INTEGRATION OF MOBILE DEVICES INTO HIGH SCHOOL CLASSROOMS:

ENGAGEMENT or DISTRACTION?

Paula Aquino

Thompson Rivers University

July, 2014
Abstract

As personal mobile devices proliferate in society and increasingly accompany students into classrooms, it becomes a challenge for teachers to compete with the attraction of technology. This paper considers the literature regarding the use of mobile technology in the classroom, potential challenges for schools and classrooms, and the opportunity these devices afford for promoting student interest, engagement, and learning. Research is revealing that harnessing the power of mobile technology for collaboration and the host of learning opportunities afforded through digital capabilities and wireless access can lead to student engagement and has the potential for improved learning outcomes. A significant aspect is facilitation by a teacher who has mastered their subject area, pedagogy, and technology in the context of a social constructivist learner-centred approach.
Integration of Mobile Devices into High School Classrooms: Engagement or Distraction?

“The responsibility of educators is to ensure that today’s students are ready to live, learn, work, and thrive in this high-tech, global, highly participatory world.” (Lemke, 2010, p. 244) What does this high tech world look like? Visit a coffee shop, a library, a classroom or a mall. All around you will see people, including high school students, engaged with technology—cell phones, tablets, iPods, laptops, among others. Up to 98 percent of high school students now own a cell phone (Project Tomorrow, 2010), and according to Trim (2009, as cited in Keengwe, Schnellert, & Jonas, 2014) nearly half of all teens said having a cell phone was key to their social lives. In spite of prohibitive policies in many schools, these phones are making their way into the classroom in the pockets and purses of students. Rather than ban these devices, Keengwe, Schnellert, and Jonas (2014) said that schools need to understand the nature of today’s digital natives, and recognize the power of digital devices to engage, enable, and empower today’s learners. “Cell phones are not going away. Cell phones can be used as a learning tool for knowledge construction if educators teach students how to use them appropriately.” (Humble-Thaden, 2011, p. 14)

History

As we entered a new millennium, handheld devices began to appear as potential options for the classroom. “Handheld computers may become an increasingly compelling choice of technology for classrooms because they enable a transition from the occasional, supplemental use associated with computer labs, to frequent and integral use of portable computational technology.” (Roschelle, 2003, p. 260 citing Soloway, Norris, Blumenfeld, Fishman, & Marx, 2001; Tinker & Krajcik, 2001) Hoppe (2003) saw them “emerging as one of the most promising
technologies for supporting learning . . .” (p. 255) Research in the late 1990s and early 2000s was primarily funded by companies such as Texas Instruments and PalmPilot, and centred around devices they were marketing to schools, including classroom response systems (clickers), graphing calculators and PalmPilots. (Roschelle, 2003; Tatar, Roschelle, Vahey, & Penuel, 2003) “Classtalk” was patented in 1989, allowing teachers to ask short answer or multiple-choice questions to which students responded using a hand-held device or clicker. Responses were collected and displayed in a histogram. (Roschelle, 2003) Pedagogical uses included monitoring students’ understanding of concepts and using the information to generate discussions. Early adopters described this technology as having a significant impact on the classroom climate and resulting learning. (Davis, 2003; Dufresne, Gerace, Leonard, Mestre, & Wenk, 1996; Owens, Demana, Abrahamson, Meagher, & Herman, 2002; Roschelle, 2003) Benefits were seen in that information was gathered anonymously, so all students felt free to participate. However, non-technical processes were still important to instruction as the teacher asked questions, explained, clarified, or summarized information. (Roschelle, 2003)

Davis (2003) explored some of the research done with Texas Instruments graphing calculators. Students were able to participate in a variety of activities, including moving data (to the teacher who could aggregate and project it) and responding to short answer or multiple choice items. Advantages were seen in that data was submitted anonymously, and students could see that others had wrong answers as well. This sometimes led to more involvement in discussions, and even the freedom to admit to a wrong answer by some students. (Davis, 2003) Teachers could provide immediate feedback and remediation as needed.

“As the shift from teacher-centered to student centered classrooms occurs, students become more active participants in assessment. In these classrooms, students learn to
reflect on their work and their learning, make critical self-judgments, critique the work of their peers, and use productively the critiques of others.” (NCTM, 2000 as cited in Davis, 2003, p. 306)

Teachers using Palm devices saw them as effective tools with the potential to positively impact student learning, teaching practices, and the quality of learning activities. (Crawford & Vahey, 2002; Roschelle, 2003) These were used for activities such as participatory simulations related to swarming ants or the spread of disease, and students were able to exchange data with neighbouring students by infra-red beaming. (Roschelle, 2003) Another activity with handheld devices involved the use of probes to collect data, such as water quality or temperature. (Mokros & Tinker, 1987; Nachmias & Linn, 1987; Roschelle, 2003)

Roschelle (2003) saw a number of advantages to the types of devices mentioned above. They required only local messaging capabilities, and teacher-controlled communications predominated. In participatory simulations only messages relevant to the classroom could be passed, and probes could only exchange data with nearby students. None of the applications required text messaging or email, and aggregated data could be displayed in the classroom. Roschelle (2003) proposed that classrooms wouldn’t need applications with the most potential for abuse, but only those that enabled teacher-controlled messaging and directed communication. He questioned whether Internet access belonged in a pedagogical device, since the Internet was not regulated. However, he did suggest that searching the web and accessing resources outside the school were also important pedagogical activities, and this, along with other capabilities of mobile devices, is part of what is driving the integration of cell phone technology in classrooms today.
While there are still mixed reactions to the use of mobile devices in the classroom, many teachers are experimenting with various ways to integrate them into lesson activities. Mobile devices give students access to simple technologies like stop watches, timers, and scanners. (Ramey, 2014) Cell phones may now be used as “audience response systems”, with online software such as polleverywhere.com, textthemob.com, or wiffiti.com. (Engel & Green, 2011; Kolb, 2011; Ramey, 2014) Camera, audio, and video capabilities may be used to conduct interviews, record podcasts, conference with Skype, take pictures on field trips, take photos of the homework assignment on the whiteboard, practice languages, or use teacher-generated QR codes to link to information or websites. (Engel & Green, 2011; Keengwe, et al., 2014; Kolb, 2011; Lepi, 2014; Ramey, 2014; Putnam County High School, 2014; Williams & Pence, 2011) The ability of mobile devices to link to the web allows students to research, share data, post information or photos to class wikis or blogs, use various subject-specific apps and learning games or simulations, access e-books, or use sites like google calendar to post due dates and other information. (Allen, 2011; Barack, 2013; Engel & Green, 2011; Keengwe, et al., 2014; Kolb, 2011; Lepi, 2014; Ramey, 2014; Williams & Pence, 2011)

**Potential Challenges with Mobile Devices in the Classroom**

Many educators see cell phones and other personal mobile devices in the classroom as a hindrance to meaningful learning. Some concerns include:

- students having more control over their own tools and the ability to hide online activities on devices with small screens (Barack, 2013)
- equity of access for students (Allen, 2011)
- problems with connectivity and speed of the wireless network (Allen, 2011)
- sending and receiving text messages (Humble-Thaden, 2011)
• cheating by texting answers, taking photographs of tests, or looking up answers on the Internet (McGrory, 2010, as cited in Keengwe, et al., 2014; Putnam County High School, 2014)

• unhealthy pressures and addictive behaviours, such as gaming and/or staying up late with devices (Keengwe, et al., 2014; McCann, 2008)

• cyberbullying, sexting, and social disagreements (Keengwe, et al., 2014; Putnam County High School, 2014)

• downloading inappropriate content and sharing with others (Tatar, et al., 2003)

Howard Rheingold (2009) states that students are too often in a state of “continuous partial attention”, a term coined by Linda Stone, a former MicroSoft Vice President, with too little control over where their devices lead their thoughts. Barack (2013), in a study of Grade 9 to 12 students, found that up to 95 percent said that they regularly sent emails or texts, browsed social media sites, listened to music, and even talked on their phones during class time. As a result, many schools’ policies are prohibitive and students are advised to leave cell phones at home or in their lockers. (Obringer & Coffey, 2007; Humble-Thaden, 2011)

However, proponents of mobile devices in the classroom suggest banning them is not the answer. “Schools should be places where students are allowed to use the tools they are comfortable with and have access to in order to develop and use skills needed to be successful and productive in the 21st century.” (Engel & Green, 2011, p. 40, citing Robinson, Brown, & Green, 2010) Rheingold (2009) says that it is important to manage students’ attention. He suggests having “tech on” and “tech off” times. Keengwa, Schnellert, and Jonas (2014) iterated the importance of establishing expectations for how, when, why, and where cell phones will be used in the classroom. Engel and Green (2011) conducted a study where students set the rules
and took ownership because they created them. They also laid out consequences including cell phone confiscation and parent notification if the guidelines were not followed. Kolb (2011) recommended having a series of lessons around appropriate cell phone use and iterating the consequences for inappropriate actions. She also suggested that parents should be informed, and even invited to participate with their cell phones.

Inequities in the classroom is a legitimate concern as well. Does every student have a cell phone or tablet? If students have some type of mobile technology, do they have a data plan or are they able to access a wireless network? Is every device able to access the applications required for class? Would there be any cost to the student for using their device in the classroom? Engel and Green (2011) in their experience with piloting cell phone use in a pre-calculus course found that only one student did not have a cell phone or reliable Internet access outside of class. The school provided an iPod touch with wireless capability for the student to use for class activities, and for some projects alternate tasks were provided outside the classroom. Another option for students without Internet access at home would be to access computers during lunch or after school to work on assignments. Students without cell phones could possibly use someone else’s phone with permission, or write responses on a card and submit them. (Engel & Green, 2011) If several students did not have access to technology, another option suggested by Engel and Green (2011) was to do cooperative exercises in small groups with at least one group member having a smart phone.

Educators may also be concerned with ethics around the use of personal devices. While most students have a device, and may be interested in using them in the classroom context, what are the broader implications of BYOD (Bring Your Own Device)? If a free education for all is enshrined in the Canadian constitution, are parents subsidizing education when students bring
INTEGRATION OF MOBILE DEVICES

their own devices to school? Gary Stager (2011) says, “Education must not be viewed as some competitive, commercial, “every man for himself” enterprise that relies on children to find loose change behind the sofa cushions. Democracy and a high quality educational system requires adequate funding.” (para. 10)

**Implications for Teaching and Learning**

Despite some of the concerns related to educational funding, mobile devices may be a cheaper, more portable option for the classroom (Allen, 2011; Humble-Thaden, 2011), and today’s sophisticated devices come with a wide range of functionalities that can enhance the classroom. (Anderson, 2009; Keengwe, et al., 2014) Because they are physically less obtrusive, they support collaboration, both in the classroom and on the web. In a 2009 survey, nearly 300,000 students said they preferred a mobile device, and in *Creating Our Future: Students Speak Up About 21st Century Learning*, by Project Tomorrow (2010), students indicated wanting to use digital devices for learning and peer collaboration. (Allen, 2011)

Rosen (2011) states that schools need to engage and retain students, and technology may be a motivating tool in this respect. Today’s digital natives are multi-taskers and want to be connected. They are impatient and want instant gratification. (Keengwe, et al., 2014) They want to be involved in active learning as opposed to sitting passively in class, and thrive on interactive technology and tools like cell phones. (Prensky, 2001, as cited in Humble-Thaden, 2011) They are interested in using personal tools for educational purposes (Keengwe, et al., 2014) and in fact, many already use their devices for doing homework outside the classroom. (Nielsen, 2013) According to Nielsen (2013), students say that using mobile devices makes them want to learn more. “Instructors may miss an educational opportunity if they do not
incorporate cell phone use into their learning process.” (Humble-Thaden, 2011, p. 10 citing Prensky, 2005)

ISTE (2007) developed six performance indicators for students: 1) creativity and innovation, 2) communication and collaboration, 3) research and information fluency, 4) critical thinking, problem-solving and decision-making, 5) digital citizenship, and 6) technology operations and concepts. Keengwe, et al. (2014) points out that schools need to instruct so that students develop these skills with real-world activities and today’s technological devices. He continues, saying, “…creative use of mobile phone technology will enhance lessons and engage learners, and empower them to take ownership of their learning.” (p. 448)

Many studies have supported the role of mobile technology in engaging students in their learning. (Allen, 2011; Keengwe, et al., 2014; Mula & Kavanagh, 2009; Nielsen, 2013; Roschelle, 2003; Shieh, 2012; Tatar, et al., 2003) Mula and Kavanagh (2009) cited audience response systems as having the potential to improve student engagement, increase concentration, and promote greater student participation, and these characteristics have also been observed with other technology applications involving personal devices. In some cases, research has indicated higher levels of achievement, but teachers have also pointed to an increased interest in the subject, reflected in students choosing higher-level courses, and in learning beyond the classroom, as students engaged in self-directed projects. (Allen, 2011; Shieh, 2012) Warschauer, (2007) in studying the results of using laptops in classrooms, found that they produced more just-in-time learning, autonomous and individualized learning, greater ease for researching, more empirical investigation, and more in-depth learning. It seems likely that smartphones could do the same. (Williams & Pence, 2011) Sharples, Taylor, & Vavoula (2007, as cited in Keengwa, et al. 2014) indicated that mobile phones facilitated active learning by
enabling students to access and transfer information in order to build on skills and knowledge and meet educational goals. Rochelle (2003) said that handheld devices may mediate social construction of deep understanding of a subject area.

Teachers have a role in managing a learning process that involves many active, communicating learners. (Rochelle and Pea, 2002) Mishra and Koehler (2008) have argued that to successfully integrate technology into instruction, three types of knowledge—technology, pedagogy, and content (TPACK framework)—need to be closely connected. Shieh (2012) stated:

Effective teaching with technology demands an understanding of the representation of concepts using technologies; pedagogical skills that employ technologies in constructive methods to teach content; knowledge of resolving problems students encounter with the use of technologies; and knowledge of how technologies can be used to strengthen existing knowledge and to develop new epistemologies. (p. 207)

Teachers need a clear understanding of how the devices work, the potential issues, and the role of mobile devices in their subject area. (Engel & Green, 2011)

In a learner-centred environment, students may be encouraged to discuss, argue, negotiate ideas, and collaborate to solve problems. From a social constructive philosophy and pedagogy, teachers design and provide the learning context, and facilitate learning activities, an approach which may be supported by mobile technologies. (Palinscar, 1998; Shieh, 2012) In order to do this, instructors need to use their knowledge of their subject, of teaching and learning, and of technology—the TPACK framework referred to previously. Beichner et al. (1999) found that students who were taught using a technology-rich, collaborative, and activity-based instructional approach outperformed those who were taught using traditional teaching methods. Additionally,
students’ satisfaction, confidence, and retention rates were high. “… a number of researchers have claimed that technology-enhanced, constructivist-based instruction effectively helps students to improve their academic performance.” (Shieh, 2012, p. 208, citing Beichner, et al., 1999; Dori & Belcher, 2005; Dori, Hult, Breslow, & Belcher, 2007; Hake, 1998, 2007; Shieh, Chang, & Tang, 2010)

**Conclusion**

Handheld devices have gradually been introduced into classrooms over the last fifteen to twenty years. Initially, devices such as clickers, graphing calculators, and palm pilots allowed for active participation in learning, and limited interaction with other students in the classroom. Today’s mobile devices afford increasingly diverse possibilities for student-centred and social constructivist learning in the classroom, supporting opportunities for cooperation and collaboration and supplying multiple modalities for students to demonstrate their learning. While further research is warranted related to the use of devices and improvements in achievement, increasingly research is supporting the integration of mobile devices, reinforced with thoughtful pedagogy, as a means to engage students and promote learning. Johnson (2010) has stated, “Savvy teachers will figure out how to change distraction to focus by using students’ personal technologies to improve learning and teaching.” (p. 22)
References


