Technology in Education Creating Structural Change

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Abstract

Digital technologies are becoming increasingly common in our schools. However, the pedagogical changes required to use them effectively are not adopted as quickly as the hardware is physically installed in our classrooms. This paper discusses the changes that are required to the traditional structure of educational systems in order to maximize student learning with the power of technology. There is a need to look more closely at how the technology is used rather than simply the presence of the technology itself.

Digital technologies, also known as Information and Communication Technologies (ICTs), have affected the physical nature of the traditional schoolroom, and are also affecting the very structure of our educational systems. As a result, there is a need for a dramatic shift in paradigm and pedagogy to re-align practice with the desired outcome of education, which is student learning. These technologies have changed the ways that people around the world live, work, communicate, and learn. Access to digital technologies and the internet has changed the context of education through a greater access to information, and the ability of those at a distance to participate in educational programs. Digital technologies facilitate greater interaction, multi-modal education, and a different kind of learning. This functionality demonstrates the importance of how technology is used, rather than simply the amount of technology available. Teachers are the fundamental key to making this shift. Teacher professional development, evaluation and restructuring of policies, and a commitment to improvement of the status quo are fundamental for moving forward in the educational community.

ICTs have permeated many aspects of our daily lives, and increasingly continue to do so every day. Computers are profoundly reshaping children's lives and are a necessary part of the global economy (Nayak & Kalayankar, 2010). For young people, access to the internet through mobile digital technologies, particularly cell phones, has become so ubiquitous that it becomes difficult to examine learning from within the strict parameters of a school or a school day. Use of technology has blurred the boundaries between different institutions and facets of students' lives: schoolwork is routinely accessed from home, interaction with friends and extra-curricular groups often occurs online, and personal interests are developed through interaction on the internet (Furlong & Davies, 2012). Educational systems must recognize that students are connected, interacting, and learning beyond the classroom.

Many of today's youth agree that they must be constantly connected and available through technology, often in the form of multi-tasking during other activities. In fact, a cell phone is viewed by many as an extension of self (Schofield Clark, 2009), and ICT use has been identified as helping to shape a young person's identity (Furlong & Davies, 2012). Digital technologies are an extremely important and natural part of the lives of today's students.

Access to information for those in remote communities has opened opportunities through ICTs and distance education. Access to education is no longer determined by geographic location but access to a network (Anastasiades, 2010; Kozma, 2011). An example is New Zealand, where digital technologies and educational systems have evolved together to create "virtual schooling" (Davis, Eickelmann, & Zaka, 2013). This access is changing the lives of many people, but it must be noted that there are still challenges in accessing networks and the internet, especially in rural areas of developing countries (Bracey & Culver, 2005). ICTs provide opportunities for more people around the world to participate in learning and communication.

The benefit of using ICTs for students in distance education, in particular, is the inherent qualities of multi-modal communication and a great degree of interaction. Technology can be used for inquiry, communication, construction, and expression (Bracey & Culver, 2005), and to

provide the opportunity for adaptability and rapid feedback (Rienties et al., 2012). Evidence has also shown increased peer collaboration, self-assessment, and potential student ownership of learning with an ICT platform (Andersson & Hatakka, 2010,). Furthermore, learning is social, not individual (Furlong & Davies, 2012; Livingstone, 2012), which has a positive correlation with the ability to interact using ICTs and the digitally connected nature of our youth. The success of ICTs in distance education can be transferred to our face-to-face school programs where students can be learning outside of the classroom in their connected lives.

Other demonstrated benefits of ICT include increased peer collaboration, self-assessment, and student ownership of learning (Andersson & Hatakka, 2010). It is reported to be more engaging, allows students to work at their own pace, and can decrease dropout rates (Lopez-Perez, Perez-Lopez, Rodriguez-Ariza, & Argente-Linares, 2013; Livingstone, 2012). The use of technology also has a positive effect on skills such as problem solving and decision making, not simply memorization of content (Lopez-Perez et al., 2013), and should be used to improve instruction and engage learners (Schrum & Levin, 2009). These positive attributes of technology in learning support increase student achievement.

Many post-secondary institutions are creating remedial, transitional, or other courses to prepare students for their university studies. The use of interactive ICTs for this purpose has been important, especially when students have large gaps or need to study from a distance (Rienties et al., 2012). A blend of face-to-face and internet based formats has the most potential for success and students, not teachers, should determine the appropriate "blend" or combination of learning activities that will maximize engagement and skill development (De George-Walker & Keeffe, 2010). ICTs are very useful for facilitating independent student learning in post-secondary schools.

Many of the benefits of using ICT are contrary to the traditional structure of the educational system. Significant system-wide changes are required to take advantage of these benefits of technology. The shift in paradigm begins with the traditionally hierarchal roles of teacher and student; there is a need to change from a mind-set of "schooling" to one of "learning" (Bonk & Graham, 2012, p. 4). No longer is the teacher a giver of knowledge and the student the receiver. Instead, there is interaction and guidance (Kress & Selander, 2012), and the teacher, as facilitator, must use a constructivist approach to learning activities (Anastasiades, 2010). The shift "from teacher to student, content to experience, and technologies to pedagogies" (De George-Walker & Keeffe, 2010, p. 2) is central to gaining the most from the use of ICTs. This release of control may be a difficult change for many educators, but it demonstrates the power of ICTs and learning.

Access to digital technology is not as important as how it is used (Bracey & Culver, 2005; Kozma, 2011; Livingstone, 2012). An example is the evidence that there are both positive and negative effects of owning a home computer. Students need a combination of investment and ownership in their learning, digital literacy and citizenship skills, and metacognitive skills, in order for ICT to have a positive effect (Owen, 2013). There are many examples of schools installing interactive whiteboards, using educational computer games, and increasing reliance on internet applications without the expected increase in student learning (Livingstone, 2012). Powerful learning experiences can be accomplished with careful design of learning environments, teaching, and curricula, but human capacity must be built at the same pace as installing computer hardware (Bracey & Culver, 2005; Rienties et al., 2012). Technology alone is not enough to improve student learning across curricular areas.

The importance of careful planning for implementation of ICTs is more than simply a concern about lack of progress or growth in education. The implementation of ICTs without a sustainable model may intensify the existing inequalities in society and reinforce the distance between social groups (Bracey & Culver, 2005). The power of ICTs can contribute to creating a knowledge society and economy (Kozma, 2011) with economic and social effects, but must be managed with foresight. Poor implementation strategies can actually be counter-productive and increase the existing disparity of students.

Innovations, including ICT, have not replaced the classroom teacher. Teachers have remained the most influential aspect of educational systems and are not predicted to be replaced by ICTs (Davis et al., 2013). The key to implementing such dramatic shifts in educational pedagogy requires teacher training (Kozma, 2011). Teachers are fundamental in the transition to using ICTs to their potential, and governments and administrators must make significant commitments to professional development with digital learning in mind.

Teachers have varying comfort levels with implementing ICTs, and many are reluctant to use it (Kreijns, Vermeulen, Kirschner, van Buuren, & Van Acker, 2013). Factors such as ICT policy and vision, work pressure and autonomy, and personal behaviours and dispositions (Kreijns et al., 2013) will affect the successful integration of ICTs. Administrators and other stakeholders need to look carefully at all aspects of the teacher's reaction to ICT implementation, in order to support the transition to ICT use in education.

Policy makers must have a vision for the potential of ICT to improve access to education and improve student achievement (Kozma, 2011). To act on this realization is to redesign infrastructure, teacher training, curriculum and assessment at all levels. These changes in the structure of education will produce far greater demands on resources than simply getting technology into classrooms (Livingstone, 2012). The financial commitment and perseverance required to facilitate the system-wide changes to education will be greater than it has been to install computers in classrooms.

In conclusion, it is important to acknowledge the significant changes that digital technologies have brought to individuals and systems in today's world. ICTs are an integral part of young people's daily lives. At school, home, work, and leisure, mobile technologies are an extension of self that have blurred the lines between these aspects of life. The result is a significant change in the ways that students learn, share, and access information. The fact alone that this technology exists is superficial; it is the optimum use of the technology that can significantly improve student learning. Unfortunately, the beneficial applications of ICTs in education are largely contrary to the traditional structure of educational systems, so careful planning and large-scale redesigning at all levels must be implemented to maximize the potential of this technology for student achievement. Teacher professional development and creation of policies that commit to a shift in pedagogy are important in building success with ICTs in education. How technology is used is more important than the technology itself; therefore, it is important to implement system-wide changes to maximize its potential.

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Biography

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