

Innovative Ways of Integrating Information and Communication Technology in Teaching and Learning in Higher Education

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Abstract

The demand for higher education has accelerated worldwide. Between 1999 and 2008, the number of students enrolled in higher education institutions (HEIs) globally increased by 65 million. As a result of increased enrolment, teaching facilities and physical infrastructure of public universities particularly in Kenya are the most wanting. The capacity of libraries, lecture theatres, and laboratories has been overstretched. Consequently, lecturers are forced to use inappropriate teaching strategies for teaching and learning. According to UNESCO, governments and educational institutions are looking for innovative ways to increase access to higher education and improve the quality of their programmes and courses in a bid to improve their competitiveness. Definitely, the rapid breakthroughs in new information and technologies (ICTs) will change the way knowledge is developed, acquired and delivered. It offers opportunities to innovate on course content and teaching methods and to widen access to higher learning. The innovative use of ICT can contribute to a movement towards constructive teaching approaches, and constructive teaching processes can lead to greater use of ICT in education. This paper explores on innovative ways of using ICT in teaching in HEIs utilizing qualitative methods of analysis such as content analysis. The data used for this analysis is from surveys and case studies that were carried out in HEIs through a library research, in a bid to enlighten on innovative teaching strategies in HEIs using ICT to enhance learning.

Keywords: *Higher Education, Teaching Strategies, ICT, Innovation*

Introduction

The demand for higher education has accelerated worldwide. Between 1999 and 2008, the number of students enrolled in higher education institutions (HEIs) increased by 65 million (UNESCO, 2011). As a result of increased enrolment, teaching facilities and physical infrastructure of public universities, particularly in Kenya, have been rendered most wanting. The capacity of libraries, lecture theatres, and laboratories has been overstretched (Mwiria, Wawire, Ouma & Njuguna, 2007). As such, lecturers are forced to use inappropriate delivery strategies to enhance learning process.

Governments and educational institutions are looking for innovative ways to increase access to higher education and improve the quality of their programmes and courses in a bid to improve their competitiveness. The prevalence of information and communication technology (ICT) and the impact it has made in all aspects of our lives are compelling reasons for HEIs to try to capitalize on 21st century tools and technologies to address 21st century issues and challenges (UNESCO, 2011). As John, Leonard and Robert (2000) posit, technological concoction facilitates learning by providing relevant examples and demonstrations, changing the orientation of the classroom, preparing students for employment, increasing flexibility of delivery, increasing access, and satisfying public demands for efficiency.

The rapid breakthroughs in new ICTs, notes UNESCO (1998), will further change the way knowledge is developed, acquired and delivered. The new technologies offer opportunities to innovate on course content and teaching methods and to widen access to higher learning. Nevertheless, it should be borne in mind that new information technology does not reduce the need for lecturers but changes their role in relation to the learning process and that the continuous dialogue that converts information into knowledge and understanding becomes fundamental. The new ICTs offer a rich plethora of uses in learning/teaching processes far beyond the ability to transfer content of textbooks and lectures to students at a distance. In fact, none of the ICT uses denotes the physical separation of the learner from the lecturer at any stage of the study process. Many of the ICT qualities can be used most efficiently to enrich and support lectures, seminar meetings and face-to-face tutorials (Sarah, 2005). However, most university lecturers resist innovative use of technology in teaching to enrich learning as it's the way for the future.

UNESCO (2010) observes that ICT is an all-encompassing term that includes the full gamut of electronic tools by means of which we gather record and store information, and by means of which we exchange and distribute information to others. The author further observes that students in classrooms where ICT are regularly found are likely to participate in virtual excursions and be active researchers, searching the web for information to complete individual or group projects, communicating via email, blogs and social networking with students and faculty in other institutions, and reaching conclusions on the basis of evidence gathered. The internet and such services as Google and email, together with numerous new by-products like Wikipedia, Skype, Face book and Twitter are transforming further the way we live, teach and learn.

In Kenya, ICT policy came into force in 2006. This policy sought to facilitate sustained economic growth and poverty reduction; promote social justice and equity; mainstream gender in national development; empower the youth and disadvantaged groups; stimulate investment and innovation in ICT; and achieve universal access. It expects HEIs to provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms. As JKUAT (2011) ICT policy articulates, to promote distance education and virtual institutions, particularly in higher education and training, the universities shall ensure that staff members are provided with opportunities to develop and sustain their skills and technical knowledge as appropriate to the purposes of their individual jobs. However, the content of these policies remain illusive in many HEIs. It is against this backdrop this paper explored innovative ways of integrating information and communication technology in teaching and learning in higher education.

Theoretical Underpinning

Diffusion of Innovations Theory

In 1962, Everett Rogers made a publication on the Diffusion of Innovations theory. He argued that diffusion was a general process, not bound by the type of innovation studied, by who the adopters were, or by place or culture (Everett, Arvind & Margaret, 2004). Through diffusion, an innovation is communicated through certain channels over time among the members of a social system (Greg, 2003). Diffusion of innovations theory predicts that media as well as interpersonal contacts provide information and influence opinion and judgment on new innovations. Innovation consists of four stages: invention, diffusion (or communication) through the social system, time and consequences. The information flows through networks. The nature of networks and the roles opinion leaders play in them determine the likelihood that the innovation will be adopted (Rogers, 2003). The most striking feature of diffusion theory is that for most members of a social system, the innovation decision depends heavily on the innovation decisions of the other members of the system (Greg, 2003). In this paper, an extended use of diffusion of innovations theory is the most appropriate, for exploring innovative ways of integrating ICT in teaching and learning practices in HEIs, to produce graduates who can be critical thinkers, competent problem solver and inventive.

Innovative delivery Approaches in HEIs

An innovation is defined as a new way of solving problems by combining technology with transformational entrepreneurship typically involving commercialization of technologies via formal firms; but also including value generation by informal, not-for-profit, and governmental entities (Canuto, Dutz & Reis, 2010). The authors add that the key determinants for innovation can be organized into the following four main areas: Incentives, skills, responsiveness of management and worker training to changes in market demands and availability of a mix of public and private financial instruments and institutional delivery mechanisms.

The innovative use of ICT, notes UNESCO (2004), can contribute to a movement towards constructive teaching approaches, and constructive teaching processes can lead to greater use of ICT in education as shown on Table 1.

Table 1. Overview of innovative pedagogy in an integrated ICT classroom verses less integrated ICT classroom

	Less (Integration of ICT)	More (Integration of ICT)
Classroom activity	Teacher-centred	Learner-centred
	Didactic	Interactive
Faculty role	Fact teller	Collaborator
	Always expert	Facilitator
		Sometimes expert
Student role	Listener	Collaborator
	Always learner	Sometimes expert
Instructional emphasis	Facts	Relationships
	Memorization	Inquiry and Invention
Concept of knowledge	Accumulation of facts	Transformation of facts
Demonstration of success	Quantity	Quality of understanding
Assessment	Norm referenced	Criterion referenced
	Multiple-choice items	Diagnostic
Technology use	Drill and practice	Communication, collaboration, information access, expression

Source: UNESCO, 2004

According to UNESCO (2001), setting up interactive systems such as a network of classrooms and to use technology, usually video by satellite or landline, to take lecturer's lesson live to students at the remote sites encourages student to ask questions and promotes deep learning. Anna and Athanasios (2010) found that desktop video-conferencing, on the one hand, links geographically dispersed groups or individuals using powerful computer-mediated communication technology, which learners perceive as a motivating factor, appeals to different learning styles, and makes learning fun. In e-learning, seminars are transmitted via webcasting, which is broadcasting over the internet, and in which a content source is taken and distributed live or recorded to many simultaneous listeners or viewers by streaming media technology. However, this has largely remained a dream pipe in HEIs in Kenya.

Nga-Sin, Lui and Bo (2010) have researched on enhancing blended courses to facilitate students' achievement of learning. Their study revealed that innovative ways like blended learning approach that emphasizes the integration of face-to-face teaching and computer mediated instruction in a pedagogical environment are salient to enhance deeper learning and understanding among the learners. Students can have easy access to various online resources and acquire extra knowledge as a supplement to normal lectures, under the supervision and support of the faculty both inside and outside the classroom. Lecturing is not limited in classroom only. Instead it can be conducted anytime on the web, with more enriching multimedia course materials. Again, Rughooputh and Santally (2008) observe that text-to-speech software can 'read-aloud' typed text, simulating a real face-to-face lecture with the same tonality and different verbal cues of the lecturer demands more than a simple read-aloud approach to text. This collaborative learning allows students to learn from peers and get exposed to different points of view. Albeit, this is seen ancillary in HEIs in Kenya as face-to-face strategy is commonly used.

In 2001, UNESCO stated that learners need to graduate with competencies which will ensure that they are critical thinkers and competent problem solvers and able to analyze, interpret, evaluate and apply information to vastly different systems. This raises a range of pedagogical issues for school, vocational education and universities including:

1. Facilitating an integrated, collaborative approach to teaching and learning. Much more collaboration between teachers of all disciplines, integrating learning across the curriculum can also involve the community as a learning environment.
2. Using ICT to enhance learning by catering for individual learning styles, allowing learners to make connections with knowledge and analyze, explain and apply knowledge to practical applications, make decisions and work co-operatively. The Internet 'seems to have considerable potential to be able to meet this challenge because of its ability to assist with the individualization of instruction.
3. Selecting and combining different media that suits students' learning styles, for example, using the technical features of the web to the advantage of teaching and learning activities.

As UNESCO (2010) reports, HEIs should lead in drawing on the advantages and potential of new ICTs, ensuring quality and maintaining high standards for education practices and outcomes observes in a spirit of openness, equity and international co-operation by: creating new learning environments, ranging from distance education facilities to complete virtual HEIs and systems, capable of bridging distances and

developing high-quality systems of education, thus serving social and economic advancement and democratization as well as other relevant priorities of society, while ensuring that these virtual education facilities, based on regional, continental or global networks, function in a way that respects cultural and social identities. However, this remains a mirage in HEIs in Kenya.

The study on ICT transforming education revealed that the use of ICT in classrooms, UNESCO (2010) can lead to a shift towards more learner-centred approaches. The main approaches to ICT taken by faculty:

1. Integrated approach: Planning the use of ICT within the subject to enhance particular concepts and skills and improve students' attainment. This involves a careful and considered review of the curriculum area, selecting the appropriate ICT resource which will contribute to the aims and objectives of the curriculum and scheme of work, and then innovatively integrating that use in relevant lessons.
2. Enhancement approach: Planning the use of an ICT resource which will enhance the existing topic through some aspect of the lessons and tasks. For example, using an electronic whiteboard for presenting theory about a topic. In this approach, the lecturer plans to complement the lesson with an innovative presentation method to promote class discussion and the visualization of problems.
3. Complementary approach: using an ICT resource to empower the students' learning, for example by enabling them to improve their class work by taking notes on the computer, or by sending homework by email to the lecturer from home, or by word processing their homework.

Writing on using ICT as a subject, a tool for curriculum and co-curricular resource, Lee (2002) articulates that ICT offers new and innovative modes of learning for all students at all educational levels. It can bring about classrooms without walls when faculties are ready to realize the potential of this powerful tool. However, at the present time, despite the technology changes in society, faculty in HEIs are still to a great extent using the approach of helping students acquire information from textbooks and acting as the information giver. All of their formal teaching in classrooms is still driven by traditional teaching practices although there may be occasions when ICT is used those practices designed to bring about new learning goals and new modes of learning are the practices likely to exhibit innovative features and lead to new learning outcomes.

Boon (2010) explains that where technology is at hand, faculty still uses the talk-and-chalk method. Although there might be a good reason for teaching this way, for example, in Mathematics where transparent logic is exposed by using talk and chalk, the reasons for teaching this way in many other disciplines are in some cases unclear. The need to adapt teaching to the digital age effectively seems obvious. The author further contends that the environment within the HEIs must be present in order to provide faculty with support, but also reward and encourage faculty for venturing into the unknown with technological innovations.

New paradigms are also emerging where the delivery of education becomes less about teaching and more about learning, i.e. via self-tutoring and the use of individualized information research abilities. Education becomes increasingly less confined within the sole geographical location of learners or less dependent on a physical space, e.g. a classroom for pooling a critical mass of learners together. Technologies can improve the teaching/learning process by reforming conventional delivery systems, enhancing the quality of learning achievements, facilitating state-of-the-art skills formation, sustaining lifelong learning and improving institutional management (UNESCO, 2009). As Pabio and Pierre (2004) posit, network technologies have enabled web-learning activities based on the emergence of virtual learning communities (VLC). In the VLC, the collaborative learning activities are realized mainly through a conversational asynchronous environment, which we call forum-type tools. These tools have opened the possibility of creating virtual learning communities and in different depth levels, through a threaded conversation structure.

In Nancy, Allan and Robert (2011) analysis, ICT tools at the innovative level include the use of more advanced tools such as network and collaboration tools, data-analysis software, and asynchronous and synchronous tools for collaboration. An example of innovative use is an online platform specifically designed at the University of Turku, Finland, to support collaboration among students. Data-loggers and graphing software were also used to conduct scientific investigations. The students' roles become more innovative when they include collaboration with local and remote peers learners, inquiry-based activity, and providing support to faculty.

UNESCO (2012) avers that research learning and course management systems are useful in generating and managing a variety of student support services and products, such as course outlines, digitally recorded classroom material, discussion groups, laboratory manuals and lab assignments, lecture

notes, live lectures for later viewing and re-viewing, links to course specific websites, online tutorials, supplementary readings, and virtual office hours for teacher-student consultations. Virtual libraries, where they exist, are a particular boon to students as they cut down on costs of acquiring expensive textbooks, journals and reference material.

Innovative ways of integrating ICT in large classrooms, however, are costly in terms of the time needed to develop and establish new practices. In addition to the new interpersonal and pedagogic skills which faculty require to use ICT in their classrooms, other contextual factors which can act as barriers to using ICT innovatively include lack of confidence, experience, motivation, and training; access to resources and timetabled use of dedicated ICT classrooms; unreliability of equipment; classroom practices which clash with the culture of student exploration, collaboration, debate, and interactivity within which much technology-based activity is said to be situated (Sara, Kenneth & Sue, 2005).

Luis, Robert and Brendan (2009) note that technologies pose difficulties for professors when they are used to support learning. For instance, professors may not have had experience of innovatively integrating ICTs into their course design and may not know how to adjust their teaching accordingly. As a consequence, the difficulties encountered can increase professor frustration and students may become dissatisfied with the learning experience and the technology. Organizational barriers such as lack of leadership and an intractable institutional culture impede infusion at the institutional level (John, Leonard & Robert, 2000).

Conclusion

As has been discussed in this paper, innovative use of technology for teaching and learning is paramount in attaining the kind of interactions and dedications that will lift teaching and learning in HEIs to the highest notch. It is inescapable that HEIs will have to use ICT innovatively in teaching and research to meet the demands of 21st century. The planet is moving into an information age distinguished by a high level of reliance on technology. Those who would blossom in such an epoch can no longer resist innovative use of technology. It is our contention that Institutions of Higher learning need to pay attention to the following issues:

1. There is need for HEIs to ensure that staffing policies sustain undertaking in innovative teaching strategies using ICT through staff training and development.
2. Governments should adequately fund ICT infrastructure in HEIs to espouse innovative delivery strategies.
3. There is need to provide incentives to university lecturers, to encourage innovative delivery strategies.

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