government and Chemistry teachers towards the importance of incorporating ICT in Chemistry instruction in different States including Enugu State. The finding is against the finding of Gideon and Ogologo (2021) who reported that teachers can competently utilize the available ICT facilities for teaching Sciences to a high extent.

The findings of the study showed that, chemistry teachers are faced with a lot of problems in the use of ICT for chemistry instruction such as, lack of sufficient training skill opportunities, lack of ICT learning equipment, tools, and resources, lack of expert ICT operators, poor or low-speed internet services, and frequent power disruption and among others. This finding is in agreement with the findings of Naah, and Mayeem (2020), which started the barriers to ICT integration in teaching in the SHSs as lack of enough or limited access to computers/computer lab, non-availability of computer software, lack of time in the School schedule for integrating ICT and lack of adequate technical support. Also, the finding is in consonance with that of Nwafor, Ibe and Muoneke (2022) who reported that the use of outdated computers, lack of technical assistance, lack of time, lack of computer hardware/software, lack of electricity, broken down computers, lack of internet or slow connectivity and high cost of computer are some of the challenges of ICT application affecting effective Chemistry instruction. This finding is also in alignment with the findings of some previous researchers like (Osakwe, 2012; Abdulrazak, 2015) who reported that, poor ICT infrastructure, weak policy, a limited number of teachers who are ICT proficient, low telecommunication services penetration, inadequate funding, lack of basic infrastructure, poor network services and epileptic power supply are the challenges facing the use of ICT facilities in the teaching and learning process. It can therefore be deduced from findings that, generally a lot of challenges are facing the use of ICT in the teaching and learning of Chemistry in Nigeria as a whole.

Moreover, the findings of the study also revealed that some of the possible remedies to the problems faced by the chemistry teachers in the use of ICT for chemistry instruction are provision of an ICT laboratory with more tools and equipment for teaching and learning, having a constant power supply, teachers being open-minded towards teaching with new technology, purchasing of high bandwidth with high internet speed and among others. The findings from this study showed that both the school authority and Enugu state Educational Board should try to provide adequate ICT facilities and train teachers on the use of ICT for effective teaching and learning of chemistry in secondary schools. This finding is in agreement with the findings of Naah, and Mayeem (2020), who recommended that computer laboratories should be set up and furnished with computers and software that will enable teachers to plan and deliver their lessons effectively using ICT and that the timetable of the school should be reviewed to cater to ICT integration which teachers perceived to be time-consuming. Similarly, the finding is in agreement Siddiquah and Salim (2017) who emphasized the need for the teachers and students to acquire the needed ICT and called on the Government and school administrators to invest more in ICT.

Conclusion

The researchers therefore concluded that Chemistry teachers are not competent in the use of ICT for Chemistry instruction in Secondary Schools which would adversely affect teaching and learning in a period of socio-political and economic uncertainty. A number of factors were identified as the challenges facing the use of ICT in the teaching and learning of Chemistry which include: Lack of sufficient training skill opportunities, lack of ICT learning

equipment, tools, and resources, lack of expert ICT operators, poor or low-speed internet services, frequent power disruption. Furthermore, the researchers recommended among other things that Chemistry teachers should be regularly trained and re-trained in the use of ICT in the teaching and learning of Chemistry in secondary schools and Government should provide adequate ICT facilities in Secondary schools

Recommendations

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

1. Government should map out a sustainable strategy for a short-course training programme for teachers in the state on various ICT applications to make the teachers more useful especially in a period of socio-political and economic uncertainty.
2. Personal laptops should be provided for the teachers in order to continue learning even in a period of socio-political and economic uncertainty.
3. The various school authorities should organize regular hands-on training on the use of ICT for their teachers to enhance their ICT skills.
4. Schools should also provide constant power supply and ICT laboratories with adequate ICT tools and equipment for effective Chemistry instruction.
5. Moreso, the teachers on their part should not wait for the authorities, as personal efforts are very important if they must remain relevant in today's world of ICT.

References

Abdulrazak, A. (2015). The challenges facing the use of ICT facilities in the teaching and learning process. *International Journal of Education and Development using Information and Communication Technology, 13*(1), 32-51.

Aji, M. A. (2022). Research and chemistry education for national development. *Journal of Science Education, 23*(2), 1-4.

Al-Hariri , M. T. , & Al-Hattami, A. A. (2017). Impact of students' use of technology on their Learning achievements in physiology courses at the University of Dammam. *Journal of Taibah University Medical Sciences, 12*(1), 82-85. doi:10.2307/249008.

Baidoo, C. (2023). *The Crucial Role of Chemistry education in national development.* Retrieved from https://www.linkedin.com/pulse/crucial-role-chemistry-education-national develop ment-crispin-baidoo#:~:text=Chemistry%20education%20holds%20immense%20import ance,a%20driving%20force%20for%20progress.

Buseri,A. (2010). The role of technology in knowledge acquisition: The need for well-trained, efficient, knowledgeable and skilful teachers. *Journal of Education and Technology, 8*(2), 1-10.

Coleman, L. O. , Gibson, P., Cotten, S. R., Howell-Moroney, M., & Stringer, K. (2016). Integrating computing across the curriculum: The impact of internal barriers and training intensity on computer integration in the elementary School classroom. *Journal of Educational Computing Research, 54*(2),275-294.doi:10.1177/0735633115616645.

Ellermeijer, T., & Tran, T.B. (2019). *Technology in teaching physics: Benefits, challenges and solutions. Upgrading Physics Education to Meet the Needs of the Society*, pp. 35-67. Doi:10.1007/978-3-319-96163-7_3

Federal Ministry of Education (2009). *National policy on education.* Lagos: Nigeria Educational Research and Development Council (NERDC) Publisher

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology : Effectiveness O f ICT integration in schools. *International Journal of Research in Education and Science (IJRES),1(*2),175-191. Doi:10.21890/IJRES.23596

Gideon, O., & Ogologo, O. (2021). The integration of ICT in teaching and learning in secondary schools in Nigeria. *Journal of Educational Technology, 12*(1), 45-52.

Igboanugo, B. I., Igboegwu, E., Attah, F. O. & Okonkwo, I. G. (2020). Efficacy of integrating information communication technology (ICT) in teaching method for effective Chemistry curriculum delivery. *International Journal of Education (IJE), 2*(1), 1–10. http://iaeme.com/Home/issue/IJE?Volume=2&Issue=1

Khanam, R. (2018). Chemistry education: Importance, challenges, and solutions. *Journal of Chemistry Education, 12*(3),123-127.

Kwache, P. Z. (2017). The imperatives of information and communication technology for teachers in Nigeria higher education. *MERLOT Journal of Online Learning and Teaching, 3*(4): 359 - 399. http://jolt.merlot.org/documents/kwache.pdf

Naah, A. M. & Mayeem, B. (2020). Assessing Chemistry teachers knowledge and skills in using ICT in teaching Organic Chemistry at the senior high school in the Ashanti Region. *Journal of Education and Practice, 11*(24), 23-30.

Nnoli, J. N. (2022). Teaching chemistry through identification of science process skill involved in the production of perfume using pineapple rind. *Journal of STEM Education UNIZIK,* 5(1), 112-120.

Nwafor, S. C., Ezeanya, M. C. & Onuigwe, B. U. (2024). Effect of class-wide peer tutoring on senior secondary school students achievement in chemistry. *Edukasiana: Jurnal Inovasi Pendidikan, 3*(1), 35-45. Doi: 10.56916/ejip.v3i1.490

Nwafor, S. C., Ibe, F. N. & Muoneke, N. M. (2022). Optimizing Information and communication technology application in Chemistry learning. *Journal of Research in Instructional, 2*(2), 151-162. https://doi.org/10.30862/jri.v2i2.92

Nwafor, S. C., Ogbonna, J. N. & Agugu, C. V. (2022). An empirical study of availability and adequacy of information and communication technology (ICT) facilities in teaching and learning of Chemistry in Orumba South Local Government Area of Anambra State. *South Eastern Journal of Research and Sustainable Development, 9*(1), 1-17.

Odukwe, O. C. & Nwafor, S. C. (2022). Effect of guided-inquiry method on senior secondary school Chemistry students' academic achievement in Anambra State, Nigeria , *UNIZIK Journal of Educational Research and Policy Studies, 11*(1), 151-161. https://unijerps.org/index.php/ unijerps/article/view/228/198

Ojukuku, O. G. (2010). *Understanding Chemistry.* Ibadan: Printing Press.

Onyi, I. E. Njoku, Z. C. & Nwafor, S. C. (2022). Efficacy of problem based learning in promoting high achievement of students in Chemistry. *Journal of Critical Reviews, 09*(01), 49-57.

Osakwe, P. N. (2012). The use of ICT to enhance university education in Nigeria. *International Journal of Education, Learning and Development, 4*(5), 1-11.

Poelmans, S., Truyen, F. & Stockman, L. (2012).Competence and ICT in chemistry education. *Journal of Chemistry Education, 33*(4), 563-567.

Siddiquah, A. & Salim, Z. (2017). The ICT facilities, skills, usage, and the problems faced by the students of higher education. *EURASIA Journal of Mathematics Science and Technology Education, 13*(8), 4987-4994. https://doi.org/10.12973/eurasia.2017.00977a

Verkhivker, A. (2016). *Political and economic uncertainty: Causes, context and correctives.* Retrieved from https://bfi.uchicago.edu/news/political-and-economic-uncertainty-causes-context-and-correctives/