Digital Technologies’ Current and Potential Impact on Education

Abstract

Education in the United States has been experimenting with technology as a teaching and learning tool for many years. The research shows that technology, when appropriately applied, can and does positively affect student learning. Recent advancements and developments in digital technology are quickly changing the educational technology landscape and educators and researchers are struggling to keep up.

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Computer technology is the agent of change that has loomed on the horizon of education since the first computers hit the scene in the early 1950s. Since that time the impact of computers and other digital technologies on the educational landscape has been sporadic at best. Programs of excellence are evident in pockets around the country. However, most would agree that digital technology has not fueled dramatic changes in education as it has in other segments of society.

In conducting research for this paper I looked for research discussing current technologies impacting the educational landscape. It quickly became evident that much of the research was outdated. Many studies examined the effects of technology used as a way to deliver education in a traditional method. These early techniques (which continue today) include repetitive practice, simple educational games, and other tools that amount to drill and practice. Research into using technology as a tool allowing students and teachers to interact in new and exciting ways is more difficult to find. Part of the reason for this is the fact that many of the technologies that fit with this more constructivist use are very recent developments (Stratham & Torell, 1996).

The body of this paper examines some of the current technological and educational trends that are changing education and society. Separating the trends as educational, or technological, is nearly impossible. Educators are beginning to change the way they teach as they integrate and leverage new technology. The educational technology trends that are discussed in this paper include the growth of online learning, and the increase in one-to-one laptop learning programs. Also included, and closely related to these trends is the explosion of highly portable, personal devices such as netbooks and smartphones. Additionally, a brief description of classroom technology tools that are gaining in popularity in classrooms around the world is included. The final trend discussed is the proliferation of Web 2.0 tools that many would say is just now finding its way into schools.
Current Environment

Online learning is one of the fastest growing fields in education. The number of enrollments of K-12 students in online courses during the 2007-2008 school year is estimated at 1,030,000. That estimate indicates an increase of 47% over the 2005-2006 school year (Picciano & Seaman, 2009). As the number of fully online courses and students are increasing, so are the number of teachers incorporating online technologies and techniques in traditional classrooms, thus creating new hybrid classes. The popularity of these hybrid teaching and learning strategies is driven largely by nearly ubiquitous student access to Internet technologies.

There is no one reason that online learning continues to gain popularity. Students benefit from online learning’s anytime, anywhere, capabilities. Students are able to work classes into already busy schedules. Online learning also helps break down geographic boundaries to learning. Schools and school districts benefit from online learning by being able to increase class offerings thereby expanding access and improving education (Smith, Clark, & Blomeyer, 2005). At the same time, the quality of online distance learning is improving as the technologies and pedagogies improve. Increasingly fewer online classes resemble the paper-based correspondence classes of old. Online classes are making use of many of the technologies discussed below.

Another exciting and growing trend in education is the move toward one-to-one educational computing. This movement started with Maine’s one-to-one laptop initiative, in 2002 and 2003, which aimed at providing every seventh and eighth grade student in the state with a laptop computer. One-to-one teaching and learning environments where each student has access to a computer at school and at home have demonstrated that gains in writing, English-language arts and mathematics can be achieved (Gulek & Demirtas, 2005). However, the use of laptops does not
guarantee results. Laptop programs are effective only when the laptops are used to create a significantly different environment for learners.

Still, laptop programs are gaining in popularity. In addition to academic success, laptop programs have been credited with additional benefits. Student behavior improvements included decreased absenteeism and discipline problems (Barrios, 2004). Encouraged by the positive results several states are pursuing implementation, continuation, and expansion of their laptop initiatives, even in the current economic recession. Recently, the Maine Department of Education announced plans to expand their program to high school students.

Another trend that has been gaining momentum and is being eyed as the next step in educational technology is the proliferation of portable, wireless devices. Netbooks (small, highly portable, relatively inexpensive laptop/notebook computers) are the fastest growing segment of the computer hardware market. Additionally, the proliferation of smartphones with Internet browsing and email capabilities presents new educational opportunities that forward-looking organizations are only now starting to explore. Indeed, the differences between smartphones, laptop and tablet computers, and personal-media-players are blurring. Products such as the iPhone and iPod touch are at their infancy with regard to educational uses.

Interactive white boards, clicker response systems, document cameras, and other technologies have added even more potential weapons to an educator’s arsenal. Since each of these technologies can be used by themselves, or combined with other technologies, it is hard to research the effectiveness of individual technologies. Indeed, it is often the creative combination of different technologies that leads to the most powerful educational environments.

With all of the technologies discussed above, one may ask, “Why hasn’t digital technology transformed education?” Unfortunately the answer is complex. The mere availability of technology means nothing if institutions lack the resources to acquire it. Additionally, purchasing technology
does little unless teachers have, or learn, the skills to integrate and leverage that technology in the educational setting.

One factor that makes it difficult for teachers to leverage technology is the rapid rate with which all this technology is evolving. On the hardware front, advanced technology has moved from being desktop or laptop computers to netbooks, tablets, and smartphones. Indeed, the line between many of these technologies is blurred at best. However, focusing on the hardware may obscure the true potential of using technology in education. A recent development, this one on the software side, holds what many consider to be the new promise for technology in education.

Known as Web 2.0, this new technology is even more difficult for many teachers to adopt than the hardware and software of the past. Part of the difficulty teachers have with Web 2.0 is the difficulty with even defining the term. Generally, Web 2.0 is used to refer to Internet based applications that facilitate collaboration, information sharing, interoperability, creativity and publishing of information. The proliferation of Web 2.0 “tools” does not help ease the confusion. Social-networking, blogging, video sharing, and tweeting are the new “actions” on the Internet. Keeping up with the latest trends can be daunting. However, today’s so called “digital natives” have grown up (or are growing up) with these technologies surrounding them. Teachers however have largely managed to stay out of the way of the changing tide.

While it is common to assume that students are digital natives, it is dangerous to assume that all students know how to use, or when to apply, Web 2.0 technologies in educational settings. “Many learners lack technical skills, and lack an awareness of the range of technologies and of when and how they could be used, as well as the digital literacy and critical skills to navigate this space. Teachers should be careful not to overestimate learners’ familiarity and skills in this area (Web 2.0 technologies for learning, 2008).”
Interestingly, Web 2.0 technologies are widely viewed as valuable education tools by educational professionals. In a recent study conducted by the Metiri group, a majority of school district administrators have positive views of the influence Web 2.0 tools can play in the educational environment. Administrators view Web 2.0 technologies as having great potential for helping create a learning environment where students are interested and engaged. Unfortunately, it was also noted that while Web 2.0 tools have great potential, their progress is outpacing the innovation of the educational system (Lemke, Coughlin, Garcia, Reifsneider, & Bass, 2009). Still, Web 2.0 could be a technology that allows many teachers to change how they teach.

A lack of equipment is no longer an acceptable reason to explain why digital technology has not transformed education as many prognosticated, and many more still do. This is not to suggest there is equal or equitable access to digital technology for all students. Unquestionably there are schools, districts, and states around the United States that have not kept up with the acquisition of technology. The bigger problem though is the demonstrated inability for teachers to significantly change their teaching strategies to leverage the power of technology. This inability is largely due to a lack of appropriate training. Education Week’s Technology Counts gives “states an average of C- plus for policies that support the capacity for educators to use technology” (Hightower, 2009).

Conclusion

The question is no longer, “Can computers have a positive effect on learning outcomes?” Rather, the question has become, “How can computers best be used to influence educational outcomes?” The answer does not reside with a particular technology. The answer is that technology must be used to engage students in learning. Prensky (2005) states this well when he states “today’s kids are challenging us, their educators, to engage them at their level, even with the old stuff, the stuff we all claim is so important, that is, the curriculum.”
Many current technological developments are accelerating the acceptance and adoption of technology into the classroom. It is hard to pinpoint a single technology that changes the educational landscape. Rather, it is a convergence of many technologies that may be creating the perfect storm that will finally transform education.

Research regarding the educational efficacy of new hardware such as netbooks, smartphones, and other highly portable devices combined with Web 2.0 tools such as blogs, wikis and social networking is scarce and largely anecdotal. Much new research will need to be done to identify and disseminate best educational practices for these new tools.
References


