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Handheld Devices in the Classroom

Teachers and instructors are always looking for creative ways to engage their students with projects that generate student interest and foster critical thinking skills. Students learn when they are connected and engaged in the learning process.

Today's students bring their personal mobile technologies, i.e. mobile phones, iPads, laptop computers, with them to the classroom (Vesisenaho, Valtonen, Kukkonen, Havu-Nuutinen, Hartikainen, & Karkkainen, 2010). How can schools take advantage of the assumed mobile technology skills of their students? How should teachers react to their students bringing personal mobile devices with them to school? Are these mobile devices a threat to teaching or is there an advantage to the teacher's providing new tools for learning (Basoglu & Akdemir, 2010)?

Vocabulary Terms

- *21st century skills* - skills students need to succeed in work, school and life
- *College and Career Readiness Standards* – (CCRS) standards set to establish what students must know and be able to do to succeed in entry-level courses offered at institutions of higher education
- *Digital Natives, Millennials, the net generation* – students who have lived their whole lives surrounded by a variety of technologies
- *E-learning* – electronically supported learning and teaching
- *Handheld device* – also known as a mobile device, is a small computing device, typically having a display screen with touch input and/or a miniature keyboard; i.e. mobile phones, tablets, Ereaders
- *Information and communication technology (ICT)* – technology and communication consisting of all technical means used to handle information and aid communication, including computer and network hardware, as well as necessary software
- *Instant message (IM)* – a form of real-time direct text-based communication between two or more people usually over the Internet
- *M-learning* – also called mobile learning; learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies
- *NCLB* – No Child Left Behind
- *Networking* – connecting with other people (or organizations) that have a common interest
- *Uploading/Downloading* – transmitting data from a local system to a remote system/receiving data from a remote system to a local system

Descriptive Context

Background

In the Report to the Nation on Technology and Education, June 29, 1996 by the Department of Education it was noted that students spent an average of only a few minutes a day using computers for learning. Only 4 percent of schools had a computer for every 5 students, and only 9 percent of classrooms had connections to the Internet (U.S. Department of Education, 1996). These percentages were drastically improved by 2009 according to a national survey of teachers (U.S. Department of Education, 2010). Of those surveyed 97 percent of the teachers had one or more computers located in the classroom every day, Internet access was available for 93 percent of the classroom computers, and the ratio of students to computers in the classroom everyday was 5.3 to 1.

Digital Natives have lived their whole lives surrounded by a variety of technologies, so it is assumed they are interested in, capable of, and willing to use different technologies.

Reaching the student of today is challenging. It was reported in 2006 that teens spent more than 72 hours per week using electronic media, and they spent their free time listening to iPods, networking, downloading, uploading and instant messaging (IM), and one-third of the teens reported owning an Apple iPod (Bauleke & Herrmann, 2010).

In the rest of the world the mobile reigns, with countries often having 5 to 10 times more mobile phones than PCs (Prensky, 2005). In China, the Philippines, and Germany, students are using their mobile phones to access live and archived university lectures, learn English, and study math, health, and spelling.

What to do - Action

Instead of fighting the trend of students showing up for school carrying their own powerful learning devices – which are paid for – why not use the opportunity to enhance and promote their education? If educators design “it” right, using handheld devices will provide the owners of the device with knowledge, skill, behaviors and attitudes that will help them succeed in their school journey, their jobs, and their lives.

The most frequent time-tested types of learning and the processes students use to learn include listening, observing, imitating, questioning, reflecting, trying, estimating, predicting, speculating, and practicing. Handheld devices such as laptops, tablets, eReaders, and mobile phones can support all these learning processes in short-burst, casual, multitasking style that will complement the Digital Native learners (Prensky, 2005). If you give students the opportunity, they will take a digital tool and make it their own in various unexpected ways – just as they have done with all useful digital technology.

21st Century Skills

21st century skills are the skills students need to succeed in work, school and life.

They include:

- Core subjects (as defined by NCLB) and 21st century themes: global awareness; financial, economic, business and entrepreneurial literacy; civic literacy; and health literacy
- Learning and Innovation skills:

- o Creativity and Innovation
- o Critical Thinking and Problem Solving
- o Communication and Collaboration
- Information, Media and Technology skills:
 - o Information literacy
 - o Media literacy
 - o Information and communication technology (ICT) literacy

The Partnership for 21st Century Skills (Skills, 2010), representing both business and education, believes success of U.S. education in the 21st century depends upon student acquisition of 21st century skills because:

- **Education is changing.** The U.S. results are no longer supreme in this global economy. Students around the world outperform American students on assessments that measure 21st century skills.
- **Competition is changing internationally.** Innovation and creativity no longer set U.S. education apart. Innovators around the world rival Americans in breakthroughs that fuel economic competitiveness.
- **The workplace, jobs and skill demands are changing.** Today *every* student, whether he/she plans to go directly into the workforce or on to a 4-year college or trade school, requires 21st century skills to succeed. We need to ensure that all students are qualified to succeed in work and life in this new global economy.

Legislation Passed

The 79th Texas Legislature, Third Called Special Session, passed House Bill 1, the “Advancement of College Readiness in Curriculum.” Section 28.008 of the Texas Education Code seeks to increase the number of students who are college and career ready when they graduate high school. The College and Career Readiness Standards (CCRS) are designed to represent a full range of knowledge and skills that students need to succeed in entry-level college courses, as well as in a wide range of majors and careers. According to research, over 80 percent of 21st century jobs require some postsecondary education. By implementing these standards in Texas, secondary school and postsecondary faculty in all academic disciplines will advance the mission of Texas: college and career ready students (Texas Education Agency, 2009).

Differing Perspectives

- It is hoped that the continuous investment in school technology will bring about significant improvements in education. This hope has not been supported by empirical evidence (Zhao & Lei, 2009).
- Even when technology is provided to schools, the focus is on how to use the specific technology hardware and software, but not on a deep understanding of technology and how it interacts with people and society, even if the that technology is ubiquitous (Zhao & Lei, 2009).
- Some studies indicate that student outcomes are not positive and may even harm children and their ability to learn. One study found that the computer restricted rather than promoted “inquiry” in a sixth- grade science classroom (Zhao & Lei, 2009).
- There are also mixed findings as to the benefit of technology in large scale international studies (Zhao & Lei, 2009).

- In Fiscal Year 2009, more than 31.3 million children each day got their free or reduced school lunch through the National School Lunch Program (United States Department of Agriculture, 2011). That number translates to many families that can't afford school lunch, so how will they be able to afford Internet hookups in their homes? However, according to CTIA, the International Association for the Wireless Telecommunications Industry, the U.S. has approximately 303 million wireless subscriber connections that accounts for 96% of the population (Wikipedia, 2011).
- Stepping back and examining how to best use technology might be a good idea. Instead of plugging technology into older pedagogical methods (i.e. lectures), maybe teachers should look at creative opportunities that emerging technologies can provide. This could include using technology outside of the classroom, and not just inside the classroom (Gray, 2010).
- Using cell phones as learning devices, whether in or out of school, requires a good deal of rethinking and flexibility on the part of educators (Prensky, 2005).

Snapshots of Research

The research suggests that standards-based reforms are in contrast with the efforts to integrate technology in the K-12 school setting because standardized testing discourages the constructivist learning supported by technology (Keller & Bichelmeyer, 2004).

Illegal and immoral use of mobile phones should be addressed by schools before allowing them into the classroom. International court cases of illegal use has been reported since mobile phones started coming equipped with cameras (Parry, 2005). Camera phones have been welcomed in professional work by surveyors, estate agents, emergency medical teams, and police as the phones facilitate the taking and transmitting of pictures without the necessity of carrying cameras. In the educational setting these camera phones could be used to transmit photos of school trips, drama productions, and sporting events.

Some studies show a positive technology impact on student outcomes in the areas of literacy development, reading comprehension and vocabulary, writing, mathematics, and science (Zhao & Lei, 2009).

Undergraduate students are having positive experiences with mobile phones in language learning by using instructional materials on their phones (Basoglu & Akdemir, 2010).

A recent study blended a three-stage problem-based estimation instruction scenario with a mobile-device-supported cooperative learning environment. The teachers were able to observe students using a PC tablet for their estimation lessons and how it helped these fourth grade students to work cooperatively using the mobile device. The result of the study supports not only the development of estimation skills in elementary students, but also metacognition knowledge of estimation strategies (Lan, Sung, Tan, Lin, & Chang, 2010).

The Issue in Practice

Teachers are using the mobile technology market that is booming with powerful applications to enhance their classroom. Their choices range from teacher productivity and organizational tools to resources for at-risk students and personalized math education. These products can give

meaningful boosts to teachers' efforts as well as students' educational experiences (McLester, 2011).

In other countries, mobile devices allow students to explore new knowledge through continual communications. Students who used handheld devices as individual workplaces interacted with peers through shared displays, which supports one-to-one collaborative learning activities. The students using handheld devices also showed good retention of concepts in later classes (Wu & Zhang, 2010).

Digital tools extend and enhance our cognitive abilities by using digital technology to enhance memory via data storage. Digital data-gathering and decision-making tools enhance our judgment by allowing us to gather more data than we could on our own, helping us complete more complex analyses than we could do unaided, and by allowing us to ask more "what if?" questions and all the implications that go with it. There are context-specific tools, i.e. laptop computers, online databases, 3-D virtual simulations, online collaboration tools, in every profession that help us with digital cognitive enhancement (Prensky, 2009).

Related Issues

Ownership of Mobile Phones

The Federal Communications Commission (FCC) counted over 270 million mobile phone users in the U.S. in 2009, as seen in Figure 1. According to the Pew Internet and American Life Project, 82 percent of American adults own a mobile phone or a mobile computing device as of mid-2010 (this number does not include laptop computers). The percentage is even higher for 18-29 year old American adults, with around 90% owning a cell phone (Hanson, 2011).

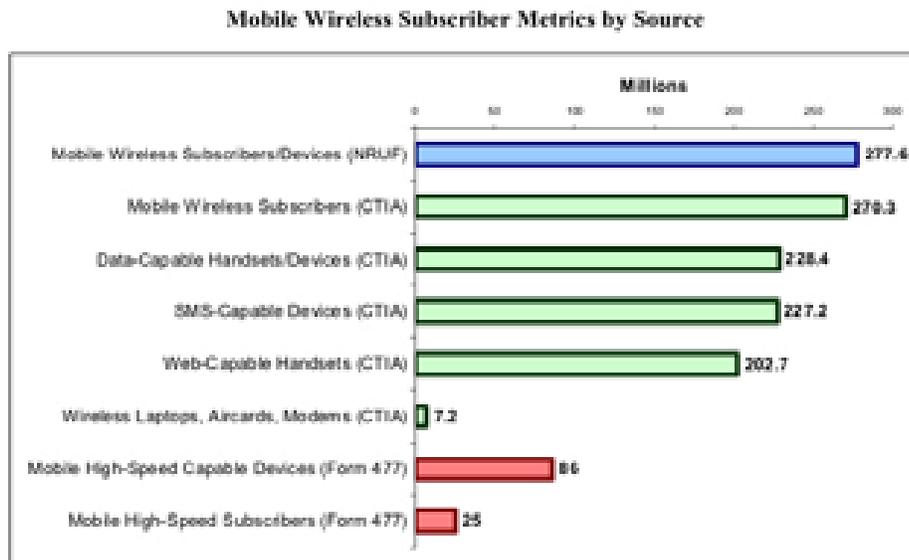


Figure 1
FCC statistics on mobile device ownership in the U.S.

The Educause Center for Applied Research (ECAR) in a yearly survey, the *ECAR Study of Undergraduate Students and Information Technology* asked undergraduate students at U.S. colleges and universities about their ownership and use of technology. In 2004, 82 percent of

study respondents reported owning a cell phone. In the subsequent years, the number rose so high that they have ceased asking that question.

Smartphone Sales

In Figure 2, according to Hanson (2011), the sale of smartphones is projected to be higher than the sales of PCs by 2011. A Fortune magazine blogger predicts that between 2009 and 2012, the number of smartphone users worldwide will more than triple, from 165 million to over 500 million.

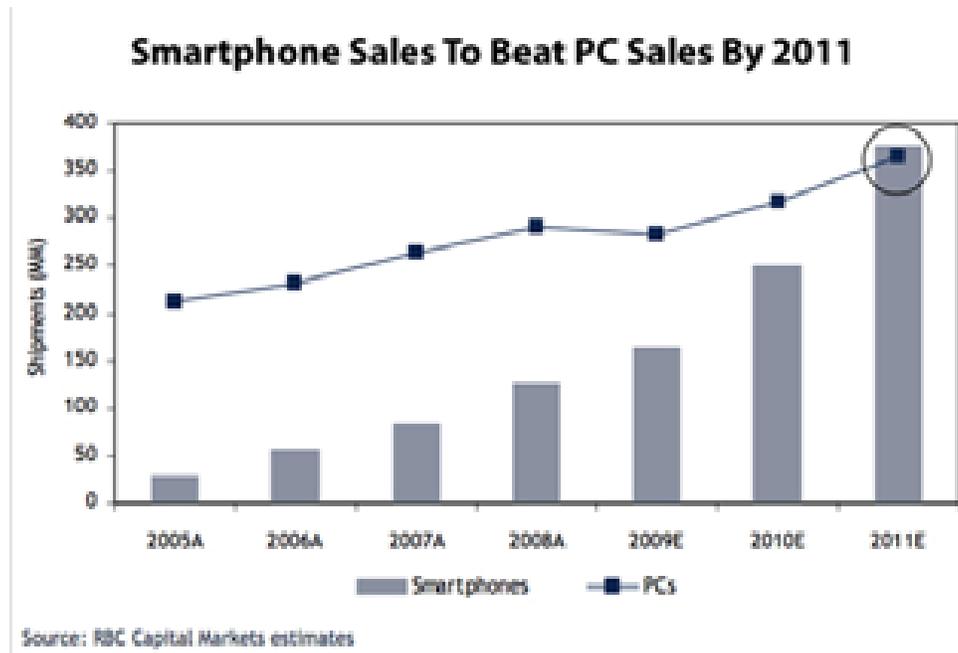


Figure 2
Smartphone sales are poised to overtake PC sales (Original image: Dan Frommer, "Chart of the Day: Smartphone Sales to Beat PC Sales by 2011," *Business Insider* website, Aug. 21, 2009, www.businessinsider.com/chart-of-the-daysmartphone-sales-to-beat-pc-sales-by-2011-2009-8 [accessed Jan. 4, 2011]).

Over 35 percent of U.S. adults now own phones which they can install software applications (apps). That number does not include devices like the iPad or iPod Touch, which can use apps, but don't function like a traditional cell phone. ECAR also found that almost 63 percent of U.S. undergraduates report owning an Internet capable handheld device.

With the number of mobile wireless subscribers growing and the Smartphone sales projected to beat PC sales in 2011, this seems a good time to start incorporating handheld devices into the classroom.

Changing Learning Environments

In order to meet the needs of the Digital Natives there is a call to create flexible, collaborative learning environments using information and communication technology (ICT) where it is needed (i.e. the classroom, online, etc.) instead of traditional computer laboratories.

Collaborative learning emphasizes participation and the creation of materials. It supports an environment where students are supported with their ideas and interpretations. There is also a need to use social software to foster students' collaborative learning (Vesisenaho, et al., 2010).

Social software supports conversational interaction and allows the construction of meaning and a new way to collaborate. The social software also sets students up for a more active role in learning as compared to traditional passive ways of using web pages. Students will be able to have more creativity when publishing material and will be active participants in reading and writing.

Summary

Using technology as a tool to research, organize, evaluate, and communicate information, and understanding of the ethical/legal issues surrounding access to and use of information is important in today's classroom. Continual access to the Internet changes the way that people search, discover, and retrieve information, if for no reason other than convenience. Students need to use digital technology, communication tools and/ or networks appropriately to access, manage, integrate, evaluate, and create information in order to function in a knowledge economy (McLester, 2011).

Handheld device ownership is on the rise. Schools need to look into using these devices as tools in the education of their students. These devices lend themselves to a collaborative learning environment that will meet the needs of the Digital Natives in classrooms today. Today's teachers need better tools to address the growing problem of U.S. students' not performing as well as international students on 21st century skills. Although there are unresolved issues, now is the time for the e-learning and educational technology community to pay serious attention to mobile learning and handheld devices (Robson, 2003).

Recommendation

State Policy

- **Integrate 21st century skills** into standards, assessments and graduation requirements at all levels.
- **Establish a state center**—or realign existing state centers—for professional development, teaching and assessment of 21st century skills.
- **Partner with the business community** to set a 21st century skills agenda and plans to implement 21st century learning for the state.
- **Develop state workforce development policies** in which every aspect of the workforce pipeline is focused on the same set of 21st century skills.
- **Appoint Cabinet-level officials** for 21st century learning in education, workforce and economic development to provide dedicated leadership on 21st century skills and to coordinate state initiatives for 21st century skills.
- **Align 21st century skills measures and outcomes** with workforce and economic development initiatives.
- **Partner with businesses** to provide opportunities for educators and students to learn 21st century skills.

Local Policy

- **Develop local policies** that include direct references to acceptable use of hand held devices brought from home
- **Develop local guidelines for teachers/staff** at the building level in reference to handheld devices brought from home

- **Develop a design for successful implementation** of bringing handheld devices from home—create a pre-planning guide to include polls from students and parents, permission slips, etc.
- **Develop the capacity of district administrators and school leadership teams** to implement 21st century skills strategies.
- **Build 21st century skills into long-term planning and budgets** for school districts.
- **Appoint assistant superintendents** for 21st century learning to oversee the development of 21st century skills strategies in school districts.
- **Convene business and education leaders** to agree on goals for acquiring the 21st century skills that are essential to their region or community.
- **Incorporate 21st century skills** into regional economic development strategies.
- **Align pre K–12, postsecondary and adult education, after-school and youth development, workforce development and training, and teacher education programs** around the 21st century skills that matter for regional and local competitiveness.
- **Make proficiency in 21st century skills the outcome** of education, training and workforce development at all levels.
- **Develop active partnerships with businesses** to provide opportunities for educators and students to learn 21st century skills.
- **Embed 21st century skills** into teacher preparation and professional development.
- **Keep up with current trends** through blogs and web sources that are updated regularly (i.e. <http://byodmobilelearning.blogspot.com/>)

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