

# THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN TEACHING AND LEARNING OF CHEMISTRY IN SECONDARY SCHOOLS IN NIGERIA: CHALLENGES AND REMEDIES

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## **Abstract**

This paper focused on the use of information communication technology (ICT) in the teaching, and learning of chemistry and other sciences. It examined the objectives of using ICT in teaching and learning process, the major potentials of ICT in teaching and learning, its role in making science concepts easy to understand by the learner, the challenges facing the use of ICT in the teaching process; such as poor funding of education, insecurity and vandalization of installed ICT/computer facilities, poor electricity supply, non-motivation of science/computer science teachers, lack of qualified and well trained ICT/computer teachers. Remedies to the challenges of the use of ICT/computer in the teaching and learning process were also stated.

Science and computer education is that education intended to make every individual of the society scientifically computer literate, enough to live in this age of science, information, communication and technology and to make those with the intellectual ability productive and functional members of the society. Education of the youths should now be geared towards making them relevant to the current realities of our time. This is the reason why the beginning of the 21<sup>st</sup> century brought in a new dimension in pedagogy of teaching and learning in science. Ezeliora (2004) observed that the beginning of the 21<sup>st</sup> century saw a shift in emphasis from science and

technology to information technology. Recently there is a shift from information technology (IT) to information and communication technology (ICT).

Information and communication technology (ICT) is an aspect of technology that involves an integrated application of computer, information, electronic telecommunication technologies-in solving problems of time, distance, volume and fidelity created by information explosion across the globe. Okwor in Omiko (2011) described information and communication technology (ICT) as the use of computer and telecommunication technologies in the collection, collation, analysis, processing, manipulation, storage, retrieval, transmission and communication of data in different forms which may include audio, visual and audio-visual formats. The present 21<sup>st</sup> century is regarded as an information explosion age. This has brought in the need for an advanced technology to manage and control information and make it available/accessible to the users at a very fast rate to avoid getting obsolete (Ezeliora, 2004). The efforts made by the federal and states governments in Nigeria towards this direction is a welcome development in the education industry.

## **Objectives of Using ICT in Teaching Chemistry and other Sciences**

The main objectives of using ICT in teaching and learning of chemistry or any of the science programmes is the sustainable development of the programmes of studies to

realize its potentials as an art, science, technology and industry. Specifically the objectives are to accomplish the following:

- (i) To provide necessary facilities in training and expertise in all the areas of chemistry and other science subjects.
- (ii) To conduct research in all aspects of science.
- (iii) To provide necessary data bank for the enhancement of quality performance in science.
- (iv) Collaborate with other institutions and relevant bodies within and outside the country towards evolving a virile and self-sustainable programme.

Curricular activities and programmes organized and presented through (ICT) will provide qualitative education virtually in all areas (topics) of the subject and prepare the ground for eventual take-off of higher learning, based on adequate knowledge in the selection and skills in the utilization of instructional materials. Rishante (2004) observed that every curriculum is designed to be an excellent one, but each fails short of this aspiration. The failure to achieve the desired objectives is caused by the lack of skills in selecting and using instructional materials.

ICT is always applied in teaching and learning of chemistry and other science concepts for a number of reasons; such reasons include the following:

- (i) It is the most dynamic and vibrant method of instruction and also possesses immense potentials through its varied nature.
- (ii) The uniqueness of ICT lies in the fact that as one of the components of mass complex, it is an integral part of the modern teaching and learning process.
- (iii) The other uniqueness is derived from the enormous relevance of its varied and immense potentials.

For one, it is congenial in any form of teaching and learning, be it for an individual, small or larger group and at their own convenience.

### **Major Potentials of ICT in Teaching and Learning of Chemistry and Other Science Subjects**

Information and communication technology (ICT) is the latest technology ever invented by man for its benefits. ICT is an aspect of technology which has impacted positively in all aspects of human life. There is no human activity where ICT is not involved. It is useful in agriculture, business, communication, engineering, construction, hospitals (Health institutions), banking, and education, among others. The application of ICT in education sector has affected the system positively in several ways. The use of ICT in teaching and learning of chemistry can accomplish the following:

- (i) The use of ICT, especially Computer Assisted Learning (CAL) technique is an ideal in teaching and learning of chemistry concepts and other science subjects.
- (ii) Difficult chemistry and science concepts are taught easily by the use of ICT.
- (iii) ICT is not only used to source information in chemistry or other sciences, it is also used to carry out most challenging stoichiometric calculations in chemistry, especially those chemical calculations involving complex ions, wave and particulate nature of matter. Ivowi (2002) and Ezilora (2004) were of the same view when they observed that with ICT, quantum mechanics is used to compute the properties of molecules and their interactions.

- (iv) **Span time:** This implies that events of the past can be kept to be reviewed at a later and more convenient time for learning. Examples, in football matches replay/review of events are possible because of ICT. Fault is detected during the review. In teaching and learning of chemistry, ICT would enable the teacher and students to have a review of what they have studied.
- (v) **Span space:** Distant or less accessible places are accessed at first hand, example, scanning is done in the health sector to detect problem where our eyes cannot see ordinarily. We can apply this in chemistry when teaching the structure of atom, wave and particulate nature of matter. Those aspects of chemistry concepts which we cannot view easily can be taught by the use of scanning process. It makes students' understanding of the concept faster and easier.
- (vi) **Convey movement:** ICT shows how things work in practical ways. This aspect of ICT can be used to teach chemical combination, diffusion of particles both in gaseous and in liquid states.
- (vii) Focus attention on the scene or elements, particularly the one the teacher wants to stress.
- (viii) Enlarge small objects, thereby helping the learners to see clearly the details in a chemistry lesson, we use this aspect of ICT, particularly computer to teach the atom, elements and compounds, structure of the atom can also be illustrated through this process.
- (ix) ICT can slow down time so that events that happen too fast for the human eyes and brain to comprehend can be seen at an understandable speed.
- x. ICT can speed up time so that events which happen slowly can be viewed and understood in short time.
- xi. ICT conveys ideas skillfully.
- xii. ICT hastens the understanding of abstraction by presenting situations in concrete terms.
- xiii. ICT can provide examples and helpful suggestions.
- xiv. With ICT, the learner no longer puts all his/her hope on the teacher for sources of knowledge. Both the teacher and the learner have access to current textbooks, reference books, periodicals, journals, newsletters and peers by using internet.
- xiv. With ICT, large volumes of information are made available to both the learners and teachers within a short period of time and more interestingly, current information is obtained as soon as it is accessible. ICT enhances knowledge sharing, quality of knowledge, authentic and unique knowledge.

The above benefits derived from the use of ICT in teaching and learning are important to the education system. But a lot of problems confront the teachers, school administrators and other stakeholders in the use of ICT, such challenges or problems are the focus of this paper.

#### **Challenges Facing the Use of ICT by the Chemistry Teachers in Secondary Schools in Nigeria**

1. Poor funding of education in Nigeria: Misplacement of priorities and insufficient recognition of the essence of education in budgetary planning and arrangements. The Nigerian government since independence

in 1960, has never allocated one third ( $\frac{1}{3}$ ) of the United Nations requirements/recommendation of twenty-six (26 percent) of the annual budget to the education sector.

2. Insufficient utilization and promotion of information and communication technology (ICT) in educational institutions (Iyoha, 2011).
3. Poverty: Abject poverty of a larger segment of the nation's population with about 75 percent of the population living below poverty line. This contributes to high rate of computer illiteracy in the country. Iyoha (2011) observed that:

“with the overwhelming importance accorded (ICT) impartation of knowledge and skill, many students, teachers and lecturers do not have adequate access to ICT facilities. And coupled with poor V.SAT and other internet infrastructural facilities in the country, access to information on the internet is usually erratic and discomforting.

#### **High Cost of Computer Hardware and Software**

In a country where the money to provide the basic needs in education/schools is in short supply, one wonders how willing the government will be to undertake such an uphill task of introducing computer/ICT studies in the secondary schools in Nigeria.

#### **Shortage of Qualified and Well Trained Computer/ICT Teachers**

At present, Nigeria lacks adequate number of professionally trained and qualified computer/ICT teachers for meaningful teaching and using computer/ICT in teaching chemistry and other sciences like, biology and physics in secondary schools. There is the need to produce professionally trained teachers in the discipline.

#### **i. Nigerian government's non-chalant attitude to the welfare of teachers at all levels in the education sector:**

Non motivation of teachers cuts across all the levels of the education sector. This laissez-faire attitude of the government usually culminates in avoidable and unnecessary strike actions in the system. The teachers' welfare is nothing when compared with that of councilors, elected House of Assembly Members, House of Representatives and that of Senators

- ii. **Electricity problem:** Electricity supply in this country is erratic, poor and generally annoying to the general public. Electricity is among the essential amenities which human beings require for good quality life. It is not available in some parts of the country, and where it is available; the poor state of its supply in this country is a common knowledge. It is difficult to imagine how computer/ICT facilities can be sustained in such a situation.

#### **iii. Vandalization/Insecurity of Installed Computers/ICT Facilities**

Insecurity to computer/ICT installations is a great problem facing ICT and computer utilization in Nigeria. Due to poverty and unemployment, ICT and computer facilitating structures are prone to vandalization by thieves and criminally minded telecommunication officials. Many service providers and those people who can afford to buy computers and telephones are afraid of these computer/ICT facilities being stolen. In addition, an average Nigerian is poor and living below poverty line (WESD, 1998) and as a result cannot buy computer/ICT accessories, nor pay the electricity or telephone bills.

- iv. Lack of Government Policy on ICT Usage

There is no government policy governing the use of ICT in the education sector in Nigeria. ICT education in the primary and secondary school levels has not been officially and effectively introduced in the public schools. The arrangement for its introduction has not succeeded because the curriculum for it has not been developed to guide its study in the school system (Ezeliora, 2004).

### **Remedies to the Challenges Affecting Effective Use of ICT in Teaching and Learning of Chemistry and Other Science Subjects**

Achieving ICT literate society would help Nigeria to meet the millennium development goals (MDGs) and the Universal Basic Education and enhance scientific and national development. Therefore the success and achievement of effective use of ICT in teaching and learning of chemistry and other science subjects will depend on:

- (1) Provision of adequate fund for the education sector.
- (2) Encouragement and promotion of the utilization and application of information communication technology (ICT) among, students, teachers and lecturers.
- (3) Electricity is one of the basic amenities of life in a civilized society and more so in this computer/21<sup>st</sup> century. The government should aim at providing this basic amenity to all parts of the country.
- (4) The government should also while providing electricity in the rural and urban areas link up these rural and urban areas with telecommunication facilities to facilitate transactions, minimize traveling and exposure of people to road hazards.
- (5) The government, stakeholders in education and the Science Teachers Association of Nigeria (STAN) should

work collaboratively in organizing workshops, conferences and seminars on ICT on regular basis.

- (6) The teachers' welfare should also be considered favorably by the government. Non-motivation of the teachers affects their performance in the discharge of their duties. Omiko (2011) observed that when teachers are motivated by the government through regular salary payment, award, sponsorship to in-service training, among others, they put in more effort to see that they discharge their duties creditably well.
- (7) The government should provide enabling environment for students to buy their computer/desktop/laptop by subsidizing the cost. This will enable the students to buy and use them for their studies.
- (8) The government and communities or villages where ICT/internet facilities are provided, should provide adequate securities to safe guide them from being vandalized by thieves.
- (9) There should be government policy statement on the use of computer in schools and the installation of ICT facilities in the country.

### **Conclusion**

The benefits derived from the use of ICT in teaching and learning of chemistry and other sciences are very great. ICT touches on all human activities; it has made the world a global community/village. Its role in education is overwhelming; therefore all stakeholders in the education sector should combine efforts and make sure that its introduction and use in the school system is achieved.

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