

E-LEARNING; A TOOL FOR ENHANCING SCIENCE TEACHING AND LEARNING

Gana, C.S.

Department of Science Education
Federal University of Technology Minna

Abstract

E-learning is motivated by a desire to argument the convectional teaching and learning methods. The science teacher in Nigeria acquired little proficiency in the area of emerging technologies. This paper examines the prospect and challenges of e-learning on education and particularly its integration as an instructional strategy of teaching through the use of various software programs in different field of science. Recommendation was made among others such as promoting the use of e-learning packages as an aid to teaching and learning is made

Introduction

E-learning is the application of electronics to education at any level and can be seen as a form of computer assisted process and application in which learning and teaching are interwoven in the sense that it enables the construction of knowledge and the acquisition of skills with reference to individual experience and practice. It can therefore be self paced or instructor led with the assistance of various forms of media, mostly electronic media. All digital electronics especially the digital computer device, process data to produce information that plays vital and central role.

There has been explosion of knowledge in all fields of human endeavor as a result of e-learning. It has revolutionized information and knowledge such that what happens in any part of the world could be viewed on a screen. The wave of change has also affected science education in terms of teaching and learning both in and outside the classroom. Teaching has now shifted to guiding learner on how to locate, retrieve, analyzed, use and store information.

The use of e-learning has been considered helpful though there are obvious difficulties before the benefit can be realized. For example, some of the expected benefits are:

the programmes packaged can be usually attractive and informative like the tutorial programs, which teach the materials through question-answer sequences, the students are active in learning. Indeed the instruction is driven by the response, provided feedback and uses the learner's performance data to make decisions, which are suited to learners' competence. Through class records, the teachers can observe progress, determine which topics are difficult, and arrange tutorials with students whose response patterns show conceptual misunderstanding or unexpected lines of argument. However, there are considerable difficulties encountered by learners in realizing their full potential, principally because the modes of communication from the students to the computer are limited. The point is not just that typing responses at a keyboard is slow and labourious, but that in most tutorial program material, the answer and the instructions to be carried out has to be pre stored and the range of students responses anticipated by the teacher has been programmed.

Therefore teaching steps must be relatively small, the approach directed and the type of dialogue restricted. Again in simulation programs an elementary command

language has to be designed for the students. Typically this only allows the dominance of variables and the alteration of their values. So the response set is limited. Even the students' answers a problem, which will carry out the task, the problem itself or its formation has to be provided by other means. Furthermore, facilities for full participation in e-learning is often lacking in Nigeria educational institutions including universities as few universities in Nigeria have adequate ICT facilities for teaching and learning. The situation is even worse in Primary and secondary schools where obsolete equipment and teaching methods prevail.

Computer; A Tool for E-learning

The current trend in various institutions in Nigeria is the approach of using computer centered based ideas in the writing of thesis by students of higher institutions. This trend should be encouraged because it will enhance e-learning in Nigerian educational system. Computer can store prepared instructional materials in the form of programs, which are carefully structured to teach specific lessons. CAI make use of drill and practice approach, tutorials and demonstration of which most of young talented individuals and programmers are busy producing teaching packages for PhD

and Masters Students of education. These programmers are self employed and are making progress in the field of education. These is reducing the unemployment problem and even arousing the interest of this young programmers to read education related courses at higher level so that they will be knowledgeable in the content area of the packages they are producing since that is where they earn a living. E-learning has opened their eye to see prospect that abound in education and are resolved to further their studies in education.

Drill and practice programs are probably the most common and best known educational application of computers. Such programs are used for the purpose of drill and practice. Teachers assign students to perform particular sets of discrete skills in math, reading, spelling or other basic skills areas during drill and practice. Drill and practice approach is a form of teaching aid whereby information is presented and a question is asked, the next step can only be attempted when the correct answer is given. The question is asked again when the response is incorrect. CAI has been successfully used to supplement more formal teaching methods and specifically used for remedial purpose. Drill and practice programs exist which are used mainly to

reinforce old lessons rather than new ones.

Computer assisted learning (CAL) involves the use of software, which are written to encourage learning more by discovering and investigation than drill and practice. CAL makes use of simulation programs. Simulation programs are programs that mimic the principle, causes and effect found in reality. Simulation programs can be designed to create models for experimental purposes (e.g. simulation of experiment in physics, chemistry, matrices operations in mathematics), which a student can use to discover what happen in given situations.

With simulation programs opportunity for experiments or practices to be carried out of which would not otherwise be feasible because of dangers, cost, time, etc. these simulation programs can also be used time and time again with different sets of data so that a variety of conditions can be studied. Example of simulation programs includes CATAB. Below is a sample simulation program of wave motion.

This program can further be modified to explain the concept of motion in physics. For some, the use of resources, especially science subjects other than the blackboard is

almost essential. Because it demonstrate and gives a model of atoms, incident rays circuit photo electricity and so on for easy visualization and reduce the mental load in thinking of how these abstract concepts on large television through the use of computer based instruction have been considered helpful. On the other hand, there is considerable promise in the wider range of educational activities, which are potentially available, on the other there are obvious difficulties before the benefit can be realized. Simulations of the physical world on as large television screen produced by a microcomputer similarly act as valuable aid to understanding concept.

Hence, it will be misuse of computer capabilities to conclude that computers are used in place of blackboard or over Head Projectors. It has good advantage because of its ability to produce moving pictures that can be controlled by the teacher. Tutorial program are programs that are intended to impact and actively teach principles and theories. Such programs are programmed to dictate the students' level of the learning materials accordingly. Some are designed to engage learners in friendly exchange of ideas. In tutorial, computer instruct the student in some areas of

knowledge the same way a teacher would in a one on one situation. Examples of tutorial programs include pro one multimedia tutorial, Mavis Beacon program that teaches typing skills. The student is thus guided through a process of learning by discovery in which the subject matter and underlying theory are progressively revealed to him.

Integrating Conventional Teaching and E-learning Schemes

The respective strength of the human teacher and machine based program can often be considered complementary. Though e-learning has proved to have enormous advantages over conventional process of teaching and learning such as the conventional method compels the teacher to deliver his/her lecture in a physically constrained environment. E-learning liberate teachers and students from the restrictions of space, time and physical facilities thereby promoting independent study aided by advances in modern computer technology. However, the teacher has good general knowledge of the topic area and easy modes of communication with the students.

Problems in teaching and learning are often resource based therefore the teacher must work with groups which makes it difficult to keep

detailed records or summaries of individual performances so as to closely guide decision so, computer assisted learning (CAL) can be a useful support when the teacher has little time nor the resource to give adequate illustration or small group teaching. However, the practical development of computer learning aids which are realistic in scale depends upon CAL techniques being able to engage in wide ranging activities such as tutoring simulation and the teaching of problem solving skills though, integrating these methods within normal teaching schemes is not easy. The computer based techniques emphasized individualization and the adaptive nature of teaching, whereas conventional method tends to favor minimal variation in the conditions under which students are expected to learn. In order to cope with these problems, the teacher can be provided with a variety of techniques and types of languages. In computer assisted learning, student and teacher communicate indirectly through the machine administration of teaching programs.

The teacher has to interpret objectives into a sequence of task and these techniques of analysis and ways of representing knowledge structures are requires. The program design must be specified these

include the interactive language for the student commands and permitted types of response, the rule governing the initiative that are taken by program and learner and the actual teaching material for tutorial work, this specification is coded using an author language (i.e. a series of commands words and syntax rules interpretable by the computer which are suited to response matching and character/word manipulation). In the case of simulation, the package is usually written in computer languages such as FORTRAN or BASIC which are convenient for carrying our more complex calculations.

In integrating CAL into conventional teaching the teacher must manage a class of students who will use the computer based materials individually. Their performance data must be stored and used by the program in adaptive decision-making and in printing study guidelines for the learner. The records must also show the teacher the rates of progress and particular difficulties of students. So the teacher must be able to setup evaluative functions and a process class record in order to answer enquires. In other words, CAL application requires a record creation/processing system.

It is necessary to integrate computer based materials within conventional teaching schemes. Hence, the programs are likely to enlarge the educational objective and stimulate the teacher to undertake curriculum innovations. So the teacher should be able to manage, adapt, or re-assemble Cal modules or packages to suit the different needs of classes.

The student has to learn the command language and response convention such as FOTRAN, BASIC and how to use the instructional materials at the terminal, in addition to CAL training programs, online message facility. This enables the student to comment in the teaching materials, ask questions or arrange meetings with his tutors. In order to provide a linking framework between the program and conventional modes of teaching, student guides, worksheets, and other resource materials are likely to be needed.

Prospect and Problems of Using CAL

E-learning facilities access to existing knowledge and skills by allowing teachers and students to search out desired materials from the vast reservoir of knowledge and skills through the assistance of the computer. Thus the e-learning saves the teacher and the learner a huge amount of energy and time that

would have been spent in the use of conventional procedures.

Some of the early attempts to develop behavioral control programs were aimed at a major replacement of the teacher. These were not wholly successful and the teaching functions now given to the computer are more limited and more precisely defined. This is shown by example taken from one of the largest centers engaged in computer-assisted learning, namely; the PLATO project at the University of Illinois. Several hundred terminals are available for department to use in interactive teaching and a library of over four thousand hours of programmed materials has been developed in wide range of subjects (Lyman 1974). In the department of physics University of Illinois, the organization of the introducing courses assumed that students attended lectures, read from specified textbooks and worked through assigned problems before and during example classes.

However reality differed from these expectations. For example, 30% of the science and Engineering students attending the course did not attempt any of the problems before coming to the example class and additional 30% failed to master even one problem of these given assignment (Sherwood *et al* 1971). Since the

physics course, in common with most teaching in the sciences, was hierarchical in structure, a lack of mastery of one topic hindered subsequent learning and the progress of weaker students continued to deteriorate. Therefore, instead of totally replacing the conventional teaching, the computer based instruction system was given managerial task of checking students' understanding and provides sufficient teaching to ensure that specified performance levels were met.

However, there is, yet no agreed overall learning scheme, which adequately copes with and suggests teaching designs for the many diverse situations in which CAL methods have been applied. The CAL literature reflects this absence in that no adequate taxonomy of task and teaching procedures has been defined and the result is fragmented body of knowledge comprising the case report of individual studies. Hence, computer assisted learning simulation programs attempt to realize these lapses hence it allows the student to test hypothesis held about by the underlying model. Typically variables are denoted, input values specified and the result output displayed. Within these limits, few restrictions are place on the user who has to evaluate the

output to guide further decisions. Therefore, such packages are best used when the student has sufficient knowledge to provide a coherent framework for such an explanation.

Nuthal and Smook (2007) identifies behavioral control model among other factors influencing CAL and therefore behavioral types of teaching should stress complete control over student behavior and over the conditions of learning. Within CAL the emphasis is on programs which are directive in nature/style and on adaptive decision making based on performance records of individual students. Skinner (1953) viewed learning as a complex network of stimulus response associations. These bonds are established by providing reinforcing stimuli such as knowledge of results, directing the learner as given an active and appropriate response to the stimulus material. Thus, the problem is that the teacher must control the selection and arrangement of content and task so that the required responses are elicited. The teacher also controls the type of feedback and other reinforcing stimuli which are used to maintain and regulate efforts and to shape more complex learning behaviors by building up response chain composed of small steps.

Conclusion

The use of computer based instruction system should not be seen as a total replacement of both the teacher and the blackboard but as a teaching aid capable of improving the quality of teaching and learning. In this perspective, standard topic covered by either the syllabus or curriculum are encoded in various computer programs in a self instructional mode, which makes it easy for the student to use with little or no assistance from the teacher. In this way, many subjects covering a huge variety of topics are catered for.

However, in contrast to the previous teaching mode, (Behavioral control mode), discovery learning technique, place emphasis on the control that the learner has in building up his/her own knowledge structures. The teacher is not the primary source of information, but acts to stimulate and monitor the learner and reveal the inadequacies of generalization by producing counter examples. It is maintained that such methods allow the student not only to arrive at more general conclusions but also to learn the process of generalization itself

Recommendations

- E-learning should be incorporated into science teacher preparation through
- Updating the methodology and educational technology components of the curriculum for teacher education to include development and use of E-learning
- Promoting the use of E-learning packages as an aid to teaching and learning
- Making acquisition of skills on development and utilization of E-learning packages mandatory in teacher training and other education institutions.
- Making the possession and utilization of suitable computers mandatory for student teacher and academic staff of education institutions.
- Provision of the necessary ICT facilities in teacher training and other education institutions.

References

- Babbie, E. (2001). *The Practice of Social Research*. New York: Wadsworth Publishers
- Cohen, L., and Manion, L. & Morrison, K. (2000). *Research Methods in Education*. London: RoutledgeFalmer
- Department of Education (2001). *The National Plan for Higher Education*
<http://www.policy.org.za/htmlgovdocs/misc/higheredu> retrieved on 5/6/2011
- Ellis, A., & Fouts. I. (1993). *Research on Educational Innovations*. Princeton, NJ: Eye on Education. Press
- Flecknoe, M. (2002): How can ICT Help us to Improve Education? *Innovations in Education & Teaching International*, 39A, 271-280
- Garrison, R. and Anderson, T. (2003). *E-learning in the 21st Century: A Framework for Research and Practice*. Routledge: Fulmer.
- Issac .S. and Michael, W.B. (1981). *A Hand book in Research and Evaluation*. 2nd Edition. San Diego, CA. Edits Publishers.
- McCormick, R. and Scrimshaw, P. (2001). *Information and Communications Technology, Knowledge and Pedagogy. Education, Communication and Information*, 1,1,37
- Nunnally, J.C. & Bernstein, .I.H. (1994). *Psychometric theory* (3rd Ed.). New York: McGraw-Hill
- Research Adviser (2006). Online Accessed at <http://h.NW\v.research-advisors.com> retrieved on 4/3/2011
- Tuckman, B.W. (2003). 'Homepage', Ohio State University, retrieved on 1/6/2011
- From <http://www/coe.ohio-state.edu/btuckman/>, Accessed January 14, 2005
- Wagner, A.D. (2001). IT and Education for Poorest of the Poor: Constraints, Possibilities and Principles, *Techknowlogia*, July/August, 48-50