

Strategies of Technology Integration

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Author's Note

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Introduction

Without a doubt, technology is prevalent in today's society. In Canada alone, there are an estimated 27 million mobile devices (CWTA, 2013). At the end of 2012, there were at least 6 billion mobile devices globally (ITU, 2012).

The access to information is staggering as well. Wikipedia, a popular reference site on the Internet, celebrated its twelfth anniversary on January 15th, 2013. In that time, Wikipedia has grown to include 30 million articles in 286 languages ("Wikipedia", 2013). Intel Corporation, a leading manufacturing of computer CPUs, noted that in one minute on the Internet there are over 2 million Google search queries, and over 639,000 GB of data are transferred (Intel Corp., 2013).

With all of the technology readily available to consumers today, it is no wonder that schools are trying to tap into this resource to help students achieve greater success. This article examines the question of technology integration in schools by using current research to define technology integration, to examine the current climate of technology in schools, to disclose the barriers impeding successful integration, and to uncover and suggest successful strategies in the integration of technology into our schools.

What is technology integration?

There are many definitions that exist of technology integration. In its simplest form, it is the "quality of technology use in the classroom" (Levin & Wadmany, p. 238). The International Society for Technology Education (ISTE) is a highly regarded organization in the field of Technology Education. They have further developed the definition of technology integration through their Standards initiatives. In particular, it defines a set of guidelines in what it means to teach and learn in a technology integrated classroom. These guidelines (Standards, 2008) include:

- (a) Facilitate and inspire student learning and creativity

- (b) Designing and developing digital age learning experiences
- (c) Modelling digital age work and learning will be fulfilled
- (d) Promote and model digital citizenship and responsibility
- (e) Engage in professional growth and leadership

Current Climate of Technology Integration Implementation

Around the world, government agencies are making efforts to implement technology integration into their education systems. In England, the British Educational and Communications Technology Association (BECTA) guided Information and Communication Technology (ICT) initiatives until 2010 when it was dissolved due to budgetary cutbacks. Though BECTA, computer to student ratios were reduced to better than 1 to 8 for primary and 1 to 5 for secondary students. Also, 100% of primary school and 98% of secondary schools had access to interactive whiteboards. The majority of teachers saw the positive impact on student motivation and success. However, it was noted that ICT “is still being used to support or enhance traditional ways of teaching” (BECTA, 2008, p. 5). The second phase is to develop technology confidence and is now underway.

In 2008, the Australian federal government announced the Digital Education Revolution initiative (DER). This \$2.1 billion initiative was highlighted by groundbreaking initiatives for Australia’s educational system such as broadband access for every school and a 1:1 student to laptop ratio in Grade 9 to 12 (DEAG, 2013). The student to laptop ratio was achieved at the end of 2012 (DEAG, 2013). The cost of the 1:1 student to laptop ratio was \$1.9 billion of the \$2.1 billion allocated for the DER program. There was also money allocated for teachers’ professional development (Buchanan, 2011).

The Economist Intelligence Unit, in conjunction with Pearson, published The Learning Curve (Pearson, 2012). This report compiles worldwide statistical data and gathered experts in education to rank the education systems of countries around the world. Interestingly, the countries noted above ranked 6th and 13th respectively. There is other evidence to show that infusing technology into education is not translating into student success. Research has shown that teachers are using technology in classrooms but it is for mediocre tasks such as word processing and research (Banas, 2010; Ertmer, 2005; Oncu & Dellialioglu, 2008). According to Steeves (2012): “...school boards continue to focus on training students on how to use technology instead of providing students with learning opportunities that are enhanced through the use of technological tools” (p. 4). To summarize, teachers and students are *utilizing* the technology without meaningfully *integrating* it (Banas, 2010; Smith, Higgins, Wall, & Miller, 2005).

Barriers to Integration

In relation to the above noted phenomenon, the question ‘Why is this so?’ begs to be investigated and answered. There has been much research into the barriers to the integration of technology in classrooms. Ertmer (1999) suggested a categorization of first and second order barriers to integration. First-order barriers are the factors that are “extrinsic to teachers and include a lack of access to computers and software, insufficient time to plan instruction, and inadequate technical

and administrative support” (p. 2). Second-order barriers are “intrinsic to teachers and include beliefs about teaching, beliefs about computers, established classroom practices, and unwillingness to change” (p. 2). A breakdown of the first and second order barriers found in the research are outlined below:

First Order Barriers	Second Order Barriers
<ul style="list-style-type: none"> • School Infrastructure <ul style="list-style-type: none"> ○ Adequate hardware and software ○ Access or resources • School Leadership <ul style="list-style-type: none"> ○ Clear vision • Support <ul style="list-style-type: none"> ○ Technical ○ Pedagogical 	<ul style="list-style-type: none"> • Teacher Beliefs • Teacher Openness and Willingness to Embrace Technology • Teacher Openness to Change • Teacher Confidence • Teacher Technological Literacy

Strategies for Successful Integration

First Order Strategies

Much of the focus of current technology integration plans have dealt with providing funds for school infrastructure. It is for this reason that a further investigation of other lesser discussed, impeding factors needs to be addressed.

Research has shown that if school administrators have a clear vision of what they want technology integration to mean within the walls of their school, it has a positive impact on the integration process (Dawson & Rakes, 2003). For school administrators to obtain an effective vision of technology integration, they must be in-serviced in what it means to be truly technologically integrated, or at the very least, what the school district’s vision of technology integration is. Once the vision is obtained, school administrators must define this vision through their ensuing leadership.

Support for technology is important as well. Teachers’ readiness and teachers’ beliefs are directly affected by teachers’ computer proficiency (Inan & Lowther, 2010). If teachers are supported in using the technology, their confidence to use technology in the classroom and their ability to troubleshoot problems with technology will increase. In a study performed by Lowther et al. (2008), one of the strategies used to overcome identified technology integration barriers in a school was the use of a part-time computer technician. The study found that teachers had “more positive attitudes towards technology integration and significantly more confidence to complete computer tasks” (p. 205).

Second Order Strategies

It is worth noting that the majority of the barriers identified are second-order. As stated by Dexter, Anderson and Becker (1999), “Although culture and context create norms of teaching

practice... teachers can choose, within these limits, the approach that works for them. This autonomy provides teachers with choices to adopt, adapt, or reject an instructional reform” (p. 224). Since teachers play such a pivotal role in the process of decision making within their classrooms, any successful strategies toward technology integration must help teachers subscribe to change and challenge second-order barriers. According to Ertmer (1999), changes that address second-order barriers “confront fundamental beliefs about current practice, thus leading to new goals, structures or roles” (p. 2). These barriers are more difficult to overcome as they require a fundamental change in thinking from teachers and with any change comes resistance.

Hooper and Rieber (as cited in Northcote, Mildenhall, Marshall, & Swan, 2010, p. 497) proposed that teachers go through five steps when adopting technology into their classrooms. Teachers first become *familiar* with new technology; then start *utilizing* it in their classrooms. As confidence grows, teachers start using the technology more and more until it becomes *integrated* in their classrooms. At the *re-orientation* stage, teachers learn the features of the technology *with* the students. Finally, teachers *evolve* their teaching to integrate the technology in a meaningful way.

Collaboration was found to be the most effective way in teaching technology integration. According to Mason (as cited by Ertmer, 2005, p. 33) this is especially true of adult learners as they need to express their ideas, draw on experience, and try new learning with their jobs. Experiences passed on from collaboration are helpful because teachers become aware of practical ideas and the effects if recreated in their own classrooms (Ertmer, 2005). Experiences shared through collaboration are also opportunities to get feedback and refinement from their peers, as well as to develop new ideas (Smith et al., 2005). As teachers are engaged in a shared learning process and collaboration of ideas, a learning culture develops that will yield improvements and changes to organizational learning. As teachers then reflect on the process of which they are a part, this will raise their performance and consequently improve student learning and achievement. It is important, however to recognize that sustained support and collaboration is key, as learning is ongoing and so should the support for that learning (Banas, 2010).

Collaboration has been found to increase teacher confidence in technology. This rise in confidence however does not translate into true integration of technology in the classroom (Kay, 2007). A suggestion for the much needed implementation of authentic tasks would be to allow teachers observational time in classrooms that have already integrated technology successfully (Ertmer, 2005). Viewing successful implementations can increase teacher confidence in using the same techniques and will highlight the differences in pedagogy (Oncu & Dellialioglu, 2008).

Conclusion

“Technology integration into classroom instruction is a slow and complex process that is influenced by many factors” (Inan & Lowther, 2010, p. 138). It is not just a matter of placing technology within schools. This author would argue that technology has very little to do with the goals of technology integration. Technology is a vehicle for the real goal of technology integration, which is, pedagogical change (Inan & Lowther, 2010; Lowther et al., 2008).

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