NATIONAL CONFERENCE ON ICT EMPOWERED TEACHING, LEARNING AND EVALUATION (NCICT-2016)

International Journal of Advanced Scientific Technologies in Engineering and Management Sciences (IJASTEMS-ISSN: 2454-356X) Volume.2,Special Issue.1Dec.2016

Empowering Chemistry Teaching By the Use of Information & Communication Technologies [ICT]

M. Pragathi and P. Harshalatha
Dept. of Chemistry, SVGM Govt. Degree College, Kalyandurg, Anantapuramu–515761, A.P
E-mail: pragathi.madur@gmail.com

Abstract—Teaching and learning processes have been intensely reformed by the use of ICT. Furthermore, it has expanded new opportunities for learning and accessing to educational resources beyond those traditionally available. This paper presents a view of using and incorporating information and communication technologies [ICT] into the teaching and learning of chemistry. Studies that investigate students' ICT skills in chemistry in particular and in science in general establish that ICT-based learning environments play a significant role in education. While this seems to be true as an overall assessment, the future is affected by innovations, fast-moving, and in many ways unpredictable. Present paper discusses and exemplifies visualizations in laboratories such as molecular modeling, data collection, and presentation. The focus is also on ICT use via the World Wide Web [WWW] and virtual reality as well as the role of ICT for developing higher-order thinking skills, such as inquiry, graphing, and modeling. In addition examples of different assignments for teaching chemistry using ICT are introduced including some recommendations for the designing of new ones. Chemistry teachers should know how ICT can support their own professional development. They should be aware of key sources of research and inspection evidence about ICT in science.

Index Terms—Chemistry, ICT, WWW

I. INTRODUCTION

In the present society, people should access knowledge via information and communication technology [ICT] to keep pace with the latest developments. By applying ICT, the possibility of learning without constraints of time and place would be achieved which suit the needs of the students. The use of ICT is a symbol of a new era in education. Besides, ICT alters thought patterns, enriches existing educational models and provides new training models.

Use of ICT in higher education:

ICT now permeates the education environments and underpins the very success of 21st century education. ICT also adds value to the process of learning and to the organization and management of learning institutions. Technologies are a driving force behind much of the development and innovation in both developed and developing countries. ICT is considered as a mainstream in higher education. ICTs are being used in many areas such as: developing course materials; delivering content and sharing content; communication between learners, teachers and the outside world; creation and delivery of presentation and lectures; academic research; administrative support and student enrolment [1]. When applying ICT in higher education, learning is no longer confined within schedules and timetables [2].

Use of ICT in teaching science:

There are several ways for teachers to make effective use of ICT in science education [3]. But the teachers should ensure that ICT use is appropriate and adds value to learning activities. It should be built on the teachers' existing practice and on students' prior knowledge. And finally teachers should link ICT use to ongoing teaching and learning activities.

The functions of ICT which are specifically relevant to science teaching are:

- The immediate appearance on screen of automatically collected experimental results enables pupils to make the connection between observed and empirical data;
- Access to current and relevant information sources can be used to illustrate concepts which would otherwise be very theoretical;
- Increasing precision in the use of scientific language and terminology can be encouraged when word processing software is used to produce reports and accounts of experiments;
- Interaction with simulations and models allows pupils to test hypotheses and explore relationships between variables, e.g. to explore the effect of colour of light on oxygen production during photosynthesis.

Role of ICT in teaching and learning chemistry:

In chemistry education, the most common ICT tools are visualizations such as simulations or computerized molecular modeling [CMM] [4, 5] and computerized laboratories also known as microcomputers based

laboratories [MBL]. In spite of extensive development of visualization in the field of chemistry [6], especially in the context of computerized molecular modeling, the MBL elements of visualizations in chemistry have not been thoroughly investigated [7].

Where can we use ICT in teaching and learning chemistry…?

ICT helps in teaching and learning process in several ways:

- **Simulations and modeling** help pupils to understand phenomena which may be too slow, too fast, too dangerous or too expensive to investigate and to reinforce conceptual understanding.
- **Data logging** helps to record variables such as temperature moisture and in the analysis of results.
- **Databases and spreadsheets** enable pupils to organize, search and sort information in order to explore relationships, look for patterns and test hypotheses.
- **Publishing and presentation software** enables pupils to develop understanding and present their findings to others.
- **Information resources** enable pupils to find information and thus to develop their knowledge and understanding of chemistry.

ICT is useful in explaining types of chemical bonds through animation; differentiating the different states of matter; explaining the reaction mechanisms through animation; explaining the structure of atom through videos; explaining the structures of various molecules like octahedral, trigonal bipyramidal et. These can also be used for comparing the different isomers of molecule. Chemistry educators can take advantage of the technology tools and showcase the relevance of chemistry and its connections to other fields that are part of the molecular frontier [5, 8].

***Different softwares used in chemistry*:**

Some important software programmes developed for chemistry can be listed as Chemsketch [2D chemical structure drawing program with a large template collection of pre-built molecules], chemdraw, chemix school, Chime/RasMol [3D molecular rendering software with interactive multiple display modes], Spartan [Molecular builder and research-level computational software], Odyssey [Molecular dynamics software – a systems approach to molecular motion and interactions] and chemlab [an interactive chemistry lab for simulation on windows]. Most of these are meant for molecular modeling and visualization. Model chem.lab is a unique product incorporating both an interactive simulation and a lab notebook workspace with separate areas for theory, procedures and student observations.

Databases for chemistry:

A database is a collection of information that is organized so that it can easily be accessed, managed and updated. A chemical database is a database specifically designed to store chemical information. This information is about chemical and crystal structures, spectra, reactions and syntheses and thermo physical data. Different types of chemical databases are chemical structures, literature database, crystallographic database, NMR spectra database, reactions database and thermo physical database.

Limitations of ICT:

The lack of adequate infrastructure facilities is affecting the integration of ICT into chemistry teaching and learning. Teacher competence also plays a significant influence on ICT use in chemistry teaching and learning. Majority of chemistry teachers are reluctant to extensively use ICT in their classrooms and or ICT laboratories

II. CONCLUSION

ICT has become a sole supported for all the subjects in schools and colleges. Though the teachers in service are digital immigrants, they need to understand the need for the hour and try to cope up with student who are the future nation builders, and also try to explore and use the technology to the fullest extent. Chemistry teachers should know how ICT can support their own professional development. They should be aware of key sources of research and inspection evidence about ICT in science. They should understand how to set up and keep records of pupils' attainment using ICT. They should be able to find sources of information and case studies of how ICT can be used in science.

REFERENCES

[1] Mandal & Mete, 2012
[2] Hattangdi & Ghosh, 2008
[3] Osborne and Hennessy, 2003
[4] Dori, Y. and Barak, M., 2000. Computerized molecular modeling: Enhancing meaningful chemistry learning.
[5] Scott A. Sinex and Barbara A. Gage, Proceedings of the CONFCHEM 2004: Teaching Computing in Chemistry Course.
[6] Chiu & Linn, 2012
[7] Dori & Sasson, 2008
[8] American Chemical Society, 2003; National Academies, 2003.