

PERCEPTIONS OF TEACHERS' AND STUDENTS' ON THE INTEGRATION OF ICT IN CHEMISTRY INSTRUCTION IN SENIOR SECONDARY SCHOOLS IN AWKA EDUCATION ZONE

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ABSTRACT

This study aimed to ascertain the perception of teachers and students on the integration of ICT in teaching and learning of chemistry in senior secondary schools in Awka education zone. Descriptive survey research design was used to carry out this study. The population for this study consist of chemistry Teachers and Students in the 61 public secondary schools in Awka Education Zone of Anambra State. A sample size of 20 chemistry teachers and 130 senior secondary school chemistry students were used for the study. The simple random sampling method was used to select ten (10) out of the 61 public secondary schools. Hence, in each of the five local government area of Awka Education Zone, two public secondary schools were randomly selected. From the major aims of the study, five research questions were raised and answered to achieve the purpose of this study. The instrument used for collection of data was a structured questionnaire developed by the researchers. The questionnaires contain thirty-five (35) item questions. The instrument was validated by two (2) lecturers from the Department of Science Education and one from educational foundation, Nnamdi Azikiwe University, Awka. A reliability coefficient index of 0.73 was established using Cronbach Alpha statistics. Data for the study was collected by the researcher. Data collected were analyzed using mean and standard deviation. The mean was used to answer the research questions. Results revealed that ICT improves the quality of teaching and learning of chemistry in senior secondary schools. It was concluded that the utilization of ICT increases the interest of teachers and students towards chemistry. It was then recommended that adequate ICT equipments for teaching chemistry should be provided by the ministry of education and school management.

Keywords: Perception, Teachers, Students integration, Information and Communication Technology, Chemistry, Instruction Senior Secondary School.

INTRODUCTION

Education is the totality of life experience that people acquire and which enables them cope with and drive satisfaction from living in the world. This is because it enables them to achieve social competence and optimum individual development. It is on this premise that it

is believed that the quality of a nation's education is proportional to the level of its prosperity (Osborne et al, 2020). From the beginning of time, man has strived to improve his way and quality of life. The Caveman discovered how to make and use tools, developed a logical sequence for activities and evolved processes that added to his life, the totality of the use and application of his knowledge, skills tools and materials constitute what we today describe as science and technology (Konig et al, 2022).

Science is viewed as a systematic and practical investigation of natural phenomena aimed at discovering more knowledge. It also involves the use of many practical processes of investigation and discovery. Science will continue to be of tremendous importance because of its ability to explain many natural occurrences and the central role it plays in the world's current technology development (Osborne, 2020).

Chemistry is the branch of science that deals with the properties, composition, and structure of substances. According to Nnoli (2024), notwithstanding the transformations of any substance, the energy being released or absorbed during these processes, every substance, whether naturally occurring or artificially produced, consists of one or more of the hundred-odd species of atoms that have been identified as elements. Although these atoms, in turn, are composed of more elementary particles, they are the basic building blocks of chemical substances; there is no quantity of oxygen, mercury, or gold, for example, smaller than an atom of that substance (Samuel & Okonkwo, 2021). Chemistry, therefore, is concerned not with the subatomic domain but with the properties of atoms and the laws governing their combinations and how the knowledge of these properties can be used to achieve specific purposes (Liu et al, 2022).

In senior secondary schools, theoretical teaching is accompanied by practical work in teaching and learning science. Chemistry practical constitutes an integral part of chemistry. There are various reasons for practical chemistry. It affords the learners the basic skills and scientific method of problem-solving. The knowledge obtained through practical work and experience promotes long-term memory. Teaching and learning of chemistry can benefit from using and integrating information and communication technology (ICT). However, whether and to what level of quality ICT is implemented in teaching and learning of chemistry heavily depends on the decisions teachers make for the instructional design of their lessons.

Being an essential part of the present time, Information and communication technology (ICT) significantly influences all domains of human life (Gnambs, 2021). Similarly, ICT has also transformed the education sector and turned instructional practices into more interactive and productive (Liu, 2021), as it offers various tools which are used in traditional as well as online teaching spaces and assist in building a proactive classroom environment (Jogezai et al, 2021). Technology-incorporated instructional practices not only enhance the quality of teaching but also enable students to develop their skills, boost their motivation, and enhance their knowledge and information efficiently (Enemuo and Muogbo, 2024).

ICT played a supporting role in sustaining teaching-learning activities on the one hand, while on the other hand, ICT-integrated teaching and learning provided a flexible approach and better access to learning opportunities as a substitute for face-to-face instruction (Akram, 2021). ICT-integrated instructional approaches are significant in meeting the educational needs of the learners by increasing their thoughtfulness and keeping students motivated, which is viewed as a significant predictor of students' educational growth. Enemuoh and Muogbo (2024) identified that technology-integrated learning increases the cognitive understanding and learning achievements of students. In addition, ICT-incorporated teaching-learning practices enable learners to stay connected with their instructors and peers via various social media platforms (Nnoli, 2023). It also help students resolve their academic challenges and keep them participating actively in the learning activities (Liu et al, 2021).

In this 21st century, technology has become the knowledge transfer highway in most countries. Technology integration nowadays has gone through innovations and positively changed our societies that have totally reshaped the way people think, work and live. Because of this, schools and educational institutions alike need to consider ICT integration in their curriculum. Teachers prefer those technological applications that align with their pedagogical strategies and existing beliefs about teaching and learning practices. In other words, technology use is greatly associated with teachers' perspectives regarding the nature of teaching and learning in a classroom. Taking this into account, innovative educational strategies suggest that technology integration can only be comprehended well when teachers' perspectives regarding technology use are taken into consideration (Watson and Rockinson, 2021).

Statement of the Problem

The use of ICT in teaching requires competencies on the part of the teacher and has indeed made the profession a more challenging experience and retained knowledge for a longer time. The integration of information and communication technologies into the curriculum is a crucial process in ensuring the quality of education. However, the presence of technology alone will not stimulate significant changes in a school. Teachers are an important ingredient in the implementation of ICT in education. Without the involvement of teachers, most students may not take advantage of all the available potential benefits of ICT on their own. Teachers need to actively participate in using ICT but most teachers in secondary schools have not been motivated in integrating ICT.

The tendency of using ICT in teaching and learning depends on factors such as the attitude of teachers, teachers' demography, teaching experience, and materials available (Gnambs, 2021). This determines the performance of students in chemistry, it has been a source of concern to researchers and science educators to investigate teachers' and

students' perceptions regarding the experiences they encounter while integrating ICT into the teaching and learning of chemistry.

Purpose of the Study

The main purpose of the study is to ascertain the perception of teachers and students on the integration of ICT in teaching and learning of chemistry in senior secondary schools in Awka education zone. Specifically, the study sought to find out the :

1. Available ICT equipments used in the teaching and learning of chemistry in senior secondary schools.
2. Perceptions of teachers on the use of ICT in the teaching of chemistry in senior secondary schools.
3. Perceptions of students on the use of ICT in learning chemistry in senior secondary schools.
4. Problems encountered during ICT usage in the teaching and learning process of chemistry in senior secondary schools.
5. Possible solutions to the problems encountered in integrating ICT in the teaching and learning of chemistry in senior secondary schools.

Research Questions

The following research questions have been raised to guide the study:

1. What are the available ICT equipments used in teaching chemistry in senior secondary schools?
2. What are teachers' perceptions on the use of ICT in the teaching of chemistry in senior secondary schools?
3. What are students' perceptions on the use of ICT in teaching of chemistry in senior secondary schools?
4. What are the problems encountered during ICT usage in the teaching and learning process of chemistry in senior secondary schools?
5. What are the possible solutions to the problems encountered in integrating ICT in the teaching and learning of chemistry in senior secondary schools?

METHODS

A Survey research design was used for the study. The study is carried out specifically in Awka Education Zone of Anambra State. The population for this study consists all chemistry teachers and students in the 61 public secondary schools in Awka education zone of Anambra State. A sample size of 20 chemistry teachers and 130 senior secondary school chemistry students was used for the study, making a total of 150 respondents. The simple random sampling method was used to select ten (10) public secondary schools out of the 61 public secondary schools. Hence, in each of the five local government areas of Awka Education Zone, two public secondary schools were randomly selected. Therefore, a total of

150 respondents which was the summation of 20 teachers and 130 senior secondary school chemistry students from each of the ten selected public secondary schools formed the sample of the study. The instrument used for the collection of data was a thirty-five (35) structured questionnaire developed by researchers. The questionnaire was intended to elicit the objective opinions of the respondents on their perceptions towards the integration of ICT in teaching and learning of chemistry in senior secondary schools in Awka education zone in Anambra state. The response options of the questionnaire items were arranged under two options of response. In research question one, there are “Available (A)” and “Not Available (NA)”. However, four options of response for research questions two, three, four and five. There include Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Validation of the instrument was done with the assistance of three (2) lecturers from the Department of Science Education, Nnamdi Azikiwe University, Awka. A reliability coefficient index of 0.73 was established using Cronbach Alpha statistics. The researchers went to the sample public secondary schools and administered the questionnaire to the respondents on the spot. All the filled questionnaires were retrieved from the respondents. The data collected was analyzed using mean.

Results

Research Question 1:

What are the available ICT equipments used in teaching chemistry in senior secondary schools?

Table I: Mean of the responses of the respondents on the available ICT equipment used in teaching and learning chemistry in senior secondary schools in Awka education zone

S/N	ITEMS	N	\bar{X}	REMARKS
1	Computer	150	1.81	Accepted
2	Overhead projector	150	1.57	Accepted
3	Printer	150	1.65	Accepted
4	Tablet	150	1.20	Rejected
5	Television	150	1.87	Accepted
6	CD/DVD	150	1.76	Accepted
7	Smart board	150	1.21	Rejected
8	Internet	150	1.42	Rejected
9	Laptop	150	1.50	Accepted
10	Camera	150	1.34	Rejected
11	Pen drive	150	1.27	Rejected
12	Fax machine	150	1.17	Rejected
13	Speaker	150	1.69	Accepted
14	Telephone	150	1.79	Accepted

15	CD Player	150	1.82	Accepted
Grand Total			1.54	Accepted

The data presented in Table 1 shows the response from the respondents on the available ICT equipments used in teaching and learning chemistry in senior secondary schools as shown in items 1-15. Most question items were accepted because they had above 1.5 points except for items 4, 7, 8, 10-12 which had below 1.5 points.

Research Question 2:

What are teachers' perceptions on the use of ICT in the teaching of chemistry in senior secondary schools?

Table 2: Mean of the responses of the respondents on teachers' perceptions on the use of ICT in the teaching of chemistry in senior secondary schools in Awka education zone

S/N	ITEMS	N	\bar{X}	REMARKS
16	ICT as an instructional tool can increase teachers' interest in teaching chemistry	20	3.00	Accepted
17	ICT helps teachers improve teaching with more updated materials	20	3.05	Accepted
18	ICT-supported teaching can make teaching more effective	20	2.90	Accepted
19	ICT improves the quality of teaching and learning	20	3.20	Accepted
20	Instructional technologies make it easier to prepare subject materials	20	3.10	Accepted
21	Technology makes it easier to reach instructional resources	20	3.25	Accepted
22	Instructional technologies make teachers more productive.	20	3.15	Accepted
Grand Total			3.09	Accepted

The data presented in Table 2 shows the response from the respondents on teachers' perceptions on the use of ICT in the teaching of chemistry in senior secondary schools as shown in items 16-22. All question items were accepted because they had above 2.5 points.

Research Question 3:

What are students' perceptions on the use of ICT in learning chemistry in senior secondary schools?

Table 3: Mean of the responses of the respondents on students' perceptions on the use of ICT in chemistry in senior secondary schools in Awka education zone

S/N	ITEMS	N	\bar{X}	REMARKS
23	ICT as an instructional tool can increase the interest of students in learning	130	2.95	Accepted
24	ICT helps students improve in learning with more updated materials	130	3.00	Accepted
25	ICT-supported teaching can make learning more effective	130	2.84	Accepted
26	ICT improves the quality of teaching and learning	130	3.76	Accepted
27	Instructional technologies make it easier to learn subject materials	130	3.16	Accepted
28	Technology makes it easier to reach instructional resources	130	2.80	Accepted
29	Instructional technologies make learning more adaptive.	130	3.16	Accepted
Grand Total			3.10	Accepted

The data presented in Table 3 shows the response from the respondents on students' perceptions on the use of ICT in chemistry in senior secondary schools as shown in items 23-29. All question items were accepted because they had above 2.5 points.

Research Question 4:

What are the problems encountered during ICT usage in the teaching and learning process of chemistry in senior secondary schools?

Table 4: Mean of the responses of the respondents on the problems encountered during ICT usage in the teaching and learning process of chemistry in senior secondary schools in Awka education zone

S/N	ITEMS	N	\bar{X}	REMARKS
30	Shortage of resources	150	3.64	Accepted
31	lack of teachers' technical knowledge to prepare materials	150	2.93	Accepted

	based on technology							
32	Inefficient time to prepare materials based on technology	150					2.47	Rejected
33	Inefficient number of media (printer, scanner etc.) for effective use of computers	150					3.38	Accepted
34	Absence of motivation and reward systems for ICT usage	150					2.97	Accepted
35	Lack of interest of teachers in ICT usage for teaching-learning	150					2.93	Accepted
Grand Total							3.05	Accepted

The data presented in Table 4 shows the response from the respondents on the problems encountered during ICT usage in the teaching and learning process of chemistry in senior secondary schools as shown in item 30-35. And all the items are having the 2.5 above points which is the accepted points except for item 32.

Research Question 5:

What are the possible solutions to the problems encountered in integrating ICT in the teaching and learning of chemistry in senior secondary schools?

Table 5: Mean of the responses of the respondents on the possible solutions to the problems encountered in integrating ICT in the teaching and learning of chemistry in senior secondary schools in Awka education zone

S/N	ITEMS	N	SA	A	D	SD	\bar{X}	REMARKS
36	Government funding schools for the purchase of ICT materials	150	93	21	14	22	3.23	Accepted
37	Re-training teachers on the use of ICT	150	65	34	34	17	2.98	Accepted
38	Advocating more class times to chemistry classes	150	42	58	37	13	2.86	Accepted
39	Integrating ICT into the curriculum	150	74	32	19	25	3.03	Accepted
40	Rewarding and providing financial benefits to teachers	150	81	5	48	16	3.01	Accepted
Grand Total							3.02	Accepted

The data presented in Table 5 shows the response from the respondents on the possible solutions to the problems encountered in integrating ICT in the teaching and learning of chemistry in senior secondary schools as shown in items 36-40.

Discussion

This study was carried out to ascertain the perception of teachers and students on the integration of ICT in teaching and learning of chemistry in senior secondary schools in Awka education zone. The study was guided by five research questions. It was revealed in research question one that not all ICT equipments are available for teaching chemistry in senior secondary schools in Awka education zone.

The study revealed in research question two that chemistry teachers do utilize the available ICT equipments in teaching of chemistry. This is in line with Akram (2021) who contributed that ICT played a supporting role in sustaining teaching-learning activities on the one hand, while on the other hand, ICT-integrated teaching and learning provided a flexible approach and better access to learning opportunities as a substitute for face-to-face instruction.

The study revealed in research question three that ICT improves the quality of teaching and learning of chemistry in senior secondary schools. This is in line with Liu et al (2022) who identified that technology-integrated learning increases the cognitive understanding and learning achievement of students.

The study revealed in research question four that shortage of resources and teachers lack of interest are some of the problems encountered in the use of ICT equipments. This is in line with Nowfeek, Farwis and Nowzath (2021) whose research suggested that teacher training be focused towards building pedagogical skills connected to ICT use for more effective practice of ICT in the classroom.

The study revealed in research question five the positive solutions to the problems encountered in integrating ICT in the teaching and learning of chemistry which one of them is the proper funding of schools by government for the purchase of ICT materials. This is in line with Voithofer and Nelson (2020) as they requested that schools are expected to increasingly interweave their curriculum with ICT, and teachers are required to provide learning opportunities for their students to allow the use of advanced technological tools and digital resources for creative and innovative problem-solving.

Conclusion

This Study investigated the perception of teachers and Students on the integration of ICT in Teaching and learning of chemistry in senior secondary schools in Awka Education Zone. From the findings of the study, it can be concluded that the availability of ICT have significant input in the improvement of teaching and learning of chemistry in senior

secondary schools in Awka education zone. Also, based on the finding, it can be inferred that the utilization of ICT increases the interest of teachers and students towards chemistry.

Recommendations

Based on the findings from the study, the researcher made the following recommendations:

1. Adequate ICT equipments for teaching chemistry should be provided by the ministry of education and school management.
2. Chemistry teachers should make constant use of ICT equipments in teaching as it improves the academic performance of students.
3. Government and educational institutions should provide funding to schools for adequate purchase of ICT equipments.
4. Ministry of education should integrate ICT into the school curriculum.
5. Teacher education programme should mandate ICT whereby teachers learn how to use technology while teaching which enhances the teaching and learning process.

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