International Journal of Continuing and Non-Formal Education

Contents

Effectiveness of Computer-Based Instructional Technologies in an African University: Policy Implications for University Education in Nigeria

Martins Fabunmi, Agatha-Mary Ayene Neku, Emmanuel Aileonokhuoya Isah and Samuel Olabode Fabunmi
Faculty of Education, University of Ibadan, Ibadan. Nigeria

Abstract

In Nigeria, university authorities appear not to lay adequate emphasis on the application of computer information technologies to teaching. The needed equipment is not often available. Most lecturers do not have the needed computer skills. This study, therefore, investigated the extent to which computer-based instructional technologies could enhance teaching and learning effectiveness with a view to making recommendations to policy makers and university authorities in the country on the need to provide and use Computer-Based Instructional Technologies (CBIT) to teach in at universities. The study adopted survey research design and used the multi-stage sampling procedure to select six out of thirteen faculties and 300 out of 1,156 lecturers at the University of Ibadan, Nigeria. A questionnaire was developed for data collection. The multiple regressions were used to analyze data, using a 0.05 level of significance. Result revealed that the application of Computer-Based Instructional Technologies to teaching contributed significantly to teaching effectiveness.

Key words: Computer, instructional technologies, an African university, policy implications, university education

Introduction

Global emphasis is on how to incorporate Computer-Based Instructional Technologies into the teaching process with a view to enhancing teaching effectiveness and learning. Several nations have incorporated the technology into their educational delivery systems. Japan, Mozambique and the United Kingdom introduced Computer-Based Instructional Technologies across the school system in 1985, 1997 and 1970 respectively (Sakamoto, 1995; Ismail, 2001 and School Curriculum Assessment Authority, 1994). In most advanced countries, virtually all their teachers are able to apply to apply the computer technology to teaching. Some scholars are of the view that the inclusion of ICT in teaching practice by teachers who lack the necessary skills may do more harm than good. In reality, the scientific literature on this matter is split into two major schools of thought. The first, very powerful in the pacific 'Anglophone' countries, most particularly Australia, identifies integration of ICT both as a condition of survival of university institutions and as a content favoring the modification of teaching practices, thereby showing to advantage the integration of networked environments (Dalgamo, 1996; McNaught, 1996).

A second school of thought, more pragmatic than the first, considers that the integration of Computer-Based Instructional Technologies in university teaching may not to be particularly associated with the modification of teaching practices and will not affect by itself the epistemological stance of practitioners. Teaching will remain essentially traditional, characterized by a neo-behaviorist epistemological perspective. As teaching materials, information technologies simply take the place of print or the use of the chalkboard or of the low resolution overhead projector.

Teachers integrate data entry of their course notes or the more-or-less interactive electronic manual into their practice. They may take into consideration the 'learning dimension of the educational relation and provide their students with diverse tools that they will have to manage by themselves in the course of their studies (McIntyre & Wolff, 1998). The integration of tools such as 'online' formative self-evaluation software or access to glossaries and complements of course notes entered as tele-accessible hypertext,

respond principally to these types of pre-occupations. Connick (1997) refers to ICT-mediated education as the new educational culture and recommends it as appropriate for use in university teaching as well as its potential to revolutionize the quality of the lecture delivery system. Crook, (1997) accepts that computer-assisted teaching allows for greater flexibility of content as well as a high level of bi-directional interaction in the educational delivery system, thus increasing students participation, hence increased effectiveness. The integration of ICT in educational delivery system of universities will have a significant impact on students productivity, and thus improved teaching effectiveness. ICT-mediated education is complementary to educational itself. Students' achievement which will continue to improve is a pointer to improved teaching effectiveness. Merrill (2002) states that ICT-mediated teaching has been proven to improve student's performance and had a marked and significant effect on teaching effectiveness.

The Problem

Most universities in advanced countries like the United States, United Kingdom, Japan, Canada and France provide computer-based instructional technologies (CBIT) for teachers to use with a view that it would improve teaching effectiveness but in the developing world, CBIT is novel and faced with several challenges. CBITs are just not available in most of the departments in the university and where available, they are not adequate. Even, if they are adequate, most of the lecturers cannot use them to teach. Urgent solution is required. There is a need for an empirical study to establish the problem, before appropriate policies are put in place. This study, therefore, investigated the extent to which computer literacy could enhance teaching effectiveness at the university of Ibadan, Ibadan, Nigeria, with a view to making recommendations to policy makers and university authorities in the country on the need to provide and use computer information technology to teach in our universities.

Evaluation of policies in Africa towards computer based instructional technologies:

The digital age is fast improving methods of operations in large complex organizations to which the educational system is part. Various African nations have put or are beginning to put in place methods of improving teaching and learning effectiveness as education is considered an excellent way of development. One way of improving on education in this era could be the introduction of computer based instructional technologies. (Lundu and Mbewe, 2003) point out that information and its dissemination act in a central way towards national development and a major way of disseminating such information is the adoption of the CIBT in the teaching, learning and research process. In Nigeria, the Federal Government of Nigeria (FGN) has been able to articulate policies on its expectation of the global digital revolution through the Information Communication Technology (ICT) policy at all levels of education. The policy in section 2 gives its vision statement as follows: *"To make Nigeria an IT capable country in Africa and a key player in the information society by 2005, using IT as the engine of sustainable development and global competitiveness"*. The same document describes its mission statements to include; education, wealth creation, global competitiveness, poverty eradication and job creation. Core objectives of the Nigerian IT policy include:

- Ensuring that IT resources are readily available to promote efficient national development, empowering Nigerians to participate in software and IT development, to develop and establish IT infrastructure and maximize its use nationwide, create an enabling environment and facilitate private sector investment in the sector.

- The FGN has also planned strategies to execute its vision as follows in section 5 of the Nigerian IT policy document;

- … restructuring the education system at all levels to respond effectively to the challenges and imagined impact of the information age and in particular, the allocation of a special IT development found to education at all levels. Its strategy on human resources development explains that government will

develop IT curricular for primary, secondary and tertiary institutions in Nigeria making acquisition of IT skills mandatory and compulsory for all government employees and to achieve 100% computer literacy and IT compliance by the end of the year 2002 (Nnebe, 2008).

The foregoing shows the extent to which Nigeria has advanced. Some other African countries have also articulated policies on computer based instructional technologies but it is observed by (Adekanbi, 2008) that the numbers of African countries that have IT policies are quite few. Moreover, its being observed that reasons why African universities have failed to be listed in global universities rankings is not unconnected with their low acceptance and adoption of ICT as a method of operation indicating that their operations are internalized. Since policy is a body of rules and regulations governing any organization, it could be well concluded that most nations particularly Nigeria have taken the first good step through the development of a national policy on IT that will guide the way into the new millennium. However, observations show that the strategy of achieving 100% computer literacy for civil servants in the year 2002 was not achieved and has not been attained as at 2010 as several civil servants are yet to be computer literate and the same applies to our schools and tertiary institutions where most teachers and students are yet to be literate in computing indicating that the policy is certainly experiencing some challenges.

Challenges to computer-based instructional technologies in Nigerian universities

The following CBIT challenges are clearly manifest in many universities in Nigeria. It is clear that university lecturers might prefer computer based instructional technologies due to the large number of students they teach. The challenges pose limitations to such desires. Prominent challenges include:

General problem of poor access to CIBT equipment

A core challenge to the utilization of ICT equipment and the adoption of computer learning technologies in developing countries is access

to such equipment (Otakor, 2007). The same observation is made by (Okhiria, 2007). Most developing countries do not have the requisite equipment hence even where preferred, cannot be used.

Inadequate infrastructure to support CIBT and Computer assisted learning technologies

Most developing nations like Nigeria lack the infrastructural framework for an ICT enabled society. In the past one and a half decades, Nigeria has been battling with the problem of inadequate power generation and transmission (Sambo, 2008). (Anyakola, 2009) reports that while the average power requirement/demand in Nigeria is currently estimated at 5,000MW, energy generation oscillates between (1,500 – 2000) MW. These revelations show that the framework to operate these computers is presently lacking.

Poor plan/strategy implementation devices

While the Nigerian system has been well explored in the preceding write up, it could be seen that the nation has a policy, vision and mission statements. The implementation of these policies have not been translated into concrete tangible items e.g. the level of computer acquisition skills for pupils in primary and secondary schools both public and private schools cannot be ascertained as it falls short of expectation since there is currently no syllabus or curricular for computer acquisition skills in lower levels of education. At the tertiary education level, observation shows that acquisition of these skills is subject to personal interest, affluence etc.

Poor maintenance/ICT culture in developing countries

Another challenge to the adoption of computer assisted technology is the poor maintenance culture of developing countries which is basically a function of ignorance, poor planning and strategies. Personnel versed with the knowledge of repairs of these equipment when faulty are not readily handy. Secondly, the spare parts are produced where the computers are produced hence when a computer breaks down, the cost of its repairs is almost equivalent to the cost of producing a new one as the broken down aspect will need to be imported. It further takes time and hence must faulty computers are dumped as unusable in developing countries.

Poor, fragile economies of developing nations

The economics of most developing countries lack the ability to sustain heavy ICT purchases. In Nigeria for example, well over 70% of the population live below the $2.00/day poverty line (FRN, 2004). With this uneven income distribution, it behaves on governments to provide the requisite ICT frame work but most developing countries have economics that produce primary products and classed no developing nations. Nigeria produces crude, Angola exports crude oil, Ghana exports cocoa, Cote' divore produces cocoa and several other countries. Moreover, the population figures of these countries which keep rising places much burdens on government for the production of social services and amenities hence the economies are not able to meet exigencies in other areas.

Poor leadership and governance challenges affecting education in developing nations

Most developing nations are characterized with poor governance. Indicators of such manifest in the adoption of military regimes, election rigging, poor leadership characteristics, looting of national treasuries and general tribalism, nepotism and societal plurality. In 2006, Ribadu claimed that the quantity of money stolen by African leaders in recent years is well over $360bn. With these poor methods of governance, policies are not continuous. This is why despite good paper work, implementation of policies is poor. While political leaders are filled with corruption and ethnicism the case of the civil service can be described as unfortunate as civil servants at all levels are neck deep into greed and covetousness (Fabunmi and Isah, 2009).

Human resources inadequacy

A major challenge to the development of ICT in most developing nations is the absence of capable hands to assist in the training of others and consequently the vast majority. There are some schools where government have been able to mobilize funds to procure and provide these equipment but most often due to absence of manpower to man the equipment, they are left to rot away in some offices and in some other cases due to insecurity, the items/equipment are stolen.

Theoretical Framework

The study focuses on the acquisition of skills highlighting the importance of the learner, the teacher and the materials under study including the methodology for learning hence the relevant theory adopted here is the learning theory. Omolewa (2009) emphasized that whatever resources a nation has can only advance it in other fields but cannot make it grow above the level of its teachers that is also amplified by the(NPE, 2004). In this study, the teacher, the learner, the materials and the methodology under discussion are extremely important. Beginning from the period of the classical behavioral theorist that featured classical and operant conditioning by Psychologists as the Russian Ivan Parlov and B.F. Skinner, the stimulus response mechanisms were well explained that often and always led to behaviour modification. Key scholars in the era of behaviourism were, John B. Watson, Ivan Parlov, B.F. Skinner, E.L. Thorndike, Bandura and Tolman. The highlights of these scholars theories on learning revolved around the following:

i.   The learner starts as a clean slate (*Tabula Rasa*)
ii. Learners behaviour is shaped through stimulus from the environment
iii. Learners behaviour can be modified through positive, negative or zero reinforcements to either continue, change or bring about an extinction of behaviour which is the essence of education/learning (*Change in behaviour*).
iv. Generalizations. Parlov worked with the dog and Skinner worked with the cage.

The educational and learning purposes of these theories include the following:

i.   Some skills are better learned in school under certain conditions.
ii. Teachers should use re-inforcement in teaching and learning.
iii. Teaching materials should be presented in a manner that takes care of the level and requirements of the individual.
iv. Lessons should be structure i.e. in bits and parts.
v.   Feed back is important.

Another aspect of learning theories quite relevant to this work is that of Discovery Learning being a subset in the learning theory family. The originator of discovery learning was Jerome Bruner in 1915. Its tenets were based on problem solving situation where learners draw from past experiences and existing knowledge to discover facts and relationships and new truths to be learned. This theory expounds on exploration, manipulation of objects, critical reasoning and experimentation. Models on these base their arguments on guided discovery, problem based learning, simulation based learning, case study-based learning, incidental learning etc. Jerome Bruner and other psychologists in this category believe that discovery learning;

i. Engages active participation engagement
ii. Promotes motivation
iii. Promotes autonomy, responsibility and independence
iv. Develop creativity and problem solving skills and
v. Tailors learning experiences.

Apart from the above Kolb's experimental learning originated from the work of David .A. Kolb in 1939. Colb and his contemporaries believed that learning is the process whereby knowledge is created through the transformation of experience. Kolb followed the steps of John Dewey, Kurt Lewin and others. They believed that through experimental learning, learners will:

i. Develop Concrete Experience (CE)
ii. Develop Reflective Observation (RO)
iii. Abstract Conceptualization and (AC)
iv. Active Experimentation (AE)

The above processes have been summarized by learning-theories. Com (2008) into DO OBSERVE, THINK AND PLAN.

Kolb (1984) did not only explain the four steps above but also identified four learning styles that correspond to these stages as:

- **Assimilators**, who learn better when presented with sound logical theories to consider.

- **Couragers** who learn better when provided with practical application of concepts and theories.

- **Accommodators**, who learn better when provided with 'hands-on' experiences.

- **Divergers** are described as those who learn better when allowed to observe and collect a wide range of information. In learning theories, we find the multiple intelligence theory of Harvard Gardner of 1983 that identifies 7 ways (intelligences) by which people understand and perceive the world. They include:

· **Linguistic**: ability to use the spoken word

· **Logical - mathematical**: Inductive and deductive reasoning, abilities to use numbers.

· **Visual - spatial**: The ability to mentally visualise objects and spatial dimensions.

· **Body kines theta**: The wisdom of the body and the ability to control typical emotion.

· **Muscle rhythmic**: The ability to master music as well as rhythms, tones and beats.

· **Interpersonal**: Ability to communicate effectively with other people and develop relationship.

· **Intrapersonal**: The ability to understand one's own emotions, motivations, inner states of being and self reflection.

Several other theories such as the Gestalt theory, social learning theory etc are all emphatic of the learner, the teacher and the materials for teaching and learning as facilitators of effective teaching and learning. It is clear therefore that these theories suggest and support the adoption and use of computer based-instructional technologies. The technology allows for exploration and experimentation while teaching. It give the teacher and the learner ample opportunity to draw from the level of knowledge in other parts of the world. It encourages individual exploratory practices and techniques in research.

Conceptual Framework

The conceptual framework for this investigation is derived and adapted from the works of **David Kolb on Experimental Learning**.
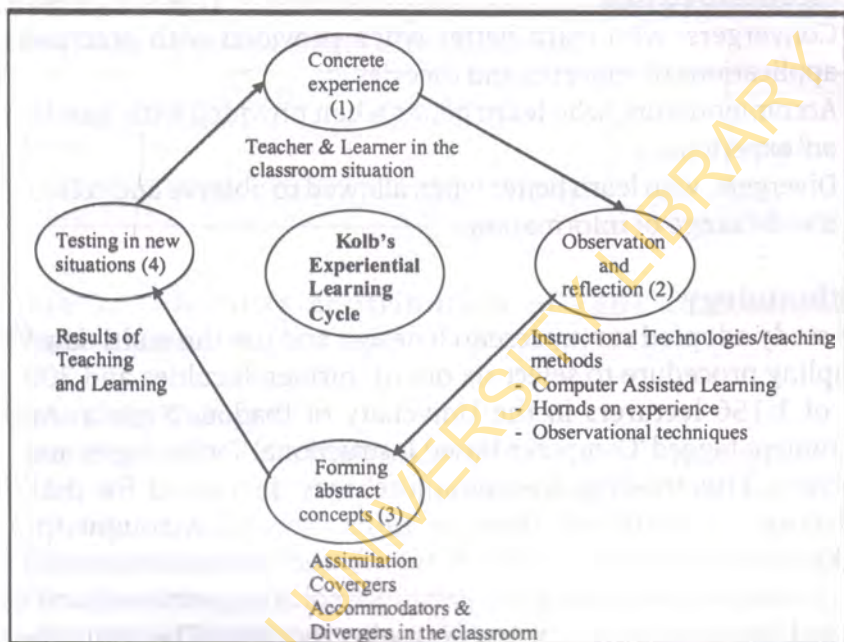
Source: Adapted from Learning-Theories.com-2008

Kolb's four-stage learning cycle shows how experience is translated through reflection into concepts, which in turn are used as guides for active experimentation and the choice of new experiences. The first stage, *concrete experience* (CE), is where the learner actively experiences an activity such as a lab session or field work. The second stage, *reflective observation* (RO), is when the learner consciously reflects back on that experience. The third stage, *abstract conceptualization* (AC), is where the learner attempts to conceptualize a theory or model of what is observed. The fourth stage, *active experimentation* (AE), is where the learner is trying to plan how to test a model or theory or plan for a forthcoming experience.

Kolb identified four learning styles which correspond to these stages. The styles highlight conditions under which learners learn better. These styles are:

- Assimilators, who learn better when presented with sound logical theories to consider
- Convergers, who learn better when provided with practical applications of concepts and theories
- Accommodators, who learn better when provided with 'hands-on' experiences
- Divergers, who learn better when allowed to observe and collect a wide range of information.

Methodology

The study adopted survey research design and use the multi-stage sampling procedure to select six out of thirteen faculties and 300 out of 1,156 lecturers in the University of Ibadan, Nigeria. An instrument tagged 'Computer-Based Instructional Technologies and Teaching Effectiveness Questionnaire' was developed for data collection. It comprises three sections. Section A sought for background information. Section B gathered information on the use of Computer-Based Instructional Technologies, while section C elicited information their teaching effectiveness. The multiple regressions statistic was used to analyze data at 0.05 level of significance.

Research Hypotheses

This section is discussed under the only research hypothesis that guided the study.

Research Hypothesis: Use of computer-based instructional technologies make no significant contribution to teaching effectiveness.

Model	Unstandardised coefficient		Standardized coefficient	t	P	Remarks
	Beta	Standard Error	Beta			
	0.75	5.855		0.128	0.898	
Constants	0.373	0.043	0.049	8.599	0.000	Significant

$P \leq 0.5$

Table 1: Showing contribution of CIBT to teaching effectiveness.

Report of Findings:

It was observed that the study tested and showed a rejection of the null hypothesis as it tested positive at indicating that lecturers prefer the use of computer assisted learning. This revelation is in line with studies which have shown that computer assisted learning is preferable to modern day educational systems than the traditional learning styles (Fabunmi, 2009, Adekanmbi, 2008, Okhira and Njoku 2007). The use of Computer Based Instructional Technologies makes a significant contribution to teaching effectiveness (t=8.599, P < 0.05). This is in consonance with the findings of Merrill (2002) and Fabunmi (2009) who state that ICT mediated teaching has been proven to improve students performance and had significant effect on teaching effectiveness. It also confirms that the teachers who use Computer Based Instructional technologies are more effective in their lecture delivery which is in consonance with previous studies.

Conclusion and Implications for Teacher Education and Policy

This study established that the application of CBIT to teaching contributed significantly to teaching effectiveness. It is therefore advised that policy makers need to incorporate the provision of Computer-Based Instructional Technologies and the re-training of

lecturers in its usage into the university education policy as its usage will perform the following:

(i)   Align Nigerian universities in perspectives with other world class universities in the digital era.

(ii)   Encourage global competition due to the acquisition of computer skills and interest skills by students and staff in this era of globalization.

(iii)   Enable the much longed for capacity development and utilization in IT usage in our tertiary institutions.

(iv)   Challenge Nigerian Academics and researchers into the development of local IT resources due to continual access and usage of IT resources and in the process enable technology transfer.

(v)   The use of IT teaching methods will give students greater challenges in 'hands on practice' of their work, be self reliant in the areas of producing documents i.e. less dependence on secretaries while old academics will have no option but to acquire IT skills or be conscripted to the dust bin of irrelevance.

References

Adekanmbi, G. (2008). New-Liberal Ideology and the Future of Higher Education in Africa: Vital Lessons for Nigeria. Second Annual Lecture for Grace Mbipon Foundation. University of Calabar. Jerry Commercial Productions, Calabar.

Ayankola, M. (2009). Power: Contract delays threaten 6,000MW target; The Punch Newspapers. Vol 17, No. 20,417. Thursday, June 18, 2009. Pp 15.

Connick, G.P. (1997). Issue and trends to take us into the twenty-first Century. New Directions for Teaching and Learning, 71 (7-12).

Crook, C.K. (1997). Making hypertext lecture notes more interactive. Undergraduate reactions. Journal of Computer Assisted Learning, 13(4), 236-244.

Dalgamo, B. (1996). Constructivist Computer Assisted Learning: Theory and Techniques in F. Brown (Dir), Proceedings of the ASCILITE 96 conference (124-148), Adelaide (Aus) Australian Society for Computers in Tertiary Education (ASCILITE).

Erwat, E.A, Isah, E.A. & Fabunmi, M. (2008) Economic Liberalization Policy and Management of University Education in Nigeria. Conference Proceedings. Adedeji (eds). International Conference on Entrepreneurship and National Transformation. Lead City University 5th – 8th Dec. 2008, Ibadan, Nigeria, pp 111-125.

Fabunmi, M. and Isah, E.A. (2009) Managing Schools in a Period of Global Economic Meltdown. European Journal of Social Sciences. Vol 8, No 4, pp 653-664.

FRN (2004). Nigeria Economic Empowerment Development Strategy (NEEDS) Published by the National Planning Commission, Abuja, Nigeria, pp 177-185.

Ismail, M. (2001). Mozambique e-Ready? Project Report submitted to Information Technology Group, the Centre for International Development, Harvard University.

Kolb, D.A. (1984). Experimental Learning: Experience as Source of Learning and Development. Prentice-Hall Inc. Englewood Cliffs, N.J.

Learning theories.com (2008): Knowledge is Base and Webliography homepage, http://www.learningtheories.com.

Mcintyre, D.R. & Wolff, F.G. (1998). An experiment with WWW interactive learning in university education, 273 (3-4), 161-170.

McNaught, C. (1996). The Nature of Information Technology and its Implication for Practices and Policies in Higher Education, In F. Brown (Dir).

Merrill, M.D. (2002). First Principles of Instruction. ETR&D, 50(3), 43-59. Retrieved January 11, 2006, from http://www/ indiana.edu/~tedfrick/aect2002/firstpriciplesbymerill.pdf.

Nnebe, H.E (2008): National Policy on Information Technology (IT) in Policies of the Federal Republic of Nigeria ... The Obasanjo years (1999-2007) vol 3. pp 45-91.

NPE (2004). National Policy on education (Revised Edition) NERDC Press, Yaba-Lagos.

Okhima, P. (2007). Zinox Spearheads ICT Revolution in Nigerian Schools. Nigerian Vanguard Newspapers. Thursday, Feb. 8, 2007, pp 37.

Omolewa, M.O. (2009). The Role of University of Education in the Development of Africa. Paper Delivered at the first Anniversary Celebration of the University of Education, Ikere-Ekiti (TUNEDIK), Nigeria.

Otakor, E.O (2007). Facilitating Improved Educational Services Advising in Nigeria Universities. Relevance of ICT in Managing Technical and Vocational Education in an Era of Globalization. Babalola et al (eds) Book of Reading NAEAP Nigeria 2007. pp 113-118.

Ribadu, N. (2006) Political Corruption in BBC News. http:/ news.bbc.co.uk/2/hi/africa/6069230.com.

Sakamoto, T. & Myashita, K. (1995). Social and Political influences on the integration of information into Japanese Education Programme in integrating Information Communication Technology into Education, Chapman and Hall, 215-227.

Sambo, A.S. (2008). Issues of Educational Planning and Management and the Development of Sustainable Energy in Developing Countries. Lead paper presented at the 2008 International Conference on Managing Education for Sustainable Development organized by NAEAP Nigeria.

School Curriculum and Assessment Authority (1994). Information Technology in the national Curriculum, Draft Proposals, HMSO, London.