

# SENIOR SECONDARY SCHOOL CHEMISTRY TEACHERS' PERCEPTION OF THE FACTORS AFFECTING THE EFFECTIVE UTILIZATION OF ICT IN TEACHING AND LEARNING CHEMISTRY

Lawrence Achimugu

**Abstract** -The study was designed to examine the perception of chemistry teachers on the factors affecting the effective utilization of ICT in teaching and learning of chemistry in Kogi State. The sample for the study consists of one hundred and five (105) chemistry teachers randomly selected from two hundred and sixty-two (262) public senior secondary schools in Kogi State through purposive random sampling technique. A 16 – item questionnaire ( $r=0.88$ ) was developed, validated and used by the researcher to collect data. Mean and standard deviation were used to answer the research questions while t – test was used to test the hypothesis at 0.05 alpha level. The results showed that chemistry teachers had the perceptions that factors such as lack of training and motivation of teachers, lack of technical support staff, and lack of funds among others affect their effective utilization of ICT in teaching chemistry. It was found that there was no significant difference between male and female chemistry teachers' mean perception scores on the factors affecting effective utilization of ICT in teaching and learning chemistry. Therefore, it was recommended that more funds should be provided to schools to tackle the identified problems and chemistry teachers should be more committed to the use of ICT in teaching and learning chemistry.

**Key Words:** Chemistry, ICT, Perception, Teaching, Learning

## 1. Introduction:

Chemistry education is an important area of focus in national development all over the world. This is because chemistry education plays a vital role in the technological transformation of any nation. In Nigeria, there seems to be an increased awareness that chemistry education plays an important role in influencing the rate of economic and technological growth. It has equally been realised that chemistry education has the capacity to solve the age-long problems of increasing unemployment, high poverty rate and insufficient manpower. According to Ogbu, (2012) chemistry provides theoretical bases for synthesis of drugs which are used for medicine, textiles, shoes, plastics, soap and detergent. Contributing to the importance of chemistry in national development, Igbonugo (2014) pointed out that chemistry helps to ensure continuous availability of students in expected number who take important professions such as medicine, pharmacy, dentistry, food science, agriculture, engineering, education, etc. In the same vein the Federal Ministry of Education (2007) on the objectives of Senior Secondary Education. Chemistry curriculum stated that students among other things are to:

- develop interest in the subject of chemistry
- acquire basic theoretical and practical knowledge and skills.
- develop interest in STM.
- acquire basic STM knowledge and skills
- develop reasonable level of competence in ICT application that will engender entrepreneurial skills.
- apply skills to meet societal needs of creating employment and wealth.
- be positioned to take advantage of the numerous career opportunities offered by chemistry.

From the objectives of the chemistry education above, one can easily infer that a sound knowledge of a chemistry teacher in the application of ICT in teaching and learning chemistry will engender entrepreneurial skills which in turn will provoke industrial revolution of the country.

Alhassan (2001) defined information and communication technology as a broad based technology that supports the creation, storage and manipulation of information. Okoye (2014) mentioned the various types of ICT to include: computers, radio, satellites online self learning, telepresence system, interactive white boards, data projectors,

video cassettes, recorders, internet optical fibre technologies, hard wares, soft wares, etc.

According to Ajagun (2003), ICT is indispensable and very important to teaching and learning science subjects. These STM teachers can use it to:

- facilitate acquisition of STM skills
- prepare resources for STM instruction
- access information and educational soft ware through the internet
- communicate and exchange information with experts in specific fields with other teachers for the benefits and development of people.

Contributing to this, Eze (2012) noted that education in whatever form it takes is not complete without effective use of ICT and that the significance of ICT in education includes: access to variety of learning resources, immediacy of information, anytime anywhere learning, collaborative learning, multimedia approach to education, authentic and up to date information, access to online libraries, distance learning, individualization of instruction, reduce time on many routine task, access to the source of information, teaching science subjects made interesting, etc. Agommuoh (2015) further observed that the use of ICT in teaching science subjects will make learning more real, relevant and experimental as large amount of data and materials on any topic can be brought to the classroom from all over the world thereby, greatly facilitating the acquisition and absorption of knowledge and offering students unprecedented opportunities to enhance their learning. From the foregoing, ICT is rapidly transforming the world into a global village and chemistry education is one of the beneficiaries of this global revolution in teaching and learning process using ICT. In line with competitiveness and emphasise of the use of ICT in teaching and learning, government of various levels and non-governmental organisations i.e. *old boys Association* have continued to intensify efforts to supply ICT facilities to senior secondary schools in Nigeria. But evidence in literature tends to show that the available ICT facilities in our schools are underutilized. (Ojaleye 2002, Ugwu 2006, Nzewi 2009, Adeyemo 2010, Kola 2013 and Okoye 2014). In the same vein, Nwagbo and Ugwanyi (2012) have argued

that despite aforementioned impact of ICT in teaching and learning science, effective utilization of it is being impeded by some challenges like lack of confidence, resistance to change, negative attitudes, lack of technical support, insufficiency in the school timetable, etc. This implies that ICT facilities when available have not been utilized in Nigerian secondary schools because of some problems. It is against this background that the researcher deemed it necessary to investigate the perception of chemistry teachers on the factors affecting effective utilization of ICT in teaching and learning chemistry. Therefore, the problem of the study is: what factors affect effective utilization of ICT in teaching and learning chemistry from the views of chemistry teachers?

Research reports on the influence of teachers' gender on the level utilization of ICT in teaching, had been well documented, but most often the reports contradict themselves. For instance, while Ahmed, Abimbola, Omosewo & Akanbi (2012) found that gender had influence on the level of utilization of available multimedia instructional resources in favour of male teachers, Onwuachu (2011) reported that there is no significant difference between the mean ratings of male and female teachers on their ability to utilize the available material resources including ICT facilities in teaching. The need for more studies on this area of research, necessitated the inclusion of the study of the influence of gender on the level of utilization of ICT gadgets/facilities in teaching chemistry.

### Statement of problem

Despite the wide recognition and acceptance accorded the role of ICT in teaching and learning chemistry at the Senior Secondary School level, there seems to be problems in the utilization of ICT in teaching and learning chemistry. How to sensitise chemistry teachers on the need to effectively utilize ICT facilities in teaching chemistry and also make government committed in providing the necessary environment for ICT instruction in our Senior Secondary School remains daunting. The overall expectation is that chemistry teachers participation by eliciting their perceptions on the factors affecting effective utilization of ICT in teaching chemistry would reawaken them to be more committed to the use of ICT in teaching chemistry as well as making them serve as agents in the spread of the effective use of ICT for teaching and learning chemistry.

### Purpose of the study

The purpose of the study is to find out the perception of chemistry teachers on the factors affecting the effective utilization of ICT in teaching and learning chemistry in Kogi State.

Specifically, the study sought to:

- 1) find out the chemistry teachers' perception on the factors affecting the effective utilization of ICT in teaching and learning chemistry in Kogi State.
- 2) establish the roles of gender, on the factors affecting the effective utilization of ICT in teaching and learning chemistry.

### Research Questions

1. What are the chemistry teachers' perception of the factors affecting effective utilization of ICT in teaching and learning chemistry?
2. To what extent does gender influence the chemistry teachers' perception of the factors affecting effective utilization of ICT in teaching and learning chemistry?

### Hypothesis

To guide the study, one null hypothesis was formulated and tested at 0.05 level of significance.

Ho: There is no significant difference in the mean perception scores of the male and female chemistry teachers on factors affecting effective utilization of ICT in teaching chemistry.

### Methods

A survey research was used for the study. The population of this study comprised of four hundred and forty-eight (448) Chemistry teachers in the two hundred and sixty two (262) public senior secondary schools of the twenty-one (21) local government area of Kogi State. The sample for the study was taken from 262 public secondary schools in Kogi State. Purposive random sampling procedure was used to choose 63 schools, three from each of the twenty-one local government areas. All the chemistry teachers in 63 senior secondary schools constitute the subject of the study. 105 chemistry teachers were therefore used for the study.

The research instrument used for the study titled *chemistry teachers' perceptions of the factors affecting the effective utilization of ICT in teaching and learning chemistry (CTPFAEUTLC)* was developed by the researcher. The questionnaire has two sections. A and

B. Section A sought the information on the personal bio data of respondents. Section B was a 4 – point rating scale of strongly Agreed (SA) = 4, Agree (A) = 3, Disagree (DS) = 2 and strongly disagreed (SD)=1. The section required the respondents to indicate their perceived factors on the rating scale. The instrument was validated by two specialists in chemistry education and two specialists in measurement and evaluation. The questionnaire was administered to 30 chemistry teachers who were not part of the study. Their responses were subjected to a reliability test using Cronbach alpha and the value was 0.88. The value was considered high enough and reliable for this study.

The questionnaire was administered by the researcher and research assistants who were active members of science teachers Association of Nigeria (STAN) Kogi State branch. The research assistants were trained for one day. The choice of STAN members as research assistants is to facilitate data collection. The questionnaire was given and collected from the subjects on the same day. A total of 105 questionnaires were collected back from the subject and used for data analysis.

The Research questions were answered using mean and standard deviation, while the hypothesis was tested using the t-test of difference between means of independent samples. The criterion mean value is 2.50 with mean values of 2.50 and above regarded as agreed / significant while those with mean value of less than 2.50 were regarded as disagreed / insignificant. The hypothesis was tested at 0.05 level of significance.

### Results

The results of the study were presented in tables 1, 2 and 3 based on the research questions and hypothesis formulated for the study.

Table 1: Mean rating and standard deviation of chemistry teachers' responses on factors affecting effective utilization of ICT gadgets/facilities.

S/No	Items	X	SD	Decision
1	Lack of training/skills among chemistry teachers on the use of ICT	3.57	1.32	Agreed
2	Lack of computers and other accessories	2.72	1.24	Agreed
3	Lack of computer laboratory	2.63	1.22	Agreed
4	Lack of regular and adequate power supply	2.87	1.07	Agreed
5	Lack of adequate fund to support purchase of ICT gadgets	3.27	1.24	Agreed
6	Lack of motivation and incentive among chemistry teachers	3.45	1.27	Agreed
7	Lack of qualified ICT technical support staff	3.33	1.16	Agreed
8	Lack of maintenance and repair of ICT facilities	3.31	1.09	Agreed
9	Lack of effective supervision and monitoring of chemistry teachers	2.86	1.20	Agreed
10	Lack of adequate time to integrate ICT into the school timetable	3.02	1.01	Agreed
11	Insufficient number of chemistry teachers	2.58	1.22	Agreed
12	High cost of ICT gadgets/facilities	2.91	1.04	Agreed
13	High enrolment in schools	2.72	1.25	Agreed
14	Chemistry teachers conservative attitudes toward change	2.43	1.76	Disagreed
15	Chemistry teachers perception that ICT is difficult to integrate into teaching	2.59	1.21	Agreed
16	Insecurity and fear of vandalism by thieves	2.65	1.26	Agreed

From table 1, mean rating of items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15 and 16 were above the mean of 2.50. This shows that chemistry teachers sampled agreed with the statements on the questionnaire as the factors affecting the effective utilization of ICT in teaching and learning chemistry. However, respondents

disagreed with the statement on item 14 as the mean rating was below the cut-off mean of 2.50. The three most frequently occurring factors that affect effective utilization of ICT in teaching chemistry are: lack of training/skills among chemistry teachers, lack of motivation among teachers and lack of technical support staff respectively.

**Table 2:** Overall mean and standard deviation scores of male and female teachers on their perception on factors affecting effective utilization of ICT in teaching and learning chemistry.

	Number of subjects	Mean	Standard deviation
Male	48	2.97	1.20
Female	57	2.89	1.24

The results in table 2 show that male teachers have overall mean of 2.97 while female teachers have overall mean of 2.89. therefore, male teachers' mean perception scores on the factors affecting effective utilization of ICT in teaching and learning chemistry is higher than their female counterparts. This mean to some extent that gender has some influence in the mean rating in favour of male chemistry teachers.

**Table 3:** T – test analysis on the mean perception of male and female teachers on factors affecting effective utilization of ICT in teaching and learning of chemistry.

Gender	Number of subjects	Mean score	SD	Df	T. Cal.	T. Table	Alpha
Male	48	2.97	1.20	103	0.410	1.96	0.05
Female	57	3.03	1.24				

From table 3, the  $t$  – calculated is less than  $t$  – critical, hence the null hypothesis of no significance difference between the mean perception scores of male and female chemistry teachers' perception on the factors affecting effective utilization of ICT in teaching and learning chemistry is accepted. Therefore, there is no significant difference between male and female chemistry teachers' mean perception scores on the factors affecting effective utilization of ICT in teaching and learning chemistry. This also implies that the observed difference in table 2 is by chance.

### Discussion of results

The results of this study showed that chemistry teachers used in this study agreed with 15 out of 16 items statements as the factors affecting the effective utilization of ICT in teaching and learning chemistry. The factors or problems they agreed affects the use of ICT in teaching chemistry includes: lack of training/skills among chemistry teachers, lack of technical support staff, lack of motivation for teachers, lack of maintenance/repairs of ICT facilities, lack of fund, lack of computers, lack of regular power supply, lack of effective supervision of teachers, lack of adequate time to integrate ICT into school timetable, high cost of ICT gadgets, high school enrolment, insecurity of ICT gadgets, perception that ICT is difficult by chemistry teachers and insufficient number of chemistry teachers. The only item chemistry teachers disagreed with, is that they do not have conservative attitudes to change. The finding of this study that most chemistry teachers are not trained or skilled to handle the integration of ICT in teaching chemistry is in agreement with the findings of Okoyefi and Nzewi (2012) who found that science teachers are not competent in the use of ICT in all the required areas as stipulated by UNESCO and that teachers need a lot of training in the area of personal ICT competencies. Also the findings of this is in consonance with that of Okoye (2014) who revealed that STM teachers encountered some problems in the utilization of e – learning on the following areas: lack of computer, lack of skills, lack of electricity supply, non-availability of e – learning devices, etc. Generally, from the results of this study, it is evident that most chemistry teachers do not use ICT in teaching chemistry because of the impediments perceived by them. The implication is that the numerous benefits of ICT especially as it is contained in the senior secondary school chemistry curriculum and the aspirations of Kogi State government who has supplied some ICT facilities to public secondary schools would not be realised if this trend is not reversed.

The findings of this study on gender perceptions on the factors affecting effective utilization of ICT in teaching and learning chemistry, indicated that there is no significant difference in the mean perception scores of the male and female chemistry teachers on factors affecting effective utilization of ICT in teaching chemistry.

### Recommendations

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

1. Government and other stakeholders should provide enough funds to schools in order to employ more teachers, ICT technical

support personnel's and security guards and to supply more ICT facilities in the senior secondary schools as well as motivate teachers.

2. Government at various levels should organise ICT conferences, workshops and seminars for chemistry teachers and make sure that all chemistry teachers are mandated to attend these training programmes.
3. Chemistry teachers should belong to professional associations such as STAN and chemical society of Nigeria (CSN). They are encouraged to sponsor themselves where government/school sponsorship is not forth coming, to attend seminars, workshops and conferences on the integration of ICT in teaching chemistry in order to update their knowledge and professional skills. They should also show more dedication to duties by using ICT in their teaching.
4. Chemistry teachers in collaboration with ICT technical support personnel's should ensure adequate repairs and maintenance of the available ICT facilities
5. School authority should ensure a reasonable class size of teacher – student's ratio of 1: 40 and should also ensure adequate supervision of their chemistry teachers on the effective use of ICT for chemistry instruction.

### Conclusion

One of the objectives of the senior secondary education chemistry curriculum is that, at the end of the chemistry education, chemistry students should develop reasonable level of competence in ICT application that will engender entrepreneurial skills. There is great need for chemistry teachers to be computer literate as well as utilize ICT in teaching so that they can deliver properly to the students. However, this study has revealed that chemistry teachers hardly utilize ICT in teaching chemistry because, a lot of problems militating against classroom instructions. These problems includes lack of basic skills and training of teachers, lack of motivation of teachers, lack of ICT support personnels, irregular and inadequate power supply, lack of maintenance and repair of ICT facilities, lack of adequate time on the school timetable, etc. Therefore, to surmount these problems, necessary recommendations were made and all hands must be on deck to implement them.

### References

- Adeyemo, S.A. (2010). "The impact of information and the use of ICT in senior secondary schools". In Z.C. Njoku (Ed) *56<sup>th</sup> Annual Conference Proceedings of Science Teachers' Association of Nigeria*, 274 – 283, Ibadan, HEBN, Publisher PLC.
- Ahmed, M.A., Abimbola, I.O., Omosowo, E.O. & Akanbi A.O.(2012). Availability and utilization of instructional resources for teaching basic science and technology in secondary schools in Ilorin, Nigeria. In O.S. Abonyi, (Ed), *43<sup>rd</sup> annual conference proceeding of STAN*, 203 – 214, Ibadan, HEBN, Publisher PLC.
- communication technology on teaching and learning of physics*", International *Journal of Educational Research and Technology*, 1, (2), 48 – 59.
- Agommuoh, P.C. (2015). "Enhancing teaching of physics through Ajagun, G.A. (2003). "The development of ICT skills through the national computer education curriculum for primary schools", In M.A.G Akale (Ed) *44<sup>th</sup> Annual Conference Proceedings of Science Teachers' Association of Nigeria*, 70 – 73. Ibadan, HEBN, Publisher PLC.
- Alhassan, M.H. (2001). "Current hardware and software trend in information technology in Isyaku, C.M. Anikweze A.A. and Olokuk M.M.(ed) *Teacher education in information technology, Abuja, NCCE*.
- Eze, G.N. (2012). "The challenges of the 21<sup>st</sup> century classrooms: The relevance of ICT in UBE". In O.S. Abonyi (Ed), *53<sup>rd</sup> Annual Conference Proceedings of Science Teachers' Association of Nigeria*, 278 – 283, Ibadan, HEBN, Publisher PLC.
- Federal ministry of education(2007) *Senior secondary education curriculum chemistry for SSI – 3, Abuja, Nigerian Educational Research and Development Council (NERDC) press*.
- Igbonugo, B.I. (2014). "Effects of cooperative learning on students interest in senior secondary school difficult chemistry concepts", In Z.C. Njoku (Ed), *55<sup>th</sup> Annual Conference Proceedings of Science Teachers' Association of Nigeria*, 271 – 278, Ibadan, HEBN, Publisher PLC.
- Kola, J. K. (2013). "Effective teaching and learning in science education through information and communication technology

(ICT)", In O.S. Abonyi (Ed), *Journal of research and method in education*, 2, (5), 43 – 47.

Ndirika, M.C. & Kanu, N.E. (2012). Availability and utilization of information and communication technology infrastructure among school teachers in Umuahia education zone, Abia State, Nigeria, In O.S. Abonyi (Ed) *53<sup>rd</sup> Annual Conference Proceedings of Science Teachers' Association of Nigeria*, 204 – 289, Ibadan, HEBN, Publisher PLC.

Nwagbo, C.R. & Ugwanyi, C.S.C. (2012). "Challenges of effective utilization of information and communication technology in teaching and learning of basic science and technology in primary schools", In O.S. Abonyi (Ed), *53<sup>rd</sup> Annual Conference Proceedings of Science Teachers' Association of Nigeria*, 215 – 220. Ibadan, HEBN, Publisher PLC.

Nzewi, U.M. (2009). Information and communication technology in teaching/learning curriculum, theory and practice *curriculum organisation in Nigeria* pp 160 – 166.

Ogbu, C.C. (2012). Effects of context based teaching strategy on senior secondary students achievement in physical chemistry, In O.S. Abonyi (Ed), *53<sup>rd</sup> Annual Conference Proceedings of Science Teachers' Association of Nigeria*, 265 – 271. Ibadan, HEBN, Publisher PLC.

Ojaleye O. (2002). "Promoting the utilization of information technology education in mathematics class among Pre-service teachers", *A paper presented at the Mathematics education summit held at National mathematical centre*, Abuja 4 – 5 Oct.

Okoyefi, C. O & Nzewi U. M. (2012). "Assessment of ICT competences possessed by Biology teachers in Nigeria education zone", In O.S. Abonyi (Ed), *53<sup>rd</sup> Annual Conference Proceedings of Science Teachers' Association of Nigeria*, 300 – 306. Ibadan, HEBN, Publisher PLC.

Okoye, P.O. (2014). "E – learning utilization: An approach to dimensions of creativity for effective STEM curriculum delivery in colleges of education in Nigeria", In Z.C. Njoku (Ed), *55<sup>th</sup> Annual Conference Proceedings of Science Teachers' Association of Nigeria*, 3 – 14. Ibadan, HEBN, Publisher PLC.

Onwuachu, W.C. (2011). Biology teachers' perceptions on the utilization of material resources as a forward for effective biology education. In O.S. Abonyi (Ed), *52<sup>nd</sup> annual conference proceeding of science teachers association of Nigeria*, 210 – 216, Ibadan, HEBN Publisher PLC.

Ugwu, O.I. (2006). "Improving instruction in Agricultural education in universities through the application of information communication technology (ICT) and other resources", *Review of education* 17, (1) 49 – 61.

Dr Lawrence Achimugu  
Dept of Science Education  
Kogi State University, Anyigba  
Kogi State - Nigeria

IJSER