Availability And Utilisation Of Information And Communication Technology Tools In Teaching Chemistry Among Secondary School Teachers in Onitsha Education Zone

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Abstract
The study investigated the availability and utilisation of information and communication technology tools in teaching Chemistry among secondary school teachers in Onitsha Education Zone in Anambra State. The study adopted descriptive survey research design. Five research questions and two hypotheses guided the study. The population of the study comprised of 98 chemistry teachers in all the public secondary schools in Onitsha Education Zone. No sampling was used for the study. The instrument for data collection was structured questionnaire developed by the researchers. Also, the instrument was validated by three experts and the reliability of the instrument was obtained using Cronbach alpha reliability which gave a reliability index of 0.85. Data collected were analyzed using mean and standard deviation to answer the research questions, while z-test was used in testing the hypothesis formulated at 0.05 level of significance. The findings of the study revealed the followings: it was revealed that most of the ICT tools are not available for teaching of chemistry in senior secondary schools. It was revealed that the extent of utilization of ICT tools among chemistry teachers is to a low extent, it was revealed that highly experienced teachers had a higher mean score than the less experienced teachers on utilization of ICT tools in senior secondary schools. While, highly qualified teachers had a higher mean score than the less qualified teachers on utilization of ICT tools in senior secondary schools and female teachers had a higher mean score than the male teachers on utilization of ICT tools in senior secondary schools. Based on the findings and conclusions, it was recommended among others that the government and ministry of education should make efforts to make ICT facilities available in every secondary school in the State and the available ICT facilities should be adequate for every chemistry students in order to ensure Hands- on learning.

Introduction

Chemistry is a natural science subject central to technological breakthroughs and national development. Chemistry studies matter, including its characteristics, structure, and composition; how it develops and interacts with energy (Speight, 2011). Chemistry links all other sciences subjects and provides the major workforce needs of a nation. Chemistry applications can be seen daily, and daily lives are deeply rooted in Chemistry, which is everywhere and essential to life itself (Cabuil, 2011, Odukwe & Nwafor, 2022). Chemistry has made significant contributions to meeting our basic needs and enhancing our quality of life, with impacts felt in medicine, potable water, food technology, household equipment, modern buildings, textiles, and more. Chemistry teaching should include creative methods that combine learning skills and classroom activities to help students become independent learners (Igboegwu & Ikokwu,

2012). Chemistry plays a crucial role in determining the educational and career paths available to young people in the sciences (Nnaka, 2010).The connection to chemistry comes about through the materials, process, and packaging technologies used to fabricate the devices.

Technology is described by Redmann and Kotrlik (2008) as the making, modification, usage, and knowledge of tools, machines, techniques, crafts, systems, and methods of organization to solve a problem, improve a pre-existing solution, achieve a goal, handle an applied input or output relation, or perform a specific function. According to Fidelis and Onyango (2021), the term "technology" encompasses many communication devices and applications, such as cellular phones, television, radio, computers, and network hardware and software. Integrating technology in teaching involves using digital technologies during the teaching of subjects or courses in schools.

Information and Communication Technology (ICT) encompasses a category of technological tools that facilitate various activities related to information, including the collection, manipulation, retention, and presentation of data (Nwafor, Ibe, & Muoneke, 2022). Laabidi (2022) stated that ICT encompasses a range of technologies that facilitate the acquisition and dissemination of information through various communication devices, such as computers, scanners, printers, and internet connectivity. Similarly, Fidelis and Onyango (2021) suggest that ICT encompasses several components, including internet connectivity, cable data transfer, and computer hardware. Correos (2014) submitted that Information and Communications Technology (ICT) is nowadays considered a potential tool that provides educational opportunities in both formal and non-formal ways. Various technologies are available for teaching chemistry at the secondary education level, including PowerPoint slide presentations, projectors, microphones, routers, email for sending assignments, smartphones/social media - whatsapp, telegram, signal, zoom, google classroom, google meet, chrome, and webinar.

The availability of Information and communication technologies, such as PowerPoint, projectors, teleprompters, and magnetic boards, in physical classrooms makes it more easy to teach large chemistry student audiences. Other technologies enable teachers to teach learners from different locations. Chukwuma-Nosike and Offorma (2020) revealed that the availability of information and communication technology tools in teaching enables teachers to use diverse online learning packages like zoom and webinar to teach effectively, especially during pandemics. Gadzama (2019) revealed that the non-availability of software and hardware ICT tools is a major factor affecting the utilization of ICT tools in teaching chemistry. Information and communication technology tools hold numerous benefits in today's teaching of secondary school subjects, especially chemistry.

Information Communication Technology (ICT) has presented educational institutions with great opportunities, which can be harnessed through educational technology. Over the years, technology has improved the way we do things, especially in education. Educational activities, including curriculum, teaching, and learning, have shifted from analog processes to technology-based approaches. This shift has spread across every facet of education globally (Chukwuma-Nosike, 2020; Undie, 2017; Nelson, 2010). As a result, ICT can be utilized in teaching at all educational levels - basic, post-basic, and tertiary. Nelson (2010) asserts that using technology in curriculum delivery enhances

learners' performance and achievement. ICT in Teaching encompasses the use of technology resources - computers, mobile devices like smartphones and tablets, digital cameras, social media platforms and networks, software applications, the internet, and so on - in daily classroom practices and school management (Ohambele, 2019). ICT brings value to chemistry students because these students can readily apply their technology expertise to the workforce (Roach, 2012; Edutopia, 2007). The new aspect of the utilization of ICTs in the teaching of chemistry is a result of the long-lasting work and the conducted practice in the field of Chemistry. The innovative methods of the utilization of ICT tools in the teaching of chemistry are based on the advantages of the use of the computer.

Information and Communication Technology facilitate and advance the work of the teacher in both theoretical and practical aspects. The computer offers plenty of possibilities in the theoretical aspect of teaching, as a result of which the students are shown various chemical processes, and natural phenomena on the computer, and vividly presented with principal chemical laws as well. The structure of molecules, atoms, and crystal systems (cubic system) of sodium chloride (NaCl) is much clearer if shown in 3D on the monitor of the computer instead of a two-dimensional diagram. Practical work with the help of ICT tools represents a simplification of procedures when applying chemicals and laboratory equipment during experiments. Arranging the apparatus when conducting experiments becomes easier when performed with the help of the computer. The position and order of the laboratory equipment are displayed on the monitor, the only task of the student is to follow the instructions on the monitor, which leads not only to independence while experimenting but also to enable students to conduct various more complex experiments. In addition, students may revise and practice certain quantitative analysis methods several times, by the use of a so-called computer virtual laboratory to optimize caution and precision in work and reduce the number of possible injuries when conducting experiments and using toxic substances. Moreover, ICTs may be used by the teacher to serve as a database. In this way, traditional files for storing student records, test scores, and seminar papers are not necessary. Lists of laboratory equipment and substances, and teaching aids are constantly available to the teacher (Sotheeswaran, 2004). Computers are also used for testing and evaluating students' knowledge (mainly of separate units) by the use of tests, composing standard tests, as well as creating procedures when conducting experiments, and organizing school quizzes, debates, and competitions. Studies show that the use of information and communication technology tools in teaching improves students' learning processes and outcomes (Chukwuma-Nosike, 2020; Nwabueze, Madumere, Obike & Okeke, 2020; Yu, Ally &Tsinakos, 2020; Undie, 2017; Roach, 2012; Nelson, 2010). The availability and effective use of information and communication technology tools in teaching revolutionizes the teaching process. Adeyemo (2010) stressed that the method of teaching has gone beyond traditional methods and this makes the utilization of information technologies very important in science class. Information technology has broken the monopoly and provided a variety of teaching-learning situations in chemistry.

The utilization of ICT tools in teaching chemistry is influenced by teacher experience, qualification, and gender, with notable differences observed across various studies. Experienced chemistry teachers are often more proficient at selecting appropriate ICT tools and implementing them in their teaching strategies (Yooyativong, 2018). Research indicates that while Information and communication technology tools can enhance educational quality, many teachers, particularly those with limited IT backgrounds, struggle to effectively utilise these tools into their teaching practices. According to Laabidi (2017), teaching experience correlates with the effective utilisation of ICT tools in teaching, with more experienced teachers demonstrating higher proficiency.

The influence of teacher qualifications on the utilization of ICT tools in teaching is significant, as it shapes both pedagogical approaches and the effective utilisation of ICT tools in teaching chemistry. Chemistry teachers who undergo comprehensive pedagogical and Information and communication technology training are more likely to utilize ICT tools effectively in their teaching practices (Vandeyar & Adegoke, 2024). Research indicates that teachers with higher qualifications and specialized training in ICT are more proficient at employing these tools to enhance learning experiences.

The teaching profession is gender-segregated, with women predominantly in primary education and men in secondary roles, influenced by labor market incentives (Carroll *et al*., 2018). While the positive impact of female teachers on student outcomes is well-documented, it is essential to consider the broader implications of gender dynamics in teaching chemistry. The influence of teacher gender on the utilization of ICT tools in teaching chemistry reveals nuanced dynamics across different educational contexts. Research indicates that male chemistry teachers generally report higher usage of ICT tools compared to female chemistry teachers (Oduor*et al*., 2018). According to Alsharidah (2018), Female chemistry teachers often express a positive attitude towards Information and communication technologies, indicating a willingness to utilise ICT tools into their teaching, yet they face challenges in actual implementation. Addressing gender inequity in ICT usage requires targeted policies and training programs to empower female chemistry teachers, particularly in regions where cultural factors may limit their access to technology (Baguant, 2019). Continuous professional development and support systems are essential to enhance female chemistry teachers' confidence and skills in using ICT tools effectively (Oduor*et al.,* 2018). Conversely, while gender may influence ICT utilization in teaching chemistry, it is essential to recognize that broader systemic issues, such as access to resources and institutional support, play a critical role in shaping teachers' experiences with utilisation of ICT tools in teaching chemistry. This perspective underscores the need for comprehensive strategies that address both gender and structural barriers in teaching chemistry.

Despite all the efforts made to ensure effective teaching and learning of chemistry at the secondary school level in Nigeria, the problem of students' poor achievement in chemistry in internal and external examinations has remained unsolved (Olorundare, 2014). This high failure rate has been attributed to many factors including non-availability and non-utilization of proper instructional tools such as ICTs in teaching and learning science subjects especially chemistry in secondary schools in

Nigeria. The education sector has undergone significant transformations due to rapid advances in Information and Communication Technology (ICT). To this end this study sought to assess the availability and utilisation of information and communication technology tools in teaching chemistry among secondary school teachers in Onitsha education zone.

Research Questions

The following research questions guided the study:

1. What are the proportion of available ICT tools in teaching chemistry in secondary schools?
2. What is the extent of utilization of ICT tools among senior secondary school chemistry teachers?
3. What is the influence of chemistry teacher's experience on utilization of information and communication technology tools?
4. What is the influence of qualification on chemistry teachers' utilization of information and communication technology tools?
5. What is the influence of gender on chemistry teachers' utilization of information and communication technology tools?

Hypotheses

The following null hypotheses were formulated to guide the study. The hypotheses were tested at 0.05 level of significance.

H_{01}: Chemistry teachers' year of experience has no significant influence on utilization of information and communication technology tools.

H_{02}: There is no significant difference between the mean rating scores of male and female chemistry teachers on their utilization of information and communication technology tools.

Method

The study adopted a descriptive survey research design and was conducted in Onitsha education zone, Anambra State, Nigeria. The population of the study comprises ninety-eight (98) Chemistry teachers in all the thirty-two (32) public secondary schools in Onitsha Education Zone. This consists 32 male and 66 female Chemistry teachers. Out of the 32 secondary schools, 19 are co-educational and 13 are single sex schools. No sampling was done. All the 98 Chemistry teachers were used for the study because the population size is small. A structured questionnaire was used for data collection. The data collection instrument was an observational rating scale developed by the researcher, consisting of two sections (A and B). Section A gathered demographic data on teachers' qualifications, experience and gender, while Section B included 50 items related to the availability and utilization of information and communication technology tools in teaching chemistry among secondary school teachers.

The mean score interpretation for research question one was based on real limit numbers, where a key: A = Available and NA = Not Available. 50% and above implies Available, while below 50 % implies not available. A mean of 3.50 - 4.50 implies Very High Extent (VHE), 2.50 - 3.49 implies High Extent (HE), 1.50 - 2.49 implies Low Extent (LE) and 0.50 -1.49 implies Very Low Extent (VLE). Teachers with 0-9 years of experience were considered less experienced, while those with 10 years and above were classified as highly experienced. Similarly, teachers without educational qualification were

labeled as less qualified, and those with educational qualification were classified as highly qualified. The instrument was validated by three experts from Nwafor Orizu College of Education, Nsugbe. The instrument was trial tested on eight (8) Chemistry teachers in Awka Education Zone that are not part of the study but share similar characteristic with the study area. The data obtained was computed using Cronbach Alpha reliability estimate to determine the internal consistency of the instrument.

The analysis of research questions utilized frequency, percentage, mean and standard deviation, while z-test was employed for addressing the research hypotheses. This comprehensive research design aimed to explore theavailability and utilization of information and communication technology tools in teaching chemistry among secondary school teachers in Onitsha education zone.

Table 1: Frequency and percentage of availability of adequate ICT tools for teaching of chemistry in secondary school

S/N	Computer Tools	Available (F %)	Not Available (F %)	Remark
1	Audio Tapes	51 (52.0)	47(48.0)	A
2	Computers	74 (75.5)	24(24.5)	A
3	Computer Laboratories	75 (76.5)	23(23.5)	A
4	Computer Assisted Learning (CAL)	9 (9.2)	89 (90.8)	NA
5	Chartroom	89 (90.8)	9 (9.2)	A
6	E-mail	91 (92.9)	7 (7.1)	A
7	Electronic Cameras	4 (4.1)	94 (95.9)	NA
8	E-Learning Applications	9 (9.2)	89 (90.8)	NA
9	Discovery Channel	27 (27.6)	71 (72.4)	NA
10	Fax Machine	13 (13.3)	85 (86.7)	NA
11	Google Talk	87 (88.8)	11 (11.2)	NA
12	Interactive Radio	15 (15.3)	83 (84.7)	NA
13	Internet/Web Services	83 (84.7)	15 (15.3)	A
14	LAN/WLAN	88 (89.8)	10 (10.2)	A
15	Microsoft Word	86 (87.8)	12 (12.2)	A
16	Multimedia Projector	75 (76.5)	23 (23.5)	A
17	Photocopy Machines	84 (85.7)	14 (14.3)	A
18	Spreadsheets (Excel, Access, etc)	95 (96.9)	3 (3.1)	A
19	Search Engines	83 (84.7)	15 (15.3)	A
20	Smart Phones	79 (80.6)	19 (19.4)	A
21	Tablet	7 (7.1)	91 (92.9)	NA
22	Whatsapp	90 (91.8)	8 (8.2)	A
23	Web Quest	21 (21.4)	77 (78.6)	NA
24	Video-Conferencing	8 (8.2)	90 (91.8)	NA
25	Youtube	85 (86.7)	13 (13.3)	A

Results

Research Question One: What are the proportion of available ICT tools in teaching of chemistry in senior secondary school?

The result in table 1 on frequency and percentage of availability of adequate ICT tools for teaching of chemistry in secondary school shows that items 1, 2, 3, 5, 6, 13, 14, 15, 16, 17, 18, 19, 20, 22 and 25 are all available as their frequencies and percentage are above the benchmark of 50 % respectively whereas, items 4, 7, 8, 9, 10, 11,12 21, 23 and 24 are not available as their frequencies and percentage are below benchmark of 50 % respectively.

Research Question Two

What is the extent of utilization of ICT tools among secondary school chemistry teachers?

Table 2: Mean and Standard deviation on the extent of utilization of ICT tools among secondary school chemistry teachers

S/N	ITEM STATEMENT	X	SD	DEC.
1	To what extent do you utilize Audio Tapes	1.99	0.78	LE
2	To what extent do you utilize Computers	1.84	0.83	LE
3	To what extent do you utilize Computer Laboratories	1.82	0.92	LE
4	To what extent do you utilize Computer Assisted Learning (CAL)	1.80	0.91	LE
5	To what extent do you utilize Chartroom	2.30	0.94	LE
6	To what extent do you utilize E-mail	2.14	0.79	LE
7	To what extent do you utilize Electronic Cameras	1.85	0.84	LE
8	To what extent do you utilize E-Learning Applications	1.76	0.88	LE
9	To what extent do you utilize Discovery Channel	1.90	0.83	LE
10	To what extent do you utilize Fax Machine	1.65	0.90	LE
11	To what extent do you utilize Google Talk	1.64	0.80	LE
12	To what extent do you utilize Interactive Radio	1.95	1.07	LE
13	To what extent do you utilize Internet/Web Services	1.87	0.88	LE
14	To what extent do you utilize LAN/WLAN	1.86	0.98	LE
15	To what extent do you utilize Microsoft Word	1.74	0.80	LE
16	To what extent do you utilize Multimedia Projector	1.76	0.90	LE
17	To what extent do you utilize Photocopy Machines	2.02	0.95	LE
18	To what extent do you utilize Spreadsheets (Excel, Access, etc)	1.64	0.66	LE
19	To what extent do you utilize Search Engines	1.55	0.50	LE
20	To what extent do you utilize Smart Phones	1.41	0.49	VLE
21	To what extent do you utilize Tablet	1.44	0.50	VLE
22	To what extent do you utilize Whatsapp	1.53	0.71	LE
23	To what extent do you utilize Web Quest	1.36	0.48	VLE
24	To what extent do you utilize Video-Conferencing	1.41	0.49	VLE
25	To what extent do you utilize Youtube	1.38	0.48	VLE
	Cluster Mean	**1.75**	**0.50**	**LE**

The analysis of the result in table 2 on mean and standard deviation on the extent of utilization of ICT tools among secondary school chemistry teachers shows that items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, and 22 has mean score of 1.50 – 2.49 set as the criterion for low extent of utilization of ICT tools. However, items 20, 21, 23, 24 and 25 had a mean of 1.49 and below set as the criterion for very low extent. The cluster mean of 1.75 and standard deviation of 0.50 indicates that the extent of utilization of ICT tools among secondary school chemistry teachers is to a low extent.

Research Question Three

What is the influence of experience on chemistry teachers' utilization of information and communication technology tools?

Table 3: Mean score and Standard deviation on influence of chemistry teacher's experience on utilization of information and communication technology tools

Experience	N	Mean	SD
Highly experience	50	1.93	0.52
Less experience	48	1.56	0.39

Result in Table 3 shows that highly experienced teachers have a mean score of 1.93 and standard deviation of 0.52, while the less experienced teachers have a mean score of 1.56 and standard deviation of 0.39. This means that the highly experienced teachers utilizes information and communication technology tools than the less experienced teachers.

Research Question Four

What is the influence of qualification on chemistry teachers' utilization of information and communication technology tools?

Table 4: Mean score and Standard deviation on influence of chemistry teacher's qualification on utilization of information and communication technology tools.

Qualification	N	Mean	SD
Highly qualified	39	2.21	0.46
Less qualified	59	1.43	0.18

Result in Table 4 shows that highly qualified teachers have a mean score of 2.21 and standard deviation of 0.46, while the less qualified teachers have a mean score of 1.43 and standard deviation 0f 0.18. This means that the highly qualified teachers utilizes information and communication technology tools than the less qualified teachers.

Research Question Five

What is the influence of gender on chemistry teachers' utilization of information and communication technology tools?

Table 5: Mean score and Standard deviation on chemistry teachers' utilization of information and communication technology tools based on gender.

Gender	N	Mean	SD
Male	32	1.68	0.45
Female	66	1.76	0.52

Result in Table 5 shows that male teachers had a mean score of 1.68 and standard deviation of 0.45, while the female counterpart had a mean score of 1.76 and standard deviation of 0.52. This reveals that the female teachers have higher mean score than their male counterpart on utilization of information and communication technology tools.

Hypotheses

H_{01}: Chemistry teachers' year of experience has no significant influence on their utilization of information and communication technology tools

Table 6: z-test analysis of the significant difference between the mean rating scores of highly experienced teachers and less experienced teachers on their utilization of information and communication technology tools.

Variable	N	X	SD	z-val	Df	p-val
Highly experienced	50	1.93	0.52	3.998	96	.000
Less experienced	48	1.56	0.39			

The result in Table 6 above showed that the z-value of 3.998 with associated probability value of .000 at 96 degree of freedom was obtained. Therefore, the null hypothesis of no significant different was rejected since the p-value (.000) is less than 0.05 level of significant. This implies that, teachers' experience has significant influence on their utilization of information and communication technology tools.

H_{02}: There is no significant difference between the mean rating scores of male and female teachers chemistry on their utilization of information and communication technology tools.

Table 7: z- test analysis of the significant difference between the mean rating scores of male and female teachers in their utilization of information and communication technology tools.

Variables	N	X	SD	z-val	Df	p-val
Male	32	1.68	0.45	.858	96	.393
Female	66	1.76	0.52			

The result in Table 7 revealed that z- value of (.858) with associated probability value of (.393) at 96 degree of freedom was obtained. Thus, the null hypothesis of no significant difference was not rejected since the probability value of (.393) is greater than 0.05 level of significant. The researcher therefore concludes that gender has no significant influence on chemistry teacher utilization of information and communication technology tools.

Discussions of the findings

The finding of this study revealed that most of the ICT tools are not available for teaching of chemistry in secondary. This could be due to the fact that adequate attention has not been given in the area of ICT and also, the cost of establishing and maintaining a well-established ICT laboratory. The finding from the study conform with the findings of Ahmed, Abimbola, Omosewo, and Akanbi (2012), Okoye and Onwuachu (2012) who point out that ICT resources such as telephone, satellite, e-mail, Internet and world wide web are not available in the schools in reasonable numbers. Amuchie (2015) established that most teachers were not utilizing ICT tools because they were not readily available. Conversely, the finding of this study disagreed with that of Eze and Aja (2014) that ICT tools are available but not adequately utilized in secondary schools. This agrees with the findings of Dambo and Umah (2018) that ICT facilities are available for effective teaching and learning in secondary schools.

The finding of this study revealed that the extent of utilization of ICT tools among chemistry teachers is in low extent. This could be due to the fact that there is no adequate ICT tools in teaching and learning of Chemistry in secondary schools. However, the finding of this study is similar with that of Onasanya, Shehu, Ogunlade, and Adefuye (2011); who reported that the extent at which science teachers use ICT infrastructure is low in Oyo and Abia States respectively. Also, this work collaborates with the finding of Igboegwu, Egolum, and Nnoli (2011) who found out, that most secondary school chemistry teachers in Anambra State were not using ICT facilities for teaching and learning of chemistry. Conversely, the finding of this study agree with that of Eze and Aja (2014) that ICT tools are not adequately utilized in secondary schools.

The finding of this study revealed that highly experienced teachers had a higher mean score than the less experienced teachers on utilization of ICT tools in secondary schools. The analysis shows a significant difference of teaching experience on the utilization of ICT tools in senior secondary schools. The reason for this may be that the more the number of years a teacher has spent in a particular field such as teaching, the more experienced the teacher becomes more knowledgeable. Teachers' experience ensures adequate pedagogical exposure, find new teaching strategies and can explore various strategies in teaching.

The finding of this study disagreed with that of Aina (2022) who identified a notable

disparity between teachers with less experience and those with more experience. However, it was observed that teachers with less experience showed greater proficiency in the utilization of information and communication technology (ICT). According to the finding of Okkan and Aydin (2022), there exists an inverse relationship between teachers' years of experience and understanding the levels of utilization of information and communication technology (ICT). The phenomenon described has been ascribed to the passion and receptiveness of young individuals towards technology, as evidenced by the works of Adhya and Panda (2022) and Okkan and Aydin (2022). Abdul-Salaam (2019) found that teachers' experience has a significant positive influence on their level of utilization of ICT for teaching as most of the experienced teachers know how to integrate ICT into their classroom activities since experienced teachers resort to the use of innovative methods. Also, Baek*et al* (2018) claimed that experienced teachers are always ready to integrate ICT into their teaching.

The finding of this study revealed that highly qualified teachers had a higher mean score than the less qualified teachers on utilization of ICT tools in secondary schools. The finding of this study is in line with that of Olagunju and Abiona (2018) who revealed that qualified teachers' perception of the utilization of ICT in teaching is higher than that of the less qualified teachers. The study conducted by Okocha (2021) revealed that academic qualification serves as a significant predictor of the utilization of information and communication technology (ICT) in the context of education. In a similar vein, Aina (2022) discovered that teachers with a first degree had a more favourable disposition towards the utilization of information and communication technology (ICT) compared to those with advanced degrees. In contrast, the study conducted by Owan and Offu (2021) revealed that there was no statistically significant disparity in the integration of information and communication technology (ICT) based on teachers' qualifications.

The finding of this study revealed that female teachers had a higher mean score than the male teachers on utilization of ICT tools in secondary schools. However, the analysis of significant difference shows no significant difference of gender on the utilization of ICT tools in secondary schools. The findings of this study is in line with that of Okocha (2021) who reported that gender did not provide any statistically significant impact on teachers' utilization of information and communication technology (ICT) facilities. Rahimi and Yadollahi (2018) reported that there is no relationship between ICT utilization and gender. Petriel (2019) found that while females used e-mails more than their male counterparts, the latter used the Web more. He further found significant gender differences in the way females and males rated themselves in their ability to

master technology skills, though both genders were positive about their technological ability. Males rated themselves higher than females.

Conclusion

Based on the findings of the study, the following conclusions were drawn:

1. It was revealed that most of the ICT tools are not available for teaching of chemistry in secondary.
2. It was revealed that the extent of utilization of ICT tools among chemistry teachers is to a low extent.
3. The findings of this study revealed that highly experienced teachers utilizes ICT tools than less experienced teachers in secondary schools.
4. The findings of this study revealed that highly qualified teachers utilizes ICT tools than less qualified teachers in secondary schools.
5. The findings of this study revealed that female teachers had a higher mean score than the male teachers on utilization of ICT tools in senior secondary schools.

Recommendations

Based on the findings from the study, the following recommendations were made;

1. The Government of Anambra State should make efforts to make ICT facilities are available in every secondary school in the State.
2. The available ICT facilities should be adequate for every chemistry student in order to ensure Hands- on learning.
3. The functionality and maintenance of these ICT facilities should be a thing of necessity for both Government and school administrators.
4. Chemistry teachers should be trained and retrained on the use of ICT in teaching chemistry; this will help them to integrate it as an instruction method in teaching and learning.
5. The secondary schools in the L.G.A should device means of generating funds to acquire necessary ICT facilities for teaching and learning chemistry. This can best be done through school community partnership.
6. Teachers' variables such as gender, qualification, and teaching experience should be considered when sensitization is done on the need for utilization of ICT resources for teaching chemistry in secondary schools in Anambra State.

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