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

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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 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 software 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. (Ojalaye 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 contradicted themselves. For instance, while Ahmed, Abimbola, Omosoew & Akani (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 for 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 utilization in teaching chemistry. How to sensitize 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 use 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 (CTPF-AEULC) 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 Agree (SA) = 4, Agree (A) = 3, Disagree (DS) = 2 and strongly disagreed (SD)=1. The structure 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.

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

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 research questions. 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.

<table>
<thead>
<tr>
<th>Number of subjects</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male 48</td>
<td>2.97</td>
<td>1.20</td>
</tr>
<tr>
<td>Female 57</td>
<td>2.89</td>
<td>1.24</td>
</tr>
</tbody>
</table>

The results in table 2 show that male chemistry teachers have overall mean of 2.97 while female chemistry teachers have overall mean of 2.89. Therefore, male chemistry 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.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of subjects</th>
<th>Mean</th>
<th>SD</th>
<th>T.</th>
<th>Df</th>
<th>T.</th>
<th>Table Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>48</td>
<td>2.97</td>
<td>1.20</td>
<td>103</td>
<td>0.410</td>
<td>1.96</td>
<td>0.05</td>
</tr>
<tr>
<td>Female</td>
<td>57</td>
<td>3.03</td>
<td>1.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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, shortage of ICT support personnel’s and guards and to supply more ICT facilities in the senior secondary schools as well as motivate teachers.

1. Government at various levels should organize ICT conferences, workshops and seminars for chemistry teachers and make sure that all chemistry teachers are mandated to attend these training programmes.
2. 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.
3. Chemistry teachers in collaboration with ICT technical support personnel’s should ensure adequate repairs and maintenance of the available ICT facilities.
4. 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 include lack of basic skills and training of teachers, lack of motivation of teachers, lack of ICT support personnel’s, 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
Kola, J. K. (2013). “Effective teaching and learning in science education through information and communication technology

IJSER
ISSN 2229-5518

1908


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