

ICT integration in teaching and learning 1.docx

by Angella Barber-simpson

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26 Integrating Information and Communication Technology (ICT) in Teaching and Learning

Thesis

There has been a rapid growth of Information and Communication Technology (ICT) which has led to its integration in teaching and learning. This growth has also given rise to classroom and workplace transformation. Jones (1993) suggest that Jamaican schools, students and teachers must quickly adjust to new, futuristic changes sweeping global education or run the risk of suffering perhaps irrevocable consequences.

Introduction

Jager and Lokman (1999, p.1.) state that “(ICT) refers to the technologies which are being used for collecting, storing, editing and passing on information in various forms”. A personal computer is the best known example of the use of ICT in education, but the term multimedia is also frequently used. Multimedia can be interpreted as a combination of data carriers, for example video, CD-Rom, floppy disc Internet and software in which the possibility for an interactive approach is offered (Jager,Lokman,1999). Information and Communications Technology (ICT) has gone through innovations and has transformed our society and has totally changed the way people think, work and live (Ghavifekr,Razak,Ghani,Ran,Meixi and Tengyue 2014, p.24). As part of this, schools and other educational institutions which are supposed to prepare students to live in “a knowledge society” need to consider ICT integration in their curriculum (Ghavifekr, Kunjappan ,Ramasamy, Anthony, 2016,p.38). However, in conjunction with preparing students for the current digital era, teachers are seen as the key players in using ICT in their daily classrooms. Up-to-date technology offers many methods of enhancing classroom teaching and learning (Ghavifekr, Kunjappan ,Ramasamy, Anthony, 2016,p.38). Ghavifekr, Kunjappan ,Ramasamy, Anthony (2016,p.38) stated that new technologies have the potential to upkeep education across the curriculum and deliver opportunities for efficient student-teacher communication in ways not possible before. With so many different types of

learning styles today our teachers are faced with a lot of challenges especially in large classes, where the typical teaching mode is heavily dependent on lectures. One of the ways to reach our students individually is through the use of educational software. We also need to understand that different students receive information best in different ways. Multimedia and computer software in general can go a long way to filling in the gaps caused by a dichotomy of learning and teaching styles. In addition, an awareness of the pedagogical needs of various styles can result more effective multimedia software. Fitzgerald (2009) refers to a study done by Dr. David Sousa which suggests that for visual learners, “a large number of students, 45% or more in American classrooms prefer to receive information visually”. For example, “those who like pictures, video tapes, and charts, even those who like reading as the interpretation of symbols translate into pictures in their minds”. For Somatic he says 35% learn most effectively while moving (kinaesthetic) or handling (tactile) things. This action and body movement help them to perceive meaning. The auditory 19% prefer either listening or discussing/talking as a way of receiving information. Clearly, we can understand how deep this topic can get.

Teachers however need to acquire new skills and become learners themselves to improve their practice. Teachers can benefit from technology in the knowledge economy through collaboration with teachers all over the world, also through the availability of a vast amount of educational resources. One of the goals of ICT is to give teachers a common understanding of how ICT can transform education. ICT also offers student different ways to learn outside of a book, to get information to solve problems and make decisions, publish and share information which allows for a better informed learner.

Some electronic or digital communication technologies used over the last fifteen years are: cell phones, computers, the web, VCR, Cassette tapes, CD's, Radios, overhead projectors, iPods, tablets etc. These technologies are still used except that there is a more upgraded version of each. This is so because technology changes and thus applications will change.

Background

Background of Study

1 The most outstanding invention of the 20th century is the development of computer and the technology involved. The advent of computer technology has revolutionized domestic and professional life. It has advanced automation to the extent where most machines and equipment have some form of computerized technology. As a result, it has developed into one of the fastest growing industries of the 21st century. It is against this background that ICT has to be integrated into the teaching-learning process.

There is a question that often comes up: “How ICT should be used in the teaching and learning process so that it contributes to the learning of the student?” This has become increasingly important as many researchers have shown that ICT integration was not a simple application but a necessity to contribute to the learning process of students. (Haslaman, Mumcu, Usluel, 2008). This however, will vary according to the two points of view on the integration process. Firstly the technological point of view, which supports the integration of technological infrastructures and systems into the educational environment. Secondly is the pedagogical point of view, which supports the integration of ICT materials and programs in terms of social constructivist learning principles (Haslaman, Mumcu, Usluel, 2008). The convergence of pedagogical and technological points of view supports effective connections between suitable technology for content and pedagogical principles to design learning environments. This means teachers will need to know why and how to use ICT applications and resources given the characteristics of learners. Also, that is why it is stated that the effective use of ICT in lessons depends on the awareness of teachers of the potential of ICT in teaching and learning processes; of appropriate selection of materials for their students; of effective contemplation of their lessons and; of carrying out class management rules while overcoming the difficulties encountered during lessons in which technology is used to support learning environment (Haslaman, Mumcu, Usluel, 2008).

Definition of Technology

1 Technology can be described as the application of knowledge and skills for the achievement of practical purposes. It includes physical apparatus, the knowledge required to build and use them to solve problems in their application to the production of goods and services. (Hodson & Sullivan 2002).

Multimedia

5 Data Solutions defines multimedia as involving any combination of two or more of the following elements: text, image, sound, speech, video and computer programs. These mediums are digitally controlled by a computer (s). In order to get an idea across, one can use multimedia to convey their message. Multimedia enhances the information for better communication and understanding. Today, multimedia is used for advertising, entertainment, public information, training and education. Educational computer programs which use multimedia and the interaction of student allows the student to see their mistakes immediately and guide them to learn a concept more quickly. The student can also move at their own speed, by reviewing or skipping material that they are unfamiliar or familiar with (http://data-sol.com/index.php?option=com_content&view=category&id=37&layout=blog&Itemid=68, 21 no date).

7 However, there are disadvantages of multimedia as unfortunately, multimedia can be quite expensive for the following reasons; the acquisition or rental of equipment to produce multimedia can be costly, multimedia in Web-based Training (WBT) may require a high learning curve for designers since the use of multimedia in WBT is fairly new to most trainers and instructional designers. Development may require contracting out for specialised skills. 7 According to Khan (2008) “Another disadvantage is that multimedia can actually distract trainers and learners from objectives and content if it is just used as “bells and whistles.” However, when multimedia follows design guidelines, it can be quite motivating and effective”.

The use of ICT in teaching has accessibility issues

Participants with visual disabilities often have the most serious accessibility problems since most Web pages are very visual. There are different means of accommodating such learners. Text-based alternatives can be provided since text can be read by a screen reader. Each visual image and its purpose can be described especially when visual images are important to understand the text. Short pages can be used so a participant with a visual impairment can more easily scan for interesting sections of content. Appropriate combinations of background and foreground colours can be used to make pages readable for users who are colour-blind.

Auditory Learners

Information and Communication Technology may not be ideal for auditory learners. People with auditory problems also experience problems with accessing information on the Web. For these learners, audio used to provide content must also be scripted in text.

Participants with Cognitive Problems

Information and Communication Technology might pose some problems for persons with cognitive disabilities. Simplifying navigation can assist participants with some types of cognitive disabilities. Site maps can help learners determine their location within the site. Multimedia may also be distracting to some of these learners.

Sensitivity to Cultural Appropriateness

The success of ICT also depends on cultural appropriateness. Learners from different cultures may not feel comfortable or motivated if the site design is cold, offensive, or foreign to them. It has been said that there is no culturally neutral design. Icons, text placement, graphics, metaphors, colour choice and white space may not transfer well across cultures. Cultural sensitivity relates not only to ethnic background but also to other group identities as well, such as gender, occupation or socio-economic status. Attention must be given visual or auditory depictions to assure they do not promote stereotypical thinking or offend potential learners.

How ICT make a difference in teaching / learning

1 Changes in jobs and work trends have had corresponding changes in skills and technology. In the 21st century, new methods have to be employed to get new jobs done well. One such new job is a social media coordinator. Increasing competition on the job market has made it necessary to have well trained workers who are on the cutting edge. It is against this background that training programmes have to be developed to equip workers with employability skills needed for these new jobs in the 21st Century. ICT can aid in teaching and learning through personalised learning in that it helps individual to learn independently. They can revisit learning and follow a personalised learning path. It can also allow engaging learning as one can learn more creatively learn through new media resources, learn through simulation and one can access learning outside the classroom building.

How ICT change how we teach

ICT can change how we teach through repositioning the teacher's authority in helping students to develop collaborative working skill, access resources, provide feedback and help learners to find answers and promote a wider audience for students work.

Implications for the new curriculum in the 21st century

1 Barber-Simpson (2016), addresses that a rise in (ICT) has compelled our education system to adapt to modern culture. Modern culture refers to the shift in collective thought that took place with the rise in scientific advancement during the Renaissance. This shift continues into the contemporary age. Things are changing and we have to adapt in whatever way we choose to. The adaptation of modern culture in our school curriculum will vary depending on which part of the world you are living in. For example, the persons living in a first world country would in fact have more resources to facilitate modern curriculum as opposed to a third world country. However, based on the development of new careers developments, especially in the ICT, music, sports and logistic industry, it is important that we adjust our curriculum to meet these industry demands so that our work force will be more marketable. This fast growing technological age facilitates new forms of conceptualization, new media for expression and alternative ways of thinking.

1 The curriculum should be practical and relevant or it will not meet the demands of the new and available job market, traditional universities/institutions could end up losing money as students will be driven towards institutions that are offering practical knowledge that will aid their career path. For example in Jamaica the University of the West Indies (UWI) and the University of Technology (UTECH) have been the major universities over the years. According to Jamaica's former Minister of youth and Culture, Lisa Hanna, in an article (Daily Gleaner 2015) "the top two tertiary institutions in Jamaica, which offer graduates the best prospects for employment, are the Caribbean Maritime Institute (CMI) and the Edna Manley College of Visual and Performing Arts. The students are being offered jobs even before they graduate. She indicated that her ministry has been forced to make several changes as a result of the trend".

1 She also mentioned that:

"Every nine out of 10 students who go to CMI will leave with a job, even before graduation. We have been looking at the global trends as a ministry, and among the top jobs and services in demand, are in the BPO (Business Process Outsourcing) industry, cultural and the creative industry, value added agriculture, in addition to logistics and shipping. Grandparents use to tell you that music and jobs in the Arts can't put food on the table but right now, Edna Manley (College) is struggling to keep their musicians because, before the students leave school, they are being approached and this is all because things have changed," Hanna said to the Gleaner. (Gilpin, 2015).

1 Skills and competencies required for the 21st century

1 Some ways in which the 21st century skills can be incorporated into our curriculum are through Communication and Collaboration. Students should be able to participate in online forums and gain credible information whilst solving problems through virtual learning. They should also be able to pool ideas and engage in inquiry-based activities where they can research topics and have meaningful discussions. Communication tools like Twitter, e-mail, Hashtag, Facebook and text messaging can further engage students in conversations with people all over the world. It is also important that as technology becomes widespread that students understand how to use technology to gain information through research and use technology to organise, evaluate and

1 communicate the information. Larson and Miller (2011) cited Leu et al. (2004) in proposing that as accessibility to internet and new classroom technologies increase, teachers become even more important, though their roles have change. School administration can support such configuration by providing professional development, skills-specific training, and time to plan and design technology-based lessons (Larsons, Miller, and Ribble, 2010).

Another way to incorporate the 21st century skill in the classroom is through innovative thinking and problem solving. The ability to solve problems and think innovatively across all content areas involves multiple levels of Bloom's taxonomy. It is important that teachers persuade students to apply knowledge, analyse that knowledge, synthesize or create new knowledge through integrating technology and practiced collaboration.

Students should be able to develop skills in the classroom where they are able to deal with real – life problems by sorting large masses of materials and identifying problems as they seek to find viable options or solutions and use appropriate criteria for evaluation. By developing these skills in the classroom, students will be able to transfer the thinking processes to unfamiliar situations, to create non-traditional solutions and to ask meaningful questions that will aid in better outcomes as recommended by Larson and Miller (2011) in pointing to the Partnership for the 21st Century Skill. The 21st century is already here, so it is up to the teachers to reshape the instruction by introducing innovative curriculum whilst managing the impact of continual educational change with new teaching skills. (Collins, 1986).

Comparative Analysis of work

1 Over the centuries, there have been major changes in work content and organization. Every job and occupation has been pulled in. Technology and its influence has been the major agent of change. To keep abreast, there needs to be a corresponding change in work, education and training. How well does our education system meet the demand for the new job requirements depends on how readily we adapt to modern culture. Blanchard (1984).

A major change has recently developed in the field of ICT job demands.

A few years ago ICT jobs were mostly limited to software developer, programmer, and networking specialist. These days, however, with new technologies emerging at almost lightning speed, new speciality areas keep popping up, leaving hiring managers struggling to define the positions and create titles. Advances in hardware have also resulting in demands for skills that aren't yet being met". (Sunday Observer, 2017).

The article propose that some of the new and emerging roles through ICT are cognitive computing engineering/machine learning specialist, blockchain engineer, GPU cluster engineer, virtual reality engineer, Internet of things architect, computer security incident responder/cyber incidence responder, end-user designer/developer, user experience researcher, augmented reality designer, and container developer.

This shows that the demands for new jobs are changing precipitately and that there is the need for "Valid Knowledge". Valid Knowledge is the acquisition of modern information that will enable new information-handling skills and knowledge expertise. There are various implications of Valid Knowledge in the school curriculum. Its absence creates a gap between what is taught in the education system and what is happening in reality.

Partnership for 21st Century skills, a leading advocacy organization that seek to promote an infusion of the 21st century skills into education, developed a framework for learning these skills. This framework describes the skills, knowledge, and expertise that students need to successfully enter today's workforce. Student outcomes include: 1) Core Subjects and 21st century themes; 2) Learning and Innovation Skills; 3) Information, Media, and technology skills; 4) and life Career skills (Partnership for the 21st Century Skills 2009). If this is not done then there will be no congruence between the curriculum and the working world. Similarly, the International Society for Technology in Education ([ISTE] 2007) recognised that in an increasingly digital world, students need skills in the following areas: 1) Creativity and Innovation; 2) Communication and Collaboration; 3) Research and information Fluency; 4) Critical thinking, Problem Solving, and Decision Making; 5) Digital Citizenship; and 6) Technology Operations and Concepts. The essence is that the curriculum will be obsolete and children will lose interest in what is being taught, as they will, not see the relevance to their careers, if classroom teachers do not get familiar with these modern skills and integrate them throughout the curriculum.

Technology-based educational activity

In choosing this activity the different learning styles will be taken into consideration.

Learning can be described as the process whereby behaviour is changed as a result of experience (Matalon 2000). Researchers have found that people learn in different ways or styles. These learning styles include the visual /verbal learner, visual/ non-verbal learner, auditory/ verbal learner and tactile/ kinaesthetic learner. Learners who are categorised as visual/verbal learners: These people learn best when information is presented visually and in a written form. In a classroom setting, they prefer instructors who use visual aids (i.e. White board, Powerpoint presentation) to list the essential points of a lecture in order to provide them with an outline to follow during the lecture. They benefit from information obtained from textbooks and class notes. These learners like to study by themselves in quiet environments. They visualize information in their “minds’ eyes” in order to remember something. The online environment is especially appropriate for visual/verbal learners because most of the information for a course is presented in written form.

Learning Styles

There are various learning styles that are impacted by ICT. ***The visual/ non verbal learner:*** these people learn best when information is presented visually and in a picture or design format. In a classroom setting, they benefit from instructors who supplement their lectures with materials such as film, video, maps and diagrams. They relate well to information obtained from the images and charts in textbooks. They tend to prefer to work alone in quiet environments. They visualize an image of something in their mind when trying to remember it. These learners may also be artistic and enjoy visual art and design. The online environment is well suited for this type of learner because graphical representations of information can help them remember concepts and ideas. Graphical information can be presented using charts, tables, graphs, and images.

The auditory verbal learner: These people learn best when information is presented orally. In a classroom setting, they benefit from listening to lecture and participating in group discussions. They also benefit from obtaining information from audio tape. When trying to remember

something, they often repeat it out loud and can mentally “hear” the way the information was explained to them. They learn best when interacting with others in a listening/speaking activity. Online learning environments can complement these learners’ style. Although most information is presented visually (either written or graphically), group participation and collaborative activities are accomplished well online. In addition, streaming audio and computer conferencing can be incorporated into an online course to best meet the learning style of these students.

The tactile/ kinaesthetic learner: These people learn best when doing a physical “hands –on” activity. In the classroom, they prefer to learn new materials in lab setting where they can touch and manipulate material. They learn best in physically active learning situations. They benefit from instructors who use in-class demonstrations, hands-on learning experiences, and fieldwork outside the classroom. Online environments can provide learning opportunities for tactile/kinaesthetic learners. Simulations with 3-Dimensional graphics can replicate physical demonstrations. Lab sessions can be conducted either at predetermined locations or at home and then discussed online. Also, outside fieldwork can be incorporated into the coursework, with ample online discussions both preceding and following the experience. Finally, the online environment is well suited for presentation and discussion of either group or individual projects and activities.

Educational Activity

The learning styles that will be addressed in this paper are the visual/non verbal learner, auditory/verbal learner and the tactile / kinaesthetic learner.

Description of content, topic and media

This lesson is from the grade 8 Integrated Science syllabus for secondary schools in Jamaica. The topic Digestion in Humans is taken from the unit – Energy Flow through Living Systems. The general and specific objectives for this topic are as follows:

General Objective: Students should understand that the food which animals eat goes through a number of processes before reaching the cells.

Specific Objectives: ¹⁶ Students should be able to:

- State that the Digestive System is responsible for food intake into the body and subsequent absorption.
- List the main organs of the digestive system of humans.
- Identify the functions of the organs of the digestive system.
- Discuss the roles of enzymes in the digestive process

Description of work areas and resources

This lesson will be taught in a science laboratory in a high school. This physical setting is one with work tables and stools. There are two open spaced areas one at the back and one at the front of the laboratory. These areas measure ten feet by seven feet and ten feet respectively.

The laboratory is equipped with specimens, charts, models and other material and equipment for the teaching of this topic. The school is also equipped with a cyber centre in the library, a wide range of biology and integrated science textbook, a television set, DVD player, document reader, laptop, multimedia projectors among other equipment acquired through the E-Learning project.

There is internet access in the laboratory, and one computer assigned to the laboratory to aid the teaching learning process. Students have computer skills that they have acquired in their computer studies class.

Teaching Strategies

Various teaching strategies will be used in the teaching of this topic. These strategies will be varied to cater to the different learning styles of the students. These teaching strategies will include:

- Experimenting/ testing
- Viewing of Video with three dimensional graphics
- Power point presentations
- Examination of specimens
- Observing models
- Visual presentation (charts, pictures)
- Group presentations / discussions

Organisation of class

The classroom (laboratory) will be organised into five areas. The open space at the back will be transformed into a pictorial area where charts pictures and diagrams related to human digestion will be displayed. These charts will have captions and brief descriptions with relevant information. There will be two work areas along the desks where equipment will be set up for the testing of enzymes in salvia. (A laboratory sheet with instructions will be posted at this area).

A fourth area will be arranged where models and specimens will be displayed. These models will include – the teeth. The specimen will include the liver, pancreas, intestines, and stomach. (These specimens are preserved in formaldehyde and are all from goats, pigs and cows).

A fifth area will be the larger space at the front of the laboratory. This area will be transformed into a mini studio. Here students will be able to sit in small groups of seven and view a short video presentation of how the digestive system works. This area will also host the computer where students will access information using the internet.

The lesson

Topic: The Digestive System

Duration: 80mins

No. Of students: 35 (20girls and 15 boys)

Ages of Students: 12-13 years old

Procedure: Students will be introduced to the topic as a group by the showing of a video on Digestion. (Appendix 1) A brief discussion / brainstorming session will follow. Students will be issued with work sheets and instructed with their task at hand. They will be made familiar with the different work stations that are provided in the laboratory and the information that can be had from each. The class will then be divided into six groups. All groups will complete the worksheets, but one group will be asked to report on the processes taking place at each part of the digestive system. (Appendix 2a,2b,2c).

Students will be asked to use a medium that they are comfortable with and which best helps them to bring across their point. Students will have an option to choose their group for presentation.

Culmination of lesson

The lesson will culminate with group reports. Teacher will summarise with a power point presentation and a song on digestion.

Homework

Students will be given homework assignment that they can do as group work in the chatroom. The teacher will give students websites for follow up work on the topic.

This lesson is structured ²⁷ to meet the different learning styles of the students.

The visual /non verbal learners will benefit from the following activities:

- Video presentations
- Charts
- Textbooks
- Diagrams and labels

The Auditory verbal learner will benefit from:

- Video presentation with three dimensional graphics
- Power point presentation
- Song
- Group presentation

The tactile/ kinaesthetic learner will benefit from:

- The video presentation with three dimensional graphics.
- Model of teeth etc. (examination of and making of)
- Examination of specimen
- Experimentation

Conclusion

The thought of integrating Information and Communication technology (ICT) into teaching and learning has become more evident as we seek to capitalise on the different means of gaining knowledge. Hodson & Sullivan (2002) suggest that in the 21st century there is a need for education of the workforce. This need is not only in college education, but vocational education and ongoing retraining for workers already in the labour force. Countries like Europe have instituted programs for mid-career training which has led to economic vitality in these countries. Jamaica has instituted the national training agency known as The Human Employment and Resource Training Trust (HEART Trust/NTA) to fulfill this mandate.

ICT is changing the way we teach in several ways. Teachers that use ICT are able to create their own material and also have more control over the material used in their classroom than they have had in the past. However, the integration of ICT has been a contentious issue. Jhurree, (2005, p. 467) posits that there are some who are not convinced that ICT will bring the pedagogical benefits that have been so much touted about” On the other hand, advocates like Edison (cited in Saettler, 1990, p 98), Negroponte (1995), the co-founder of the Massachusetts Institute of Technology Media Lab, and Papert (1996) claim that technology will change the educational landscape forever and in ways that will engender a dramatic increase in the performance of learners. Ghavifekr, Kunjappan ,Ramasamy and Anthony (2016) argue that although teachers appear to acknowledge the value of ICT in schools, they continue encountering obstacles during the processes of adopting these technologies into their teaching and learning. For example in Malaysia some of these challenges are: limited accessibility and network connection, school with limited technical support, lack of effective training, providing pedagogical training for teachers, rather than simply training them to use ICT tools, is an important issue (Becta, 2004). The introduction of technology integration in teaching and learning has considerable disparities between developed and developing countries. While developed countries have more resources, knowledge, skills and experience than developing countries they all suffer challenges and concerns. Critics of technology in education contend that overexposure to social networks; such as Facebook, infantilize learners, affects academic performance and sometimes create false impressions about learning (Considine et al, 2009; Scharber, 2009; Wintour, 2009). According

to Bennett, Maton, Kervin (2008) ¹⁹ the generation born roughly between 1980 and 1994 has been characterised as the "digital natives" or the "Net generation", because of their familiarity with and reliance on ICT. Therefore, I would implore all parents like myself ¹⁰ to offer more supervision with the internet usage with our kids especially. The integration of ICT in teaching and learning has its merits and should never be seen as a replacement of a teacher. Students need teachers. A teacher is more than just a coordinator of knowledge; a teacher also acts as a leader, a counselor and an encourager of students. This role cannot be replaced by technology of any kind. I am convinced nonetheless, that ICT, if properly integrated in teaching and learning, will aid in the development of our students.

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