Effective Use of ICT for Education and Learning by Drawing on Worldwide Knowledge: ICT as a Change Agent for Education

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INTRODUCTION

Information and communication technologies (ICTs) - which include radio and television, as well as newer digital technologies such as computers and the Internet - have been touted as potentially powerful enabling tools for educational change and reform. When used appropriately, different ICTs are said to help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life.

However, the experience of introducing different ICTs in the classroom and other educational settings all over the world over the past several decades suggests that the full realization of the potential educational benefits of ICTs is not automatic. The effective integration of ICTs into the educational system is a complex, multifaceted process that involves not just technology - indeed, given enough initial capital, getting the technology is the easiest part! But also curriculum and pedagogy, institutional readiness, teacher competencies, and long-term financing, among others.

Information and communications technology (ICT) is the hardware and software that enables data to be digitally processed, stored and communicated. ICT can be used to access, process, manage and present information; model and control events; construct new understanding; and communicate with others.

ICT, an interdisciplinary domain, focuses on providing students with the tools to transform their learning and to enrich their learning environment. The knowledge, skills and behaviours identified for this domain enable students to:

- develop new thinking and learning skills that produce creative and innovative insights
- develop more productive ways of working and solving problems individually and collaboratively
- create information products that demonstrate their understanding of concepts, issues, relationships and processes
- express themselves in contemporary and socially relevant ways
- communicate locally and globally to solve problems and to share knowledge
- Understand the implications of the use of ICT and their social and ethical responsibilities as users of ICT.

ICT ENHANCING TEACHING AND LEARNING PROCESS

We are living in a constantly evolving digital world. ICT has an impact on nearly every aspect of our lives - from working to socializing, learning to playing. The digital age has transformed the way young people communicate, network, seek help, access information and learn. We must recognize that young people are now an online population and access is through a variety of means such as computers, TV and mobile phones.

As technology becomes more and more embedded in our culture, we must provide our learners with relevant and contemporary experiences that allow them to successfully engage with technology and prepare them for life after school.

It is widely recognized that learners are motivated and purposefully engaged in the learning process when concepts and skills are underpinned with technology and sound pedagogy. Education Scotland provides advice on resources for practitioners, parents and pupils to engage with these technologies in order to inform and enhance the learning experience.

These resources include, but are not limited to:

- Glow - the world's first national schools intranet which provides access to a range of tools and resources for pupils and practitioners

- examples of innovative uses of technology in practice, including game based learning through computer games and the use of mobile technologies
- support and advice on internet safety and responsible use for all
- video material on iTunesU
- Communication via social media tools such as Twitter and Facebook.

ROLE OF THE TEACHER

TEACHERS REMAIN CENTRAL TO THE LEARNING PROCESS

A shift in the role of a teacher utilizing ICTs to that of a facilitator does not obviate the need for teachers to serve as leaders in the classroom; traditional teacher leadership skills and practices are still important (especially those related to lesson planning, preparation and follow-up).

LESSON PLANNING IS CRUCIAL WHEN USING ICTS

Teacher lesson planning is vital when using ICTs; where little planning has occurred; research shows that student work is often unfocused and can result in lower attainment.

PEDAGOGY

Introducing technology alone will not change the teaching and learning process

The existence of ICTs does not transform teacher practices in and of itself. However, ICTs can enable teachers to transform their teacher practices, given a set of enabling conditions. Teachers' pedagogical practices and reasoning influence their uses of ICT, and the nature of teacher ICT use impacts student achievement.

ICTs seen as tools to help teachers create more 'learner-centric' learning environments

In OECD countries, research consensus holds that the most effective uses of ICT are those in which the teacher, aided by ICTs, can challenge pupils' understanding and thinking, either through whole-class discussions and individual/small group work using ICTs. ICTs are seen as important tools to enable and support the move from traditional 'teacher-centric' teaching styles to more 'learner-centric' methods.

ICTs can be used to support change and to support/extend existing teaching practices

Pedagogical practices of teachers using ICT can range from only small enhancements of teaching practices using what are essentially traditional methods, to more fundamental changes in their approach to teaching. ICTs can be used to reinforce existing pedagogical practices as well as to change the way teachers and students interact.

Using ICTs as tools for information presentation is of mixed effectiveness

The use of ICTs as presentation tools (through overhead and LCD projectors, television, electronic whiteboards, guided "web-tours", where students simultaneously view the same resources on computer screens) is seen to be of mixed effectiveness. While it may promote class understanding of and discussion about difficult concepts (especially through the display of simulations), such uses of ICTs can re-enforce traditional pedagogical practices and divert focus from the content of what is being discussed or displayed to the tool being utilized.

TEACHER TECHNICAL ABILITIES AND KNOWLEDGE OF ICTS

Preparing teachers to benefit from ICT use is about more than just technical skills

Teacher technical mastery of ICT skills is a not a sufficient precondition for successful integration of ICTs in teaching.

'One-off training' is not sufficient

Teachers require extensive, on-going exposure to ICTs to be able to evaluate and select the most appropriate resources. However, the development of appropriate pedagogical practices is seen as more important that technical mastery of ICTs.

Few teachers have broad 'expertise' in using ICTs in their teaching

Even in the most advanced school in OECD countries, very few teachers typically have a comprehensive knowledge of the wide range of ICT tools and resources.

TEACHER USAGE OF ICTS

Teachers most commonly use ICTs for administrative tasks

Teachers most often use ICTs for 'routine tasks' (record keeping, lesson plan development, information presentation, basic information searches on the Internet).

More knowledgeable teachers rely less on "computer assisted instruction"

Teachers more knowledgeable in ICTs use utilize computer assisted instruction less than other teachers who use ICTs, but utilize ICTs more overall.

How teachers use ICTs is dependent on their general teaching styles

Types of usage of ICTs correlate with teacher pedagogical philosophies. Teachers who use ICTs the most -- and the most effectively -- are less likely to use traditional 'transmission-method' pedagogies. Teachers who use more types of software tend to practice more "constructivist" pedagogies.

Teaching with ICTs takes more time

Introducing and using ICTs to support teaching and learning is time consuming for teachers, both as they attempt to shift pedagogical practices and strategies and when such strategies are used regularly. Simply put: Teaching with ICTs takes more time (estimates vary on how much extra time is required to cover the same material; 10% is a common estimate).

TEACHER CONFIDENCE AND MOTIVATION

Few teachers are confident users of ICTs

Few teachers are confident in using a wide range of ICT resources, and limited confidence affects the way the lesson is conducted.

ICTs motivate (some) teachers, at least at the start

At least initially, exposure to ICTs can be an important motivation tool to promote and enable teacher professional development.

HOW CAN ICTS HELP EXPAND ACCESS TO EDUCATION

ICTs are potentially powerful tool for extending educational opportunities, both formal and non-formal, to previously underserved constituencies—scattered and rural populations, groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as all others who for reasons of cost or because of time constraints are unable to enroll on campus.

- *Anytime, anywhere.* One defining feature of ICTs is their ability to transcend time and space. ICTs make possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners. Online course materials, for example, may be accessed 24 hours a day, 7 days a week. ICT-based educational delivery (e.g., educational programming broadcast over radio or television) also dispenses with the need for all learners and the instructor to be in one physical location. Additionally, certain types of ICTs, such as teleconferencing technologies, enable instruction to be received simultaneously by multiple, geographically dispersed learners (i.e., synchronous learning).
- *Access to remote learning resources.* Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at anytime of the day and by an unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries, that have limited and outdated library resources. ICTs also facilitate access to resource persons— mentors, experts, researchers, professionals, business leaders, and peers—all over the world.

USING TECHNOLOGY TO CREATE STUDENT-CENTERED LEARNING ENVIRONMENT

In this modern era of 21st century, the infusion of technology into teaching and learning has a remarkable influence on the instructional strategies of the educational institutions. The traditional teacher-centric method which has been going on for decades. In contrast to the traditional methods, the modern learning environments, students play an active role in their learning process and determine how to reach their desired learning outcomes on their own.

This student-centered approach empowers students to build up their knowledge and enables them to think critically, work in teams and solve problems collectively. Students are always enthusiastic and demonstrate positive attitudes towards the student-centered learning environment.

The student-centered learning approach is constructivist in nature, it enables students to visualize a problem with multiple perspectives and allows them to participate in their own learning process. Students are now challenged to develop skills in problem-solving and to exercise analytical, critical and creative thinking in their work and are encouraged to learn more about their subjects. The role of the teacher now alters to being a facilitator and a consultant to the students, supporting them throughout their learning process, rather than just being a dictator in the entire process.

For teachers who wish to create a more student-centered environment, things are not always easy, since creating such an environment is an intensive

process which requires a lot of consideration and knowledge. First of all, they need to come out of the practice of being the 'sage on the stage', and also the students who are not used to being active participants in their learning need a good deal of adjustment. Technology can help pave the way for both teachers and students, but it certainly requires a teacher who is adept at creating a course that raises the pedagogical benefits of that technology has towards helping students meet the desired learning outcomes. A roadmap needs to be followed for matching technological tools to learning outcomes, so that technology can be used to get students to interact with course content in an engaging and productive fashion.

BASIC EFFECTS OF ICT ON THE TEACHING PROCESS

- Has an edit effect in terms of quality of student work and practical examples through visualization;
- Improves poor handwriting and languages skills through word processing;
- Equalizes individual differences and has particularly dramatic effects for students with special needs;
- Facilitates self-pacing with increased capacities to deal with individual learning styles as students can work at the pace and intensity suitable to their needs;
- Enables collaborative learning with little indication of the isolated learner;
- Encourages use of peer coaching and peer reviews;
- Develops communication skills and awareness of different audiences;
- Has impact on resource–based learning and access to real world information through the Web;
- Increases information reliability and accuracy adding to authenticity of learning tasks, with realistic and up-to-date information;
- Increases student motivation through hands-on activity, visual representations and improved modes of presentation;
- Encourages independent learning and individual preferences for process, layout, style and format;
- Gives students more control;
- Allows students to produce high quality multimedia products;
- Changes teacher practices, planning tools and assessment rubrics;
- Increases opportunities for classes to evolve and for student experiences to shape outcomes;
- Have motivated students to commit to learn and to participate in learning activities;
- Has improved students' quality of work and has given them the confidence to perform enhanced learning tasks;
- Has allowed students to learn independently, which has enabled more work to be completed, and
- Has enhanced achievement due to the reinforcement and practice that ICT has afforded.

CONCLUSION

ICT seems to have a profound impact on the process of learning in higher education by offering new possibilities for learners and teachers. These possibilities can have an impact on student performance and achievement. There are contradictory results in the empirical literature in this field. Three different arguments can be given in order to explain this lack of empirical evidence.

First, since ICT is a form of GPT and immature by nature, a long process of appropriation and exploration of their possibilities by higher education institutions is needed before observing any significant change. This has been the case in other economic sectors and it is also true in higher education.

Second, we consider the lack of organizational change in higher education the main explanation. While universities have invested heavily in equipment, and at the same time students and teachers are using these technologies more and more, there has been little change on the organizational side. The adoption of complementary organizational innovations is a major factor in student performances and achievement.

Third, returns of education using ICT are changing. Students are acquiring new skills and new competencies – more collaboration, team building, project management – closer to the needs in the job market and perhaps less performance on curricula.

The adoption and use of ICTs in education have a positive impact on teaching, learning, and research. ICT can affect the delivery of education and enable wider access to the same. In addition, it will increase flexibility so that learners can access the education regardless of time and geographical barriers. It can influence the way students are taught and how they learn. It would provide the rich environment and motivation for teaching learning process which seems to have a profound impact on the process of learning

in education by offering new possibilities for learners and teachers.

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