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TURNING ON MOBILE LEARNING

IN NORTH AMERICA

> Illustrative Initiatives
and Policy Implications

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ABOUT THE SERIES

This paper is part of the UNESCO Working Paper Series on Mobile Learning. The Series seeks to better understand how mobile technologies can be used to improve educational access, equity and quality around the world. It comprises fourteen individual papers that will be published throughout 2012.

The Series is divided into two broad subsets: six papers examine mobile learning initiatives and their policy implications, and six papers examine how mobile technologies can support teachers and improve their practice.

Within the two subsets there are five geographical divisions: Africa and the Middle East, Asia, Europe, Latin America, and North America. Each subset also contains a 'Global Themes' paper that synthesizes central findings from the five regional papers.

Two additional 'Issues' papers round out the Series. One paper highlights characteristics shared by successful mobile learning initiatives and identifies supportive policies. A separate paper discusses how mobile technologies are likely to impact education in the future.

As a whole, the Series provides a current snapshot of mobile learning efforts around the world. Collectively and individually, the papers consolidate lessons learned in different regions to provide policy-makers, educators and other stakeholders with a valuable tool for leveraging mobile technology to enhance learning, both now and in the future.

UNESCO has plans to add additional titles to the Series after 2012. The Organization hopes that these resources will help diverse audiences better understand the educational potential of mobile technologies.

To access existing and forthcoming titles in the Series, please see:
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The widespread use of mobile technologies around the world represents a significant opportunity in education. While mobile learning – learning with mobile technologies and devices – is still in the early stages of development, many teachers and students in North America are beginning to realize its potential for enhancing teaching and learning. Mobile learning involves more than merely incorporating new technology into current pedagogical strategies; it requires an instructional paradigm shift that promises to fundamentally change the way students learn. The move toward mobile learning is driven by increasingly high demands for student achievement and an understanding of the digital skills students need to compete in the twenty-first century global economy.

This paper provides a survey of mobile learning policies and initiatives in the United States and Canada. Mobile learning efforts in both countries tend to be school- or district-led, although the United States government has initiated several national programmes that support and promote mobile learning, and a number of state and provincial programmes exist as well. While mobile learning initiatives in North America share several commonalities in terms of devices, tools and resources, there are substantive variations in programme approach. Most school districts implementing mobile learning programmes either provide mobile devices to students directly or allow students to bring their own technology, while some districts have experimented with a hybrid approach. The scope and impact of each programme, and the challenges associated with implementation, can vary widely among individual schools and districts.

This paper draws on analysis of recent research, in-depth interviews and a survey of US states and Canadian provinces to identify the essential conditions for successful mobile learning programmes. These include visionary leadership and commitment, robust technology capacity to support changes, professional development geared to new learning approaches, scalability, and policies that promote and enhance mobile learning. The paper also discusses perceived barriers to mobile learning and describes likely scenarios for mobile learning in North America in the near future. The paper concludes by suggesting policy reforms and programme recommendations to facilitate mobile learning. Recommendations include: updating acceptable use policies for students using mobile phones in formal educational settings; evaluating the different approaches to utilizing mobile technologies in the classroom to select the one that best meets the particular needs of teachers and students; working toward ensuring continuous mobile access for students through partnerships with broadband providers; and providing job-embedded professional development for teachers to support the implementation of mobile learning programmes.

The proliferation of mobile technologies, especially smartphones, among North American consumers is staggering. In the United States, mobile phone subscribers totalled 327.6 million in 2011, despite the fact that the entire US population numbers only 315.5 million (Rainie, 2011). Of course, the more than 1:1 ratio of mobile phones to people does not mean that every person has at least one mobile phone; many people have multiple phones for work and personal purposes, and many people do not own a mobile phone at all. However, the sheer number of mobile phone users represents a potential opportunity for educators to take advantage of the connectivity and content that mobile learning affords. In the USA, 52% of all children have access to newer mobile devices at home (Common Sense Media, 2011), and 75% of teenagers have mobile phones (Madden, 2011; Wallace, 2011). Usage in Canada, while not as prevalent as in the USA, is still high: there are approximately 24.5 million subscribers, representing about 70% of the total population (Canadian Wireless Telecommunications Association, 2010). Based on the most current numbers from 2008, approximately 30% of 13- to 15-year-olds and 65% of 16- to 17-year-olds have mobile phones (Harris/Decima, 2008).

The increasing pervasiveness of mobile phones does not automatically translate to their adoption in education, but many educators are beginning to recognize the potential of mobile learning. The New Media Consortium's *2011 Horizon Report*, based on input from forty-five education leaders worldwide and published in collaboration with the Consortium for School Networking (CoSN) and the International Society for Technology in Education (ISTE), identifies emerging technology that will have a significant impact on teaching, learning, research and creative expression in education around the world. The report describes mobile devices as an emerging technology with a 'likelihood of entry into the mainstream of schools in the next twelve months' (Johnson et al., 2011).

This paper provides a survey of mobile learning initiatives in North American schools and school districts. Many of these programmes focus on primary and secondary education (usually referred to in the USA and Canada as K–12, or kindergarten through Grade 12), while several target students at postsecondary institutions. Some schools and districts have launched programmes using smartphones, tablets and other Wi-Fi-enabled mobile devices. These often begin as pilot projects, but several districts – including Rockdale Independent School District in Texas and Saddleback Valley Unified School District in California – are expanding their mobile learning programmes to include more students and grade levels in response to initial successes. Because young people are often avid mobile phone users, it should come as no surprise that students generally support the use of mobile technologies in education. The policies and data shared in this paper indicate that administrators, educators and parents are becoming more open to the concept of mobile learning as well.

Many of the new mobile learning programmes in North America build on the experience of schools and districts that have implemented 1:1 (one laptop per student) programmes, in which each student has an individual laptop computer (Greaves et al., 2010). While the majority of schools in the USA and Canada do not yet have 1:1 programmes, reports from districts that do have them offer insights into similar mobile learning programmes, including

the rationale behind such programmes, the expected student achievement outcomes, and the challenges districts may face as they embark on mobile learning projects (Friday Institute for Educational Innovation, 2008; Greaves et al., 2010).

While mobile technologies are a primary component of mobile learning initiatives, the survey respondents and the education experts interviewed for this paper do not describe the programmes as technology initiatives but rather as educational or instructional programmes that involve a paradigm shift for teachers and students. Proponents of mobile learning emphasize that their intent is not to use mobile technologies to replace educational interactions or learning experiences but rather to enhance them (SIIA, 2010). Indeed, several recent studies have noted positive student achievement outcomes from the integration of mobile technologies into teaching and learning (Gray, 2011; McFarlane et al., 2008; Wallace, 2011).

Online learning and blended learning – learning that takes place in a mixture of traditional classroom settings and online or mobile environments – are pertinent to the discussion of mobile learning because mobile technologies expand opportunities for access to teachers, content and courses. As Michael Horn and Heather Staker of Innosight Institute wrote:

Online learning is sweeping across America. In the year 2000, roughly 45,000 K–12 students took an online course. In 2009, more than 3 million K–12 students did. What was originally a distance-learning phenomenon no longer is. Most of the growth is occurring in blended-learning environments, in which students learn online in an adult-supervised environment at least part of the time. As this happens, online learning has the potential to transform America’s education system by serving as the backbone of a system that offers more personalized learning approaches for all students. (Horn and Staker, 2011)

With the increase of online and blended learning, mobile devices are becoming more common in education. While this paper focuses on mobile learning with smartphones, many survey respondents and several interviewees found it difficult to exclude tablets, laptops and netbooks from the discussion, as these devices give learners access to much of the same content, information and opportunities as mobile phones. A number of mobile learning initiatives incorporate a range of devices for students.

This paper discusses the context of mobile learning programmes in the United States and Canada, and the themes that emerged from a review of the literature, interviews with experts and the results of a survey. The paper also describes the factors that influence public policy and social attitudes about mobile learning. The final sections identify essential conditions for successful mobile learning programmes, speculate on the future of mobile learning in North America and offer recommendations for schools and districts, education leaders and policy-makers.

METHODOLOGY

Data for this paper were collected through an in-depth literature review, one-on-one interviews and a survey conducted from 26 September to 30 November 2011. The interviewees were North American education leaders and practitioners at the national, state and provincial, and local levels, as well as representatives from corporations marketing mobile technologies in K–20 (kindergarten through postsecondary) education. For a list of interviewees, see Appendix A.

The UNESCO survey solicited feedback and information on mobile learning from representatives of the state departments of education in the United States and the provincial ministries of education in Canada. For a copy of the survey, see Appendix B. The survey was sent to all US states and Canadian provinces. Representatives from seventeen states and three provinces completed the survey. For a list of survey respondents, see Appendix C. The survey responses provided information about the policies, programmes and visions for mobile learning, as well as perspectives on the direction of mobile learning in North America.

Although tablet devices are being used in education, this paper is limited to mobile phones and other hand-held devices because of their greater mobility and lower costs.

MOBILE LEARNING POLICIES

This section describes select national, state and provincial, and local policies that affect mobile learning programmes. The primary focus will be on policies in the United States due to its significantly larger population.

NATIONAL POLICIES

The US and Canadian education systems share a mission, similar to UNESCO's Education for All Goals, to provide high quality education to all students. Both countries focus heavily on increasing equity and reducing the achievement gaps between students of different socio-economic and demographic backgrounds. Many district and school leaders believe that mobile learning has the potential to make education more equitable (CMEC, 2008; USDOE, 2010a).

The majority of mobile learning initiatives in North America are led and implemented by individual schools, school districts and universities. However, in the United States the federal government and private corporations encourage and, in some instances, financially support school- and district-level mobile learning programmes. While these programmes are typically experimental and limited in size, some impact large numbers of people (FCC, 2011; Qualcomm, 2012).

The role of national government in education varies significantly between the two countries. Canada does not have a national ministry of education and the federal government does not play a significant role in determining education policy (Volante and Jaafar, 2008). However, all thirteen provinces and territories belong to the Council of Ministers of Education, Canada (CMEC), an intergovernmental body that provides education leadership at the national level. In the USA, the Department of Education (USDOE) enacts federal education laws, provides guidance and establishes programme requirements for the states. The Enhancing Education Through Technology (EETT) Act, originally part of the No Child Left Behind Act of 2001 and extended by the American Recovery and Reinvestment Act of 2009, provided funding specifically for educational technology and mobile learning programmes. However, the EETT programme is now unfunded.

The US Federal Communications Commission (FCC) focuses on telecommunications but plays an important role in education through E-rate, the commonly used name for the School and Libraries programme of the FCC's Universal Service Fund. E-rate provides 2.29 billion US dollars in funding to schools and libraries across the nation to ensure that students and teachers have access to fast and affordable internet connections and the corresponding twenty-first century tools and resources. The demand for funding, however, far exceeds the supply:

Since the program began in 1998, demand for E-rate funds has increased by 108 percent, from \$2.36 billion in 1998 to \$4.65 billion in 2011. However, despite the increase in demand, the

available funding has remained nearly the same. From 1998 to 2009, the available E-rate funds were capped at \$2.25 billion. The cap was indexed by inflation starting in 2010, resulting in \$2.27 and \$2.29 billion in available funds for 2010 and 2011, respectively. (eSchoolNews, 2011)

Mobile devices in schools rely on broadband connections to access the internet. The fact that requests for E-rate funds exceed the availability of funding by over 100% annually reflects the increasing need for connectivity in schools throughout the country.

The US government's Children's Internet Protection Act (CIPA) addresses concerns about access to offensive content over the internet on school and library computers. In early 2001, the FCC issued rules about implementing CIPA (FCC, 2001), but many district administrators remain confused or fearful about proper implementation. Because they are very concerned about violating the law, districts may prohibit or severely restrict internet access, just to be safe.

Despite the widespread use of mobile technologies in the USA and Canada, explicit mention of mobile learning typically only appears in the larger context of education technology and access. The US government has shown an increased interest in concepts related to mobile learning in two recently released plans that provide perspective and guidance on the potential role of technology and broadband internet to improve education. First, the National Educational Technology Plan (NETP) of 2010, entitled *Transforming American Education: Learning Powered by Technology*, focuses on the role of technology in ensuring that students are prepared for the twenty-first century and cites the importance of equipping students with devices that can access the internet both in and outside of school (USD OE, 2010b). States use the NETP as a guide for developing state-level technology plans, which in turn influence district plans.

Second, the National Broadband Plan, developed by the FCC in 2009, focuses heavily on education and provides both the rationale for universal access and goals to ensure that students are connected to educational opportunities and content on the internet (FCC, 2009). The FCC chairperson has signalled a desire to expand mobile broadband connectivity to provide American students with the latest digital tools and technology skills to compete in the global economy (Genachowski, 2011).

Building on the National Broadband Plan and the updated E-rate programme, the FCC awarded grants to twenty school districts through its Learning On-the-Go programme, which supports off-campus wireless internet connectivity for mobile learning devices. The FCC reports that applications to the pilot programme exceeded availability by 380%. The FCC has also begun funding School Spots, a programme that enables schools to become internet hot spots for the local community after students go home, giving students and other community members increased access to digital content, tools and resources. Both of these programmes are new; the FCC will evaluate results after the first year to direct future programmes and pilots.

The USA-based Connect-to-Compete (C2C) partnership is a joint effort by the National Cable and Telecommunications Association (NCTA), its cable providers and non-profit organizations to promote education by providing low-cost broadband service to millions of K–12 students who do not have it in their homes. This is not a publicly funded or administered programme, but households with at least one child in school who qualifies for the National School Lunch

Program (NSLP) are eligible for high-speed cable internet service for US\$9.95 per month. The cable industry estimates that approximately 10 million students in 5.5 million homes qualify for the NSLP, and they hope to reach many of these households that do not currently have broadband access. This initiative began in 2011 with Comcast's Internet Essentials programme and will be fully operational in 2012 (NCTA, 2011). The opportunity for more students to have broadband access off campus advances the potential for mobile learning.

Several USA-based organizations have issued policy statements that directly support the development and implementation of mobile learning programmes. For example, the National Association of Secondary School Principals (NASSP) recently issued a policy brief that encourages administrators to use mobile technologies for teaching and learning in schools, and to focus on teaching students how to use internet resources effectively and safely (NASSP, 2011). In 2010 former US state governors Jeb Bush (Florida) and Bob Wise (West Virginia) launched the Digital Learning Council (DLC), which brought together more than 100 education leaders to develop ten elements of high-quality digital learning, with a focus on policies needed to maximize opportunities for digital learning (Digital Learning Now, 2010). The DLC defined the ten elements and proposed actions for law-makers and policy-makers to provide all students with high-quality, customized education, including online and blended learning. The resulting report specifically identified mobile devices as access points to digital learning. Finally, the Consortium for School Networking (CoSN), a professional association for school district technology leaders in the United States, addressed a need reported by school district chief technology officers for a guidance document on acceptable use policies (AUPs) in the Web 2.0 and mobile era. CoSN produced a policy guide to help districts implement mobile learning and other technology programmes that encourage broader use of technology and digital content (CoSN, 2011*b*).

An increasingly global economy and greater demands on students worldwide have spurred efforts in the United States and Canada to raise academic expectations and increase the rigor of educational standards (CMEC, 2008; USDOE, 2010*b*). In the USA, forty-six states and the District of Columbia have agreed on a set of Common Core State Standards (CCSS) (CCSS Initiative, 2010*a*; 2010*b*). Spearheaded by the National Governors Association, Achieve Inc., the Council of Chief State School Officers, and the Alliance for Excellent Education, the CCSS initiative has created standards in mathematics and English language that define the knowledge and skills students should possess to graduate from high school prepared for college and a career. The standards include expectations for higher-level thinking and communication skills. Participating states view the standards as a challenge, and many consider the use of technology, including mobile learning, to be critical to their ability to implement the new standards successfully.

These standards offer new opportunities for digital content, courses and resources. For the first time in the history of the United States, the majority of states are implementing the same standards in major content areas. In the past, content developers, publishers and open educational resource (OER) providers had to cater to up to fifty different sets of standards in the USA alone, creating different versions of textbooks or digital content to align with each state's unique standards. This process is both challenging and costly, and limits the ability of states and districts to take advantage of common content and economies of scale. With the CCSS, content and curriculum developers can focus on a common set of standards and expectations, making innovative approaches that maximize digital and mobile technologies more viable. For example, if one state or publisher develops online learning modules that

support the CCSS, other states can also use these resources. While state standards, and the high-stakes testing associated with them, are usually seen as a barrier to innovation, the CCSS actually increase opportunities for mobile learning by streamlining the curriculum development process and encouraging collaboration and resource sharing among educators in different states. The standards themselves also invite innovation in mobile learning by directly addressing the importance of technology skills and digital literacy in preparing students for college and careers (CCSS Initiative, 2010a).

STATE AND PROVINCIAL POLICIES

US states and Canadian provinces hold the primary responsibility for education in their countries. While state and provincial education leaders are aware of some mobile learning efforts in their districts and schools, very few reported specific programmes or funding to support mobile learning. In the UNESCO survey, respondents overwhelmingly indicated that their state's or province's level of engagement with mobile technologies and mobile learning was 'low'. Most respondents noted that there is some activity in this area, but it is in the early stages of development for use in K–12 and postsecondary institutions.

In the United States, only Illinois and New Hampshire have implemented state-level initiatives that focus on mobile learning. Illinois implemented a low-cost laptop initiative to encourage the development of mobile learning programmes to support high-need districts and students. From 2009 to 2010, New Hampshire's Technology Leader Cohort (TLC) Program, funded in part by the federal EETT programme, supplied online professional development for teachers and offered grants to districts and schools to purchase iPod touch devices to aid in the development of mobile learning programmes.

Twelve other states and provinces reported efforts to support mobile learning. In Canada, the province of Alberta is developing and funding a guide to help policy-makers and district and school leaders plan, develop and implement policies for mobile learning initiatives in which students bring their own devices to school. To address a growing interest in mobile learning, Alberta is also working on a guide to provide research and recommendations on the meaningful use of mobile technologies in schools. The province of Ontario legislated the use of assistive technology for students with identified special needs. The legislation indicated that mobile devices can assist students with special needs by providing features such as text enlargement, text-to-speech synthesis, voice dictation and tools to organize information visually. In the USA, the State of Washington provides model policies and programmes related to mobile learning, and New York offers professional development on the use of mobile devices for teachers through the New York State Association for Computers and Technologies in Education (NYSCATE), a professional association for educators. Topics covered include the use of mobile devices for special education, assessment and school leadership, with a particular focus on iPads and similar tablet devices.

Six US states (Arkansas, Kansas, Nevada, New Hampshire, New York and Ohio) reported having used funds from the federal EETT programme to encourage or support mobile learning; however, this programme has been eliminated in the current federal budget. Eleven states and provinces reference mobile technologies in their educational technology plans or similar

documents. The inclusion of mobile technologies in plans spanning several years into the future demonstrates an increased interest in mobile learning at the state level. Additionally, nineteen US states and one Canadian province, Alberta, have designed iTunes University (iTunes U) sites to provide resources to teachers and students. The sites include video and multimedia resources that can be accessed via mobile technologies. iTunes U sites provide digital content and professional development to support teaching and learning, and many of the resources can be downloaded free of charge.

In the survey distributed for this paper, states and provinces were asked why they are considering mobile learning. A primary reason, especially for Canadian provinces, is to ensure that students are prepared for the twenty-first century global economy. For example, the respondent from Alberta wrote, 'We have a strong trend toward using personal devices in schools. Part of this trend is due to a new curriculum that focuses on digital fluency and also a new focus on providing inclusive learning environments for each student. Our province wants to provide a contemporary education that meets the needs of each and every student.' Other reasons include the potential for increased learning opportunities, the versatility of the devices, and lower initial costs compared with other mobile devices such as laptops and netbooks. Respondents from states and provinces also commented on mobile learning with laptops, netbooks and tablets; however, these devices are not addressed explicitly in this paper.

States and provinces have a role in setting guidelines and policies and issuing recommendations related to education. None of those contacted in the survey identified current policies or strategies for mobile learning. According to the survey responses, local control is by far the biggest reason why states and provinces do not create policies and strategies for the use of mobile technologies. Financial considerations are another key factor, as states and provinces are often reluctant to encourage districts to incur the costs of devices, data plans and broadband access in an era of limited budgets. Finally, some respondents cited the dearth of high-quality professional development models as a barrier to developing mobile learning policies. Sharon Robinson of the American Association of Colleges for Teacher Education said that most pre-service and in-service training for teachers does not yet adequately address mobile learning and the use of mobile devices with students (personal communication, 10 November 2011). This situation highlights the importance of establishing exemplary professional development programmes as a prerequisite to mobile learning.

Two Canadian provinces, Alberta and Manitoba, are in the process of creating policies to support mobile learning. Alberta is developing a guide on the meaningful use of mobile technologies in schools. Manitoba's Literacy with ICT Across the Curriculum initiative mandates that teachers develop their students' ability to think critically, creatively and ethically with information and communications technology (ICT), including mobile devices. Eight US states are also preparing to move forward with explicit policies or strategies on mobile learning. Additionally, several states have policies related to internet filtering and cyber-bullying (CoSN, 2011*b*). Appendix D lists state and provincial policy documents that relate to technology and mobile learning.

LOCAL POLICIES

Due to the emphasis on local control of education in most states and provinces, local policies play a significant role in mobile learning initiatives. District acceptable use policies (AUPs) in particular have a profound impact on mobile learning. They can completely prohibit the use of mobile technologies, including mobile phones and mobile devices, or they can open doors to mobile learning with flexible approaches such as bring-your-own-technology (BYOT) programmes, which encourage students to use their own devices at school. Districts often find themselves in a difficult position as they try to ensure that students are safe online while also enabling them to access resources and content that can enhance their learning (CoSN, 2011*b*). In many cases, local policies are based on fears about worst-case scenarios. Critics of mobile learning cite concerns about student safety, distractions, inappropriate behaviour and cheating. For example, New York City Mayor Michael Bloomberg has imposed a citywide ban on mobile phones in school. A spokesperson for Bloomberg said the mayor believes that 'mobile devices are major distractions that prevent all the other students in the classroom from learning' (Monahan and Chapman, 2011). Many school boards across the country are reluctant to allow mobile technology on their campuses. In fact, often the most difficult part of integrating mobile learning into schools is overcoming restrictive policies that prohibit mobile phone use on campus (Kolb, 2011).

Advocates say the benefits of mobile learning far outweigh the potential drawbacks (Shuler, 2009). Some schools and districts are beginning to acknowledge the benefits afforded by mobile technology and are modifying their AUPs to accommodate the use of mobile devices on their campuses. In most cases, this requires lifting mobile phone bans in class or on school grounds. Even without a revised AUP, teachers may be able to obtain an exemption from an administrator or create a permission slip for class-related mobile phone use that includes an explanation of the benefits and expectations, as well as the consequences for misuse (Kolb, 2011). Other policy changes reflect a philosophical shift, with the responsibility moving toward the student and away from the school or district administrators who have historically been responsible for monitoring AUP compliance. This approach focuses on helping students learn how to safely and appropriately access content and interact online, rather than relying on filters to block potentially inappropriate material. Considering that many students have online access at home, this focus on digital literacy offers the advantage of ensuring that students understand how to stay safe and act responsibly online (CoSN, 2011*b*). The LARK framework (legal, appropriate, responsible and kind) adopted by some districts reflects this shift in responsibility and provides a model for other districts and schools (Livingston, 2006).

MOBILE LEARNING INITIATIVES

Although still in their infancy, mobile learning initiatives are emerging in schools and districts in the United States and Canada. Almost all survey respondents as well as the experts interviewed for this paper described specific examples of mobile learning programmes in their state or province. The majority of mobile learning initiatives discussed in this section have been implemented in the United States; Canada has a number of disparate programmes, but given the space considerations of this review, these will be treated in less detail.

There are a limited number of in-depth case studies and little guidance on how to develop a successful mobile learning programme with smartphones and other Wi-Fi-enabled mobile devices (Ally and Palalas, in press). That said, a review of mobile learning initiatives across North America reveals three broad approaches to programme design and implementation:

- School-provided device initiatives
- Bring-your-own-technology initiatives
- Shared-expense plans for devices and broadband access

The following sections provide examples and discuss the advantages and drawbacks of each approach. No one strategy is necessarily the best; districts select an approach based on their specific educational goals, resources, infrastructure and political environment.

SCHOOL-PROVIDED DEVICE INITIATIVES

Many schools, districts and universities provide mobile devices for all students, to ensure that students have similar devices and consistent access to mobile learning opportunities. In the United States, two programmes offer grants for mobile learning with devices provided to students. The first, Qualcomm's Wireless Reach initiative, created in 2006, is one of the longest-running mobile learning initiatives. The second is the FCC's Learning On-the-Go pilot programme, launched in 2010 as an upgrade to E-rate. Both programmes provide external funding and programme parameters to encourage and support district mobile learning initiatives.

The Wireless Reach initiative, which focuses on bringing third-generation (3G) wireless technology to underserved communities around the world, collaborates with local and global partners to develop and fund projects in education, entrepreneurship, environmental management, health care and public safety. The initiative's education projects aim to increase student access to educationally relevant content and enable communication with teachers and peers through online tools and resources for 24/7 learning. North Carolina's Project K-Nect has been a part of the Wireless Reach initiative since the 2007–08 school year. The project provides smartphones to at-risk students with low end-of-grade (EOG) math test scores and no internet access at home, as a way of increasing their engagement and math

achievement. With the smartphones, students have round-the-clock access to content specifically aligned with the school's Algebra I lesson plans, and they are encouraged to collaborate with other students through texting and talking on the phone. EOG test scores have increased by 30% compared with the scores of similar students who did not receive mobile phones, and some students who were initially at risk for not completing Algebra I are now enrolling in advanced math, including pre-calculus (Project Tomorrow, 2010a). In interviews the students said the ability to connect with other students and teachers at any time is the strongest benefit of the smartphones and makes the difference in completing homework and being prepared for class. Previously, these students might not have had access to homework help at home; the phones provide a support network when a student has a question or is confused. In 2011, the FCC provided US\$2.5 million to extend the programme to all Algebra I students, and the Project K-Nect initiative has expanded to other states, including Ohio and Virginia, indicating that it has the potential for replication in other school districts.

The FCC's Learning On-the-Go pilot programme provides support for wireless technologies to twenty districts in fourteen states (FCC, 2011). The programme supplies funds for districts to purchase a range of devices, including laptops, tablets, smartphones, netbooks and wireless cards. The majority of 2011–12 grants were awarded to laptop and netbook programmes, but several hand-held device (e.g. smartphone) programmes were funded as well. Grant recipients included elementary, middle and high schools, the majority of which operate in traditional brick-and-mortar settings. Katy Independent School District (ISD) in Texas received funding to develop a programme in which students in Grade 5 and their teachers will have smartphones, and teachers will use a learning management system to create and manage assignments (FCC, 2011). The Greater Southern Tier Board of Cooperative Educational Services – an educational service agency that supports twenty-one districts in New York – received a grant to provide 'middle and high school students with ubiquitous access to online learning devices (such as smartphones and netbooks) utilizing a virtual classroom software program' (FCC, 2011). The investment of federal funds into the Learning On-the-Go programme signals a new US-government interest in mobile learning.

ADVANTAGES

There are several advantages to mobile learning initiatives based on school-provided devices. Most importantly, programmes that supply devices to students have shown the most evidence of increased student achievement, though this may simply be due to the fact that these programmes are accountable to their funders and are consequently tracking student progress and compiling data more carefully than other programmes. Providing students with devices also increases educational equity, especially in comparison to BYOT programmes. In addition, homogeneity of devices within a school or district facilitates their integration into instruction and makes it easier for districts to filter content and control access. Finally, the financial investment in devices signals a strong commitment from the district, which may lead to better and more sustained efforts to plan, implement and maintain the programmes.

Districts that supply devices are beginning to see a connection between increased access and increased student achievement. Saddleback Valley Unified School District in California has a mobile learning programme that provides students with devices at the elementary-school level, as well as ongoing, job-embedded professional development for teachers. The district

plans to track individual students for two years before the devices are in use and then for two years while the students have access to them. Initial results show that achievement is higher among students who are using mobile devices for educational purposes than among similar students without mobile devices. Robert Craven, coordinator of education technology for the district, says they are encouraged and excited by the changes they are seeing in the achievement of participating students, many of whom were struggling or not making sufficient progress before the programme was implemented (personal communication, 2 November 2011).

Similarly, in Project K-Nect, a Wireless Reach project in North Carolina, students at a participating high school increased their proficiency rates by 30% on the state's End of Course exam, compared with classes not in Project K-Nect but taught by the same teacher (Project Tomorrow, 2010a). Project Tomorrow reported that, based on the 2010 programme evaluation and data from the 2009 Speak Up survey, Project K-Nect students are 'more likely to be very interested in a job or career in science, technology, math or engineering' than high school students nationally (32% versus 19%), and almost two-thirds of the students reported taking additional math courses (Project Tomorrow, 2010a).

Equity must be a fundamental component of any education initiative. A key advantage to the school-provided device approach is that it provides access to similar devices and internet services for all students, regardless of demographics or income. Several programmes, including Project K-Nect, directly target high-need and low-income students by expanding their access to mobile devices and the internet beyond the school day (Project Tomorrow, 2010a). The outcomes in math achievement described above demonstrate the positive impact of increasing student access to educational opportunities through mobile learning.

Another potential benefit of providing mobile devices to all students is that integration into instruction may be easier because everyone is using the same kind of device or platform. Professional development specific to unique operating systems, applications and digital content can be streamlined, and management and maintenance of devices are more feasible for teachers and school technology professionals (R. Kaestner, personal communication, 26 September 2011). For example, Canby School District in Oregon purchased iPod touch devices and iPads for more than 2,400 students beginning in the 2011–12 school year. The district has found that the continuity provided by using the same platform makes it easier to manage the devices. The versatility of the devices also allows the district to use them for multiple purposes. Students use the devices primarily as response systems through Google Forms. However, unlike other student response devices designed solely for classroom use, iPod touch and iPad devices have many other features that can be used to aid learning, such as voice recording, movie production software, word processing, spreadsheets, a dictionary and thesaurus, and a calculator (J. Morelock, personal communication, 26 October 2011).

Along these same lines, providing students with the same or similar devices allows the district more control over content and access. Districts are able to exercise this control through school internet gateway filters and the ability to adapt settings by grade level (R. Kaestner, personal communication, 26 September 2011). Joe Morelock, director of technology and innovation for the Canby School District in Oregon, said there is great value in having the flexibility to modify filters. For example, access to content with the word *breast* could be turned off in the lower grades, where it might be deemed inappropriate, but then turned back on for high-school students, who might need to search for content related to breast cancer

research. In another example, Morelock said the district sometimes blocks YouTube in the lower grades (personal communication, 26 October 2011). The ability to limit student access to the internet from the school network through filtering and content selection has the potential to reduce risks associated with unknown or dangerous sites. School-wide filters are more effective when all students are using the same devices and software.

Finally, when a district purchases mobile devices for students, it signals ownership and leadership, which have been identified as essential conditions for school reform efforts and specifically for technology initiatives. The commitment required for the purchase of mobile devices will ideally be part of the district's broader technology planning and improvement efforts, and the fact that the district has to justify the purchase in the budget process may encourage thoughtful planning and support.

DRAWBACKS

Although providing devices for students has many benefits, this approach can also have negative implications for districts and schools. First and foremost, the costs associated with purchasing a device (and possibly a related data plan) for each student, and the accompanying maintenance costs, might be too high for some schools and districts, especially in light of other expenses and economic pressures. Secondly, students may find it burdensome to switch between two different devices, if they already own a mobile device, or to leave their device at school for the summer, which may affect student buy-in. Lastly, providing students with district-owned devices introduces the risk of students losing or stealing the devices, which can be costly for the district to replace and time-consuming from a disciplinary perspective.

While the lower costs of mobile devices may make purchasing one for each student more feasible than a 1:1 laptop programme, the associated costs for maintenance, data plans and broadband services are significant (Wallace, 2011). It is probably not a coincidence that two of the major mobile learning initiatives described in this section are the result of significant investments by the United States government and a private corporation. At a time when budgets are generally decreasing, districts are unlikely to have the funds necessary to invest in mobile devices for all students. Another downside is the burden on the school district to maintain and eventually replace the mobile devices. New technologies and frequent releases of new versions of hardware and software put tremendous financial pressure on districts when they own the devices. Districts also have to maintain adequate broadband access for mobile technologies, and the majority of districts in the USA and Canada are already struggling to keep up with demands on their infrastructure and broadband – currently, very few school districts in the USA have the broadband necessary for video streaming and other resources that require high bandwidth, which clearly limits the potential for mobile learning (SETDA, 2008). However, for districts striving for a 1:1 learning environment, programmes using smartphones or similar mobile devices may cost less than laptop programmes. Districts such as Katy ISD and Rockdale ISD in Texas have documented savings from a mobile device pilot programme compared with a 1:1 laptop programme. Katy ISD used CoSN's Value of Investment (VOI) methodology to conduct a cost-benefit analysis of the district's smartphone pilot programme and concluded that the district saved money overall when it implemented the mobile device programme compared with a typical laptop programme. The mobile learning programme required a monthly carrier data plan, whereas a laptop initiative would

not have this expense. However, initial device costs for the pilot programme were dramatically less than for the laptop programme, and ongoing information technology (IT) support costs were lower, although teachers spent more time on casual learning and supporting students (L. Schad, personal communication, 26 October 2011).

Student buy-in is also an important factor in the success of any mobile learning programme. Students who already own a mobile device might find it cumbersome to carry two different mobile devices, one for personal use and one for school, which might operate on different platforms. Students will likely learn how to use the different devices quickly and thereby acquire additional skills, but the use of multiple devices may also result in a less thorough understanding of each device. Also, when the district owns the device, students must leave their mobile devices at school during the summer months. Removing students' access to the devices for a significant portion of each year limits their opportunities for expanded education and undermines the school or district's message about the importance of 24/7 learning.

Finally, the responsibility for replacement of lost or stolen devices can be problematic as well. At Katy ISD in Texas, where the district provided mobile devices in the first years of the pilot programme, students reported more 'stolen' devices during the last month of school (L. Schad, personal communication, 26 October 2011). The district assumed that students were keeping the devices and reporting them as stolen. In an effort to solve this problem, the district did not permit students to take the devices home during the last month of school. In addition, when a device was reported as stolen, it was not replaced; instead, students were given low-tech alternatives to complete their work. These measures reduced the number of devices reported stolen. Districts need to consider these kinds of issues when they are developing mobile learning programmes.

One solution to some of these drawbacks is for schools to provide class sets of mobile devices that can be checked out by a teacher, typically for use within one school day. This approach leads to lower costs by reducing the number of devices needed and allows more students to benefit from a limited number of devices. At Jamestown Elementary School in Arlington County, Virginia, sets of iPod touch devices, Nintendo DS consoles, laptops and tablets provide teachers with various options for implementing instructional strategies. Some teachers use a range of devices in one class setting by developing different centres or activities that cater to the needs of individual students. Others opt to use the devices for project-based learning and collaboration among students. The benefit to this approach is that teachers have the flexibility to use different kinds of mobile technologies, depending on grade level and content area. However, students do not have 24/7 access to the devices, so they have restricted opportunities compared with a mobile learning programme in which students have access throughout the school day and are allowed to take the devices home.

BRING-YOUR-OWN-TECHNOLOGY INITIATIVES

Because more and more students in North America have their own mobile devices, BYOT programmes and policies are an emerging trend in the United States and Canada (Quillen, 2011). This approach goes against the very traditional way most schools and districts in North America have viewed mobile phones. The idea of inviting students to bring their own devices

to school frequently evokes anxiety, especially among teachers who see mobile phones primarily as a source of disruption in the classroom. However, many of those who have implemented this model cite the positive effect on student engagement and learning, although they acknowledge that – as with any instructional strategy, tool or resource – the use of mobile technology must be carefully planned and implemented to maximize learning (Project Tomorrow, 2010b). The following examples illustrate how two different institutions – a college in Canada and a K–12 school district in the USA – approached BYOT initiatives.

At Algonquin College in Canada, 80% of students have their own mobile device. The college is taking advantage of the mobile devices students already use in their daily lives to extend learning opportunities and expand learning time (Ally and Palalas, in press). Algonquin recently opened the Mobile Learning Centre, which provides a space for students to engage in mobile learning and collaborate with peers using mobile technologies (Algonquin College, 2011). To ensure equity, the Centre allows students to borrow devices if they do not have their own. Since the majority of college students have mobile phones and many colleges and universities require students to have laptops, postsecondary education is probably the most natural fit for the BYOT approach (Ally and Palalas, in press; Corbeil and Valdes-Corbeil, 2007).

For K–12 education, BYOT programmes, perhaps more than any other type of mobile learning initiative, require tremendous shifts in policies and practices. Schools and districts considering BYOT should have a clear plan for how they will implement the programme, change policies to create a supportive context, develop new instructional practices and resources, address potential equity issues, and measure results (Johnson et al., 2011; Quillen, 2011). Bailey Mitchell of the Forsyth County School District in Georgia explained how the district developed a thorough plan for a pilot programme that directly addressed questions about broadband access, prompted revisions to the AUP, helped win support from teachers and school leaders, and tailored professional development programmes to account for the incorporation of mobile technologies. The district elicited assistance from the curriculum, instruction and assessment departments to implement the programme, which started with a small number of schools before expanding to twenty schools. The programme provides teachers with job-embedded professional development and instructional support from the library media specialist in each school. District teachers are now designing instruction that includes increased collaboration among peers, often with an online component, and are using new kinds of instructional tools and resources, including simulations and digital content. Forsyth County’s approach emphasizes that simply including student-owned devices in the learning process is not sufficient to achieve positive results; districts and schools must employ a systemic approach that appreciably changes teaching and learning (personal communication, 4 November 2011).

ADVANTAGES

The greatest advantage to the BYOT approach is low-cost, high-speed implementation. BYOT efforts can accelerate a school district’s or university’s movement to a 1:1 or mobile learning environment by taking advantage of the technologies that students already have and allowing schools to quickly focus on instructional strategies and professional development rather than on the selection and purchase of devices. In many cases, this approach also alleviates the cost of ongoing maintenance and data plans, because most parents have already purchased such

plans for their children. Additionally, BYOT lessens the burden of providing technical support, because students typically know how to use their own mobile devices. With reduced responsibility to troubleshoot or repair devices, the school has more funds available for other purchases such as increased broadband, digital content and professional development for teachers.

There is also some evidence that parent buy-in for BYOT already exists. Parents watching their children using mobile devices adeptly at home often see the potential for using them in school. In a recent survey, more than 60% of parents said they would purchase a mobile device for school use if the school allowed it (Project Tomorrow, 2011).

DRAWBACKS

Equity is the biggest concern with any BYOT programme. National data indicate that in the United States, 75% of teens have mobile phones, including 78% of white, non-Hispanic students; 75% of black, non-Hispanic students; and 68% of Hispanic, English-speaking students (Madden, 2011). Though the disparity in mobile phone ownership can vary widely from school to school, nearly all districts will need to directly address potential inequities when considering a BYOT approach. The districts interviewed for this paper shared some solutions to the equity issue, including using district devices to supplement those that students bring to class. A district or school could provide devices for students who do not have them, as Algonquin College has done through its Mobile Learning Centre, which permits students to borrow devices. However, students may be self-conscious about not owning their own device. Eric Sheninger, principal of New Milford High School in Bergen County, New Jersey, says that confidentially addressing the needs of students who do not have a device must be part of planning and implementation for any BYOT programme (Sheninger, 2012).

BYOT programmes also place high demands on district broadband connections and infrastructure (SETDA, 2008). While districts that implement BYOT programmes will save on devices, the broadband requirements will be very similar to those of districts that purchase devices for students. Careful planning is required to ensure that infrastructure and broadband access are in place and resources are available to maintain them.

Bailey Mitchell, chief technology and information officer for the Forsyth County School District in Georgia, noted that while BYOT programmes greatly expand the range of devices and technology available to a school, they also pose a steeper learning curve than school-provided device programmes. The district has realized that for a BYOT programme to be effective, both teachers and students need to learn more about the various devices in use, and students need to learn how to use their personal devices for educational purposes (B. Mitchell, personal communication, 4 November 2011).

SHARED-EXPENSE PLANS FOR MOBILE DEVICES AND BROADBAND ACCESS

Some districts, schools and universities use a combined approach to mobile learning in which they fund part of the cost of the device and the required access plan, while students or their parents are responsible for the remainder. In most cases, those who cannot afford to contribute can obtain support for their share. Because younger children are less likely to have their own mobile devices, the BYOT approach may be less feasible in the lower grades. Some districts, like Saddleback Valley Unified School District in California, have found that they can purchase devices for students in elementary school and then implement a BYOT approach in middle and high school (R. Craven, personal communication, 2 November 2011). Some programmes in the USA provide access at home for students who do not have it, and some companies are beginning to offer shared plans, in which parents and districts split the costs, or reduced rates for students who have a district device. The new C2C programme offers discounted rates for broadband access to lower-income families. Programmes like these can help minimize the costs of BYOT or shared-expense approaches to mobile learning.

PERCEIVED BARRIERS TO MOBILE LEARNING

Perhaps the biggest barrier to mobile learning is not the cost or time required to plan and implement the programmes in schools, but the way people feel about mobile phones in education. Many policy-makers, parents and educators worry about the possible negative effects of using mobile devices in schools. Their concerns include doubts about the usefulness of a device with a small screen for learning; the potential for distraction caused by the devices; problem behaviour such as cheating, cyber-bullying and ‘sexting’; and student safety online. Because these fears often form the foundation of restrictive use policies that preclude the possibility of mobile learning, it is important to carefully consider the objections to mobile devices in schools as well as potential strategies for addressing them. The following sections discuss each of these concerns in turn.

SMALL SCREENS

Many educators and policy-makers are concerned about the efficacy of the small screen on mobile devices compared with larger laptop screens (Corbeil and Valdes-Corbeil, 2007). Some researchers, however, believe that an increasing number of students are accustomed to small screens and may actually prefer them to a larger screen on a less portable device (Corbeil and Valdes-Corbeil, 2007; Project Tomorrow, 2010*b*; Wallace, 2011). The portability of mobile technologies allows students to access resources and collaborative tools almost seamlessly as they go about their personal and educational activities (Corbeil and Valdes-Corbeil, 2007; Park, 2011; Wallace, 2011). For example, Abilene Christian University in Texas provides both iPhones and iPod touch devices for students. Researchers found that the iPhones the university provided are used more frequently than iPod touches, because students and teachers always have their phones with them. Bill Rankin, director of educational innovation at the university, said that whenever students have a question, want to collaborate, or need to find a picture or example of something they are studying, they typically use a smartphone to facilitate the process (personal communication, 9 November 2011). However, educators must weigh the benefits of portability against those of a full-sized laptop screen or keyboard, and ensure that software and other programs are adaptable to a small screen (Wallace, 2011). Also, while mobile learning may open doors for more portable assistive technologies, such as text-to-speech and voice dictation, some people worry about the accessibility of smaller devices for students with disabilities.

DISTRACTIONS

The ‘distraction factor’ is the primary concern that has led many districts to ban mobile devices from school altogether (CoSN, 2009; Wallace 2011). Many people worry that

allowing students to use mobile devices in school would disrupt rather than enhance learning. Administrators considering mobile learning have expressed concerns about social networking in particular. Although over 75% of district administrators have a positive view of the potential uses of social networking in education, most also rated time-wasting and distraction as a moderate or severe concerns related to social networking (CoSN, 2009). While mobile technologies do have the potential to be a distraction for students, many educators have found that students are actually more engaged when using mobile devices for learning. In *Cell Phones in the Classroom: A Practical Guide for Educators*, Liz Kolb explains:

Most of [the] teachers told me that they did not have any discipline problems when using the students' cell phones. Indeed, many of the teachers claimed that using cell phones for learning actually cut down on discipline problems in school related to cell phone use. Many teachers mentioned that their discipline problems around cell phones decreased once they began setting up rules and cell phone safety guidelines and using the phones for learning, rather than spending time taking them away and policing their use. (Kolb, 2011)

The Mooresville Graded School District in North Carolina reported a 64% reduction in disciplinary suspensions since the implementation of Digital Conversion, a 1:1 laptop programme; they also noted a 21% composite gain on state end-of-course tests during the same period (Mooresville Graded School District, 2011). In an efficacy study, Rockdale ISD in Texas found that students in the mobile learning programme were more engaged and discipline referrals related to policing student mobile phone use had decreased (L. Schad, personal communication, 26 October 2011).

PROBLEM BEHAVIOUR AND STUDENT SAFETY

Schools and districts are acutely conscious of the risk of exposing students to dangerous situations and people in online environments. Inappropriate student behaviour, including cheating, cyber-bullying and 'sexting' – sending sexually explicit messages or photographs via text message – is a major concern for administrators, teachers and parents. According to recent studies:

- One-third of teens with mobile phones have admitted to cheating with them, and two-thirds of all teens have reported that others in their school cheat with mobile phones (Common Sense Media, 2009).
- Twenty-six per cent of teens have reported receiving bullying or harassing text messages or phone calls (Lenhart et al., 2010).
- Four per cent of teens have reported sending a sexually suggestive image via text message, and fifteen per cent have reported receiving a text of that nature (Lenhart et al., 2010).

In spite of these statistics, fewer than half of district administrators reported moderate or severe concerns about cheating, cyber-bullying and sexting (CoSN, 2009). While cyber-bullying is a serious concern for educators and parents, the district should address this issue as part of its overall approach to bullying, whether online or face-to-face. Several districts are responding to these kinds of concerns by moving toward responsible use policies to ensure

students have the knowledge and skills to behave responsibly and stay safe online. Many education leaders, recognizing that students are highly likely to access the internet outside of school, believe that students need to be explicitly taught how to safely interact with people and access resources on the internet, rather than just learn to work within the filters at school.

LIABILITY

School districts often see the potential liability associated with student safety online as a barrier to mobile learning. Legal liability and concern for student safety have led to extremely restrictive policies prohibiting mobile devices in many US and Canadian districts and schools. For example, almost every school district in the USA has a filtering system, and more than 55% of district policies are more restrictive than the federally mandated CIPA regulations (CoSN, 2009). Mobile learning can expand concerns about liability, especially if students use district-purchased devices outside of school or use their own devices on the school network. The National Association of State Boards of Education (NASBE), representing the fifty state school boards in the USA, has expressed a growing interest in technology and mobile learning and their impact on state policy (B. Hull, personal communication, 25 October 2011). While NASBE places primary importance on student safety online, the association's effort to consider mobile learning indicates a desire to develop solutions and guidance to address the potential risks. Districts that are moving forward with mobile learning programmes often see them as an opportunity to ensure that students understand how to interact with the internet in a safe and responsible way.

MOVING BEYOND BARRIERS

While acknowledging the perceived barriers to mobile learning, education leaders are also beginning to consider the potential benefits. States and provinces consistently report the need to ensure that students are prepared for the twenty-first century global economy, and this cannot be accomplished without access to technology, which mobile learning can help facilitate. In both the United States and Canada, raising standards to incorporate skills such as collaboration, communication, higher level thinking and digital literacy often leads to the consideration of mobile learning in education programmes. This phenomenon is apparent in the CCSS in the USA and in provincial curriculum efforts in Alberta and British Columbia. Because mobile learning has the potential to increase access to educational opportunities, districts see mobile devices as a possible tool for meeting the needs of all students. Thoughtful planning and implementation of mobile learning are essential to eliminate the perceived barriers and ensure positive outcomes for students. Larry Johnson, CEO of the New Media Consortium, wrote:

In the coming months, the vast potential of these devices for learning will begin to outweigh concerns about misuse that currently dominate most conversations about their use in school settings. It is the sheer power of these devices that makes them interesting, and that power lies in their ubiquity, their portability, the wide range of things that can be done with them, and their ability to access the internet nearly anywhere through the growing cellular network. (Johnson et al., 2011, p. 16)

This trend could lead many districts to revise their AUPs to encourage responsible use rather than simply filtering and blocking content (CoSN, 2011*b*), and to shift the focus of such policies to promoting digital citizenship and literacy for students (Common Sense Media, 2010).

ESSENTIAL CONDITIONS FOR MOBILE LEARNING

Mobile learning programmes are often part of larger school reform efforts. The growing body of data on school improvement efforts, including technology and digital learning programmes, provides an important basis for identifying essential conditions for successful mobile learning programmes. Empirical research (e.g. Friday Institute for Educational Innovation, 2008; Greaves et al., 2010; ISTE, 2007), interviews with experts (Appendix A), and an analysis of major mobile learning initiatives throughout the United States and Canada suggest five conditions that are essential for the success of an initiative:

1. Visionary leadership and commitment
2. Robust technology capacity
3. Professional development
4. Scalability
5. Policies that promote and support the initiative

VISIONARY LEADERSHIP AND COMMITMENT

Leadership and vision are central to the development of school reform efforts and mobile learning initiatives. Pioneering schools and districts with robust mobile learning programmes often have strong, visionary leaders who promote and oversee the projects (Ally and Palalas, in press; Greaves et al., 2010; Project Tomorrow, 2010b). While many national, state and provincial, and local policies have encouraged mobile learning, efforts to implement mobile learning programmes are typically spearheaded by a school leader – often a principal, technology coordinator, district superintendent or university faculty member. The project leader must cultivate a unified vision across the school or district, drawing in leaders from the curriculum and instruction, assessment, and technology departments. According to Lenny Schad, chief information officer for Katy ISD, it is critical that everyone involved in implementing the programme has a clear understanding of the goals, intended outcomes, and expected benefits and risks (personal communication, 26 October 2011). A mobile learning initiative should not be promoted as a technology initiative; rather, in order to win the broad support necessary for successful implementation, it should be positioned as an education initiative tied to clearly identifiable curricular goals. The education technology department must work closely with the curriculum and instruction department to ensure that their efforts and objectives are aligned. Part of the implementation must include adequate IT support, broadband access and teacher training.

ROBUST TECHNOLOGY CAPACITY

A successful mobile learning initiative requires a thorough analysis of the capacity of the existing technological infrastructure, with careful consideration and planning for the demands of the new programme, including broadband access, hardware and software, and technical support. This analysis should include projections of demand and a review of recommendations for broadband requirements based on the number of users and bandwidth needs. Ideally, wireless connectivity should be available throughout a school campus to maximize the potential of mobile learning. The increase in usage will require additional data storage, possibly off-site. Security and privacy must also be considered. Internet filters will need to comply with the district's AUP as well as CIPA requirements in the United States. US institutions also must adhere to the Children's Online Privacy Protection Act (COPPA), which regulates the online collection of personal data from children younger than 13 years of age.

PROFESSIONAL DEVELOPMENT

Many teachers will need training to successfully incorporate mobile learning into their pedagogical repertoire. Sharon Robinson, president and CEO of the American Association of Colleges for Teacher Education, said that most colleges and universities in the United States and Canada do not train teachers to integrate mobile learning into their instruction, and teachers have not typically had professional development opportunities specific to mobile learning (personal communication, 10 November 2011). First and foremost, teachers must have a basic understanding of the devices and their features. More importantly, though, they must learn how to use mobile technologies to change teaching and learning, so that they are doing more than just replacing print resources with digital versions. A common pitfall in incorporating new technology into education is over-reliance on the technology itself to produce results. Marie Bjerede and Chris Dede, for instance, found that podcasting in and of itself had little effect on teaching and learning. When played in the classroom, podcasts are just high-tech versions of age-old instructional practices of 'teaching by telling, learning by listening', previously accomplished with educational radio and portable tape recorders (Bjerede and Dede, 2011).

Researchers and education leaders say that improvements in student outcomes are more likely to occur if mobile learning initiatives lead to fundamental changes in instructional strategies. For example, in Saddleback Valley Unified School District in California, teachers participated in extensive professional development, including guidance on developing digital content and resources. Rather than trying to fit the new devices into the same instructional strategies, educators should be thinking critically about how they will deliver instruction differently using the opportunities afforded by mobile technologies. Professional development is key to helping teachers make the paradigm shift necessary to effectively integrate mobile devices into instruction.

Some educators stress the importance and potential of professional development that is available on demand and provides an individualized response to a teacher's immediate needs (Barbour, 2010). To fill gaps in professional development on mobile learning, some teachers

have created or joined communities of practice or professional learning communities (PLCs). Teachers in PLCs meet regularly, either in person or online, to exchange ideas, share successes and discuss challenges they may be facing in the classroom. Within this collaborative structure, teachers can examine and improve their professional practice at a more flexible pace and with more opportunities for individualized support than is typically offered by traditional professional development programmes (Annenberg Institute for School Reform, 2004).

SCALABILITY

Nearly every project leader of the mobile learning initiatives included in this review strongly encouraged a ‘start small, think big’ mentality. Because mobile learning is still an emerging field, any new mobile learning programme will likely encounter setbacks, and small-scale implementation can decrease risk and hasten recovery. For example, the pilot programme at Canby School District in Oregon began with a few classrooms and then expanded on the basis of those experiences. Saddleback Valley Unified School District, Rockdale ISD and Katy ISD all built on the success of their pilot programmes, often by increasing the number of students provided with mobile devices or adding a BYOT component in the upper grades. Kyle Menchhofer, technology coordinator of St. Mary’s School in Ohio, said the school started its pilot programme with five fifth-grade classrooms. In the second year, twenty-nine teachers joined the project, with 630 mobile learning devices deployed in Grades 3 through 6. In the fourth year, because of the programme’s great success, St. Mary’s implemented a BYOT pilot programme in Grades 6 through 12 (K. Menchhofer, personal communication, 4 October 2011). Although initial implementation might be small in scale, technology capacity should be addressed at the outset in preparation for large-scale implementation at a later date.

POLICIES THAT PROMOTE AND SUPPORT THE INITIATIVE

To support their mobile learning initiatives, many of the schools and districts surveyed for this paper eliminated policies that prohibited students from bringing mobile technologies to school and changed the wording in rules and guidance documents from ‘acceptable use’ to ‘responsible use’ (L. Schad, personal communication, 26 October 2011). The latter change reflects a shift in the institutional mindset: rather than simply policing mobile phone use, schools are moving toward making students responsible for their behaviour with regard to mobile technology. Successful implementation of a mobile learning initiative requires a thorough review of the school or district AUP to ensure that it reflects an updated philosophical perspective on the use of mobile devices on campus. The AUP should not be too restrictive with regard to the specific kinds of technology allowed, and the language should be more inclusive than exclusive. A number of organizations are working to help schools update their rules and policies to make room for flexible mobile learning programmes and to better account for new and rapidly changing educational technologies. CoSN, with funding from a John D. and Catherine T. MacArthur Foundation grant, recently released a document that provides guidance to school leaders looking to revise AUPs (CoSN, 2011*b*).

FUTURE SCENARIOS FOR MOBILE LEARNING

Mobile learning has the potential to transform education in North America. The following sections describe scenarios that are likely to develop in the near future.

IMPROVED FEEDBACK AND PERSONALIZED INSTRUCTION

Mobile technologies provide increased opportunities for personalized instruction, particularly by facilitating formative assessment. Formative assessment is the process used by teachers to gather feedback from students during the course of a lesson or unit. Unlike summative assessment, such as a final exam or project, which measures student achievement at the end of a curricular unit, formative assessment is used regularly throughout a lesson or series of lessons to enable teachers to adjust their instructional strategies based on their students' progress and needs. Using mobile devices for formative assessment allows the teacher to access instant, individualized data on student progress and respond immediately through instruction. For example, students in Canby School District use tablets and other Wi-Fi-enabled devices to respond to questions, and results are projected onto a screen as students input their responses. If a concept is not being understood, the teacher can adjust instruction for the entire class, groups of students or individual students. Additionally, teachers can have students text or upload homework to inform instructional planning for the next day. Mobile technologies allow teachers to gather and analyse student performance data more quickly and efficiently than ever before. Teachers can use the data to personalize education by selecting content and instructional strategies that best meets the needs of individual students.

PROFESSIONAL DEVELOPMENT

Mobile technologies can also help teachers personalize their own professional learning (Bjerede and Dede, 2011). Teachers using mobile devices have more flexible access to a wider variety of professional development options. Mobile courses and training programmes are being developed that deliver content in small increments, allowing teachers to take advantage of naturally occurring downtime to complete courses in five- to ten-minute intervals, rather than carving out large blocks of time from their already busy schedules (Vanthournout and Koch, 2008). Mobile devices also increase opportunities for collaboration, as teachers can participate in professional learning communities and communicate with coaches and mentors to ask questions, discuss ideas, and share video clips, lesson plans and other resources online.

AUGMENTED REALITIES

Augmented realities refer to computer programs that superimpose graphics, audio or other sensory enhancements over a real-world environment in real time. Augmented reality applications on mobile devices generally use the built-in camera, GPS and compass features to gather information about the user's surroundings and then project additional information onto the screen over the user's real-world view. For example, one popular application allows users to point their smartphone at the night sky and see a replica of the real sky with a map of the stars, planets and constellations drawn over it; tilt the smartphone or change positions and the phone's sensors and compass will automatically detect the movement and adjust the map to match the user's view. When employed in an educational context, augmented realities can increase student engagement and facilitate the transfer of knowledge and skills from classroom settings to real-life situations. They offer educators all the powerful supports of classroom learning without confining educational experiences to campus buildings or school hours (Bjerede and Dede, 2011).

According to Matthew Dunleavy, an assistant professor at Radford University in Virginia, augmented reality is probably the 'most innovative' type of mobile learning (personal communication, 25 October 2011). Through a grant funded by the National Science Foundation, Dunleavy and Radford's School of Teacher Education and Leadership have launched the Radford Outdoor Augmented Reality (ROAR) programme, which develops augmented reality curricula for use in K–12 education. The programme managers are building a network of software developers for K–12 applications and games through partnerships with the local community college and high schools as well as the computer science department at the university. The programme's initial findings indicate that augmented reality can increase student engagement and accountability and promote collaborative problem-solving and interdependence. ROAR leaders are beginning to see strong possibilities for instruction, student engagement and assessment (M. Dunleavy, personal communication, 25 October 2011).

Augmented reality may allow for the development of content linked directly to geographic locations. The Ecosystems Mobile Outdoor Blended Immersion Learning Environment (EcoMOBILE) programme, currently being implemented with middle-school students, allows students to use mobile devices to learn more about the ecosystem of a pond. On one or more field trips to a local pond, students use their mobile devices to explore the area; when they arrive at certain locations, they are asked questions, provided with resources and encouraged to collect data for further investigation. This interactive programme dramatically changes the relationship between students and the environment they are studying, and encourages high-level thinking skills, primary research and collaboration. EcoMOBILE, funded by the National Science Foundation and Qualcomm's Wireless Reach initiative, is an extension of the Harvard Graduate School of Education's EcoMUVE project, which uses multi-user virtual environments (MUVEs) to teach middle-school students about ecosystems.

SHARED LEARNING COLLABORATIVE

The opportunities to leverage mobile technologies continue to be magnified with the emergence of initiatives such as the Shared Learning Collaborative (SLC), a project of the Bill and Melinda Gates Foundation and the Carnegie Corporation of New York. The SLC is a multistate effort to develop an open-source technology platform that will analyse and store instructional performance data and support an extensive clearing house of resources that teachers can access via mobile devices. In the near future, educators will have continuous access to free resources that align with the Common Core State Standards and target students' specific needs. Teachers will be able to communicate with each other, share applications and tools, and design differentiated instruction. While the SLC is still in development, the extensive scope of the project and the large amount of funding and resources dedicated to it promises to increase the possibilities for mobile learning in the future.

BRIDGING THE DIGITAL DIVIDE

Mobile learning has the potential to be an equalizer in education, bridging the digital divide by providing access to digital content and educational opportunities to all students, regardless of their socio-economic status or geographic location. However, this will only be possible if students have access to a mobile device and broadband services both at home and at school. Although access to mobile devices is widespread in North America, there is a disparity in access based on socio-economic status. In the United States, 55% of children from higher-income families have used a mobile phone, tablet or similar device for playing games, watching videos or navigating applications, compared with only 22% of children from lower-income families (Common Sense Media, 2011). It is important that approaches to mobile learning ameliorate this disparity rather than exacerbate it. Programmes in which districts or schools provide students with mobile devices are likely to increase access for all students, including those who do not have mobile devices or broadband at home. For BYOT initiatives, a district must carefully consider the way it approaches the issue of students who do not have devices or internet access at home, to ensure that the initiative is narrowing rather than widening the digital divide. Districts may opt to purchase devices for these students and in some cases may help support internet access or data plans as well. Programmes like C2C may also help families afford broadband access. By keeping equity at the forefront of planning and implementation for mobile learning initiatives, districts can develop policies that address potential socio-economic issues and help families take advantage of programmes that increase access and opportunities for their children.

CONCLUSIONS AND RECOMMENDATIONS

The emergence of mobile learning in K–20 education across North America offers a significant opportunity for policy-makers to maximize the potential of mobile learning to support educational goals. The examples and approaches shared in this paper provide an overview of the current state of mobile learning. The following sections list conclusions, describe the policy changes needed to enable mobile learning, and make recommendations for the development of mobile learning in the United States and Canada.

CONCLUSIONS

- Mobile learning has the potential to increase student achievement. Innovative districts and schools have produced empirical data showing improvements in student progress as a result of mobile learning programmes.
- Mobile learning is becoming more feasible. The variety of approaches to mobile learning allows districts and schools to adapt programme models to meet their particular goals and needs.
- As technology advances, so do the opportunities for mobile learning. The increase in the quality and quantity of mobile technologies is expanding their potential impact on instruction.
- A number of factors affect the success of mobile learning initiatives. Available funding; national, state and provincial, and local policies; and attitudes held by educators, parents and policy-makers all play significant roles in decision-making and programme implementation.
- Interest in mobile learning is growing. Evidence abounds that education leaders and teachers are increasingly interested in exploring the potential of mobile learning.
- Equity must be a critical component of any mobile learning initiative. Policies that support equal and sustainable access must be carefully developed to ensure that mobile learning initiatives – especially BYOT approaches – do not exacerbate inequities in education. Students who do not have their own devices must have access to devices similar to those owned by their peers as well as broadband access at home to take full advantage of the potential of mobile learning.
- Mobile learning is supported at the national, state and provincial levels. National, state and provincial policies and initiatives can and do serve as important catalysts for mobile learning.

- Mobile learning is implemented on a local level. District policies and leadership can dramatically impact mobile learning by facilitating or hindering programme implementation.

POLICY CHANGES REQUIRED FOR MOBILE LEARNING

Most current policies for technology in schools do not specifically address the use of mobile devices, particularly smartphones, for educational purposes. In the policies that do exist, mobile phones and other hand-held devices are often treated differently from laptops and personal computers, which can make their integration into school technology programmes challenging. Educators have called for revisions to several national laws and policies that are unclear, outdated or overly restrictive in regards to mobile technologies and may limit the possibilities for mobile learning in schools. In the United States these include federal tax laws, the FCC's E-rate programme, and the CIPA and COPPA regulations for children's safety online. At the local level, many district AUPs need to be updated to support mobile learning efforts, and local policy-makers must consider equity issues when drafting new policies for mobile technology or updating existing ones.

Antiquated US tax laws can create complications for institutions purchasing smartphones for instruction. In 1989, under Internal Revenue Code (IRC) §280F, mobile phones became 'listed property'; like company cars and other executive perks, they were classified as a fringe benefit that equated to extra monetary compensation. Consequently, the Internal Revenue Service (IRS) requires additional taxes on mobile phones provided to employees. Under this law, schools or universities might have to pay taxes on phones and data plans used by teachers and students for educational purposes. This directly affects purchasing decisions for mobile learning programmes; for example, Abilene Christian University in Texas chose to purchase iPod touch devices instead of smartphones to avoid the legal complexities (W. Rankin, personal communication, 9 November 2011). Either the tax code should be revised or guidelines should be issued to ensure that schools providing mobile devices to students and teachers do not incur financial penalties for doing so.

While the FCC's E-rate programme has played a significant role in providing connectivity to schools and libraries in the United States, some policy revisions are needed to expand the reach of mobile learning efforts. E-rate's Learning On-the-Go pilot programme, which provides districts with funding for wireless connectivity and mobile devices, has great potential as a catalyst for mobile learning, but the guidelines and requirements need to be modified to allow students to take the mobile devices home.

As noted earlier, school districts in the United States struggle to adhere to the Children's Internet Protection Act and the Children's Online Privacy Protection Act. Many district administrators are confused about how to read these laws and often choose the strictest interpretation to ensure they are in compliance. The federal government should provide more guidance to help districts understand how to comply with these laws and keep children safe without simply blocking access to the internet or mobile devices.

To adequately support mobile learning in schools, districts need to make the shift from acceptable use policies to responsible use policies that focus on teaching students how to use mobile devices safely and responsibly. Policies also need to be flexible enough to account for the rapid pace of innovation in mobile technology. AUPs written just three years ago that list specific devices have already been outdated by the introduction of the iPad and other tablet devices. Limiting mobile learning options to current devices places an unnecessary burden on districts to continually revise their policies as new technologies become available. Karen Cator, director of educational technology at the US Department of Education, said that global changes in wording are needed to make these policies less restrictive and more inclusive (personal communication, 18 October 2011).

Finally, schools and districts developing mobile learning policies need to carefully consider equity of access, especially for students who will need a subsidized device, data plan or broadband connection at home. Policy-makers must address these concerns in advance, before programmes are implemented. Solutions could involve public or private partnerships, district subsidies, and support for families to take advantage of programmes like the C2C Partnership.

RECOMMENDATIONS

As districts and schools begin to plan for mobile learning programmes, they must ensure several critical components are in place before moving forward with programme implementation. The following recommendations are based on the mobile learning programmes and related policies reviewed in this paper:

1. *Focus on leadership and a common vision before embarking on a mobile learning initiative*

In every mobile learning programme surveyed, the importance of leadership at the national, state, provincial, district and school levels was clearly evident. Setting a common vision, establishing supportive policies that will enable effective implementation, and cultivating a sense of ownership among programme implementers and participants are all prerequisites to successful mobile learning programmes.

2. *Shift from AUPs to responsible use policies*

The smartphone is a computer in the student's pocket. Rather than banning these devices, educators need to take advantage of the remarkable opportunities they afford. Policies must be revised to focus on teaching students how to use mobile technologies responsibly and safely, both in and outside of school.

3. *Consider how the use of mobile technologies can create a 1:1 learning environment*

Districts and schools must ensure that students graduate from high school prepared for college and a career – an increasingly difficult job as states and provinces continue to raise educational standards and expectations. Implemented effectively, a 1:1 learning environment can help schools achieve this goal by expanding students' access to digital content, resources and learning opportunities. The low cost and accessibility of mobile technologies may make a 1:1 experience feasible for more schools and districts. Also, a

1:1 model using mobile devices ensures students learn how to use powerful mobile technologies to improve efficiency and productivity, a skill that will no doubt be crucial in the workforce.

4. Consider a variety of approaches to implementing mobile learning initiatives

The ability of districts to purchase mobile technologies for students varies widely, depending on funding as well as the attitudes and priorities of district administrators, school leaders and school boards. In considering a mobile learning initiative, districts and schools must determine whether they will provide students with mobile devices, institute a BYOT programme or use a combination approach.

5. Consider expanding broadband connectivity to ensure 24/7 access for students

Some internet providers are beginning to offer programmes that would enable more students to have data plans or broadband internet access at home. Schools and districts need to be familiar with these options and prepared to guide families through the process.

6. Establish a job-embedded professional development programme

Research and interviews stressed the importance of ongoing and sustainable professional development for teachers as they incorporate mobile learning into their curriculum and instruction. The professional development should focus not only on learning to use the devices but, more importantly, on pedagogical strategies to improve instruction.

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APPENDIX A: Interviews conducted

- Kristin Atkins, Director, Wireless Reach, Qualcomm
- David Byer, Senior Manager, Education Leadership and Policy, Apple
- Karen Cator, Director of Educational Technology, United States Department of Education
- Leslie Conery, Deputy CEO, International Society for Technology in Education
- Robert Craven, Coordinator, Education Technology, Saddleback Unified School District, California
- Matthew Dunleavy, Assistant Professor, Radford University, Virginia
- Julie Evans, CEO, Project Tomorrow
- Melinda George, Vice President and COO, National Coalition on Teaching and America's Future
- Lucy Gray, Project Director, Leadership for Mobile Learning initiative, Consortium of School Networking
- Holley Hayes, Chief Information Officer, Katy Independent School District, Texas
- Bradley Hull, Deputy Executive Director, National Association of State Boards of Education
- Rich Kaestner, Project Director, Mastering the Moment, Total Cost of Ownership, and Calculating the Value of Investment initiatives, Consortium of School Networking
- Joellen Killion, Senior Advisor, Learning Forward
- Hilary LaMonte, Director, Connected Online Communities of Practice, Consortium of School Networking
- Kyle Menchhofer, Technology Coordinator, St. Mary's School, Ohio
- Bailey Mitchell, Chief Technology and Information Officer, Forsyth County School District, Georgia
- Joe Morelock, Director, Technology and Innovation, Canby School District, Oregon

- John Orban, System Administrator, The Country School, Maryland
- William Rankin, English Professor and Director of Educational Innovation, Abilene Christian University, Texas
- Sharon Robinson, President and CEO, American Association of Colleges for Teacher Education
- Lenny Schad, Chief Information Officer, Katy Independent School District, Texas
- Lewis Wynn, Technology Coordinator, Rockdale Independent School District, Texas

APPENDIX B: Survey instrument

Thank you for assisting the Consortium for School Networking (CoSN) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) in our study on the use of mobile technologies in North America.

For the purposes of this survey, 'mobile technology' refers only to mobile phones or iPod touches. Tablets (e.g. iPads, Kindles, Galaxy Tabs) are not being considered.

It will take approximately 10 minutes to complete this survey.

Thank you!

*Denotes required question

1. Is your state department of education actively supporting the use of mobile technologies in education through policies or programs? (Check all that apply.)*
 - Do not know
 - No, not really
 - Yes, through initiatives by institutions and engaged individuals
 - Yes, through specific projects or programs with dedicated public funding
 - Yes, through specific projects or programs with dedicated private funding
 - Yes, through state department of education initiatives including specific measures and incentives
 - Yes, otherwise; please specify here. (Please enter an 'other' value for this selection.)
 2. Please provide some contact details or websites that could provide additional details about the programs or projects being carried out and list what agencies/organizations are involved, sources of funding, etc.
 3. Are you aware of any initiatives promoted by districts or local education agencies (LEAs) that actively support the use of mobile technologies in education?*
- Yes
 - No

4. Please identify the district/LEA's primary contact and email address, and give a brief description of the program, subject area(s), and grade level(s).*

5. Can you specify the level of activity for each of the following educational subsectors?

- Low: There is some activity, but it is in an early stage of development, probably with scattered activities rarely going beyond one particular school or institution.
- High: There are programs or activities that have reached a critical mass of schools or learners and have become publicly noticeable.
- Very high: There are programs or activities that can be said to be widely used by schools or learners.

	Non-existing	Low	High	Very High
Elementary school	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Middle school	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High school	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post secondary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Do you have any additional comments?

7. Are there indications that your state/province will become an active supporter of mobile learning in the near future? (Check all that apply).*

- Yes, by explicitly stimulating initiatives in this field
- Yes, by introducing subsidy programs or project funding
- Yes, by developing a dedicated action plan
- Yes, otherwise
- No, not yet, but it could well develop into a priority in the medium term
- No, we do not expect this to become a priority

8. Do you have any additional comments?

9. Is your state department of education actively trying to prevent the use of mobile technology in education?*

- Yes
- No
- Don't know

10. Does this policy refer to any particular (or all) of the following subsectors?

- Elementary school
- Middle school
- High school
- Postsecondary

11. Please specify the nature of the policy or action.

12. Within each of the following categories, please list the names of individuals/entities that you believe contribute to the use of or prevention of use of mobile technology in education in your state/province.

	Use	Prevention of use
The state department of education	<input type="text"/>	<input type="text"/>
Regional educational authorities	<input type="text"/>	<input type="text"/>
Local education authorities	<input type="text"/>	<input type="text"/>
Telecom providers	<input type="text"/>	<input type="text"/>
Cell phone/hardware makers	<input type="text"/>	<input type="text"/>
Teachers	<input type="text"/>	<input type="text"/>
Students	<input type="text"/>	<input type="text"/>
Parents	<input type="text"/>	<input type="text"/>
Education specialists/ scholars	<input type="text"/>	<input type="text"/>
Other (please specify)	<input type="text"/>	<input type="text"/>

13. There are social, economic and political factors influencing public policies and social attitudes about mobile learning. Given the circumstances, the same factor could be seen at one point as a driver and at another point as a barrier. For example, this could be the case regarding connectivity costs, teacher training, policy support, and so on.

With reference to your state/country and the use of mobile technologies in education, what would you consider to be the main...

Drivers:

Enablers:

Barriers:

Success factors:

14. Is there reference to the use of mobile technologies in education in any state/province or regional educational strategy, educational technology plan or similar documents?*

- Yes
- No

15. Please specify the title of the document, the nature of the reference, and a URL where it can be accessed.

16. In your state/province, has the education ministry/department of education (or a different area of government) defined a clear strategy or policy regarding the use of mobile technology in education?*

- Yes, in operation
- Yes, in development
- Not yet, but under discussion
- No, with no preparations yet
- No, we do not anticipate this in the near future
- Don't know

17. Please identify and describe any state/province-level policies or sample policies disseminated to the local schools regarding the use of mobile technologies.

18. Why is learning with mobile technology a consideration or an option in your state/province? And, if learning with mobile technology is not actively encouraged, or if it is not an option, why not?

19. Do you have any additional comments?

20. Can you provide examples of professional development that focuses on using mobile technologies in the classroom or for teacher support (in your own or in other states/provinces or districts/LEAs in your state)?*

- Yes
- No

21. Please provide information about this professional development effort. (e.g. a brief description, title of the offering, name of organization/instructor, location, grade level, etc.)

22. Are the examples of professional development on using mobile technologies with students MOST OFTEN offered as a standalone topic or are they integrated into other initiatives/topics (i.e. mobile technologies for 21st century skills or mobile technologies for middle-school science teachers)?*

- Standalone topic
- Integrated into other initiatives/topics

23. Can you provide examples of educators using mobile technology to participate in professional development? (Note: these examples may range from informal participation in social networking groups to formal trainings that use mobile phones to respond to polls during the session.)*

- Yes
- No

24. Please provide information about this professional development effort (e.g. a brief description, title of the offering, name of organization/instructor, location, grade level, etc.)

25. What are the barriers that inhibit the delivery of professional development related to mobile learning or that hinder participants from using mobile technologies to participate in professional development?

26. Please provide the following information about the person completing this survey.*

Name:

Organization:

Title:

State:

Thank you for taking our survey. Your response is very important to us.

APPENDIX C: Survey respondents

Surveys and follow-up requests were sent to fifty states and the District of Columbia in the United States, and ten provinces in Canada. Representatives from the following state departments of education and provincial ministries of education completed the survey:

US States		Canadian Provinces
Arkansas	Nevada	Alberta
California	New Hampshire	Manitoba
Delaware	New Jersey	Ontario
Illinois	New York	
Iowa	Ohio	
Kansas	South Dakota	
Maine	Vermont	
Michigan	Washington	
Nebraska		

APPENDIX D: State and provincial policies that support mobile learning

Canada

Alberta: Technology in Schools
<http://www.education.alberta.ca/admin/technology.aspx>

United States

California: Literacy with ICT Across the Curriculum
http://www.edu.gov.mb.ca/k12/tech/lict/show_me/continuum.html

Illinois: Children's Low Cost Laptop Act
<http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=3132&ChapterID=17>

Maine: 2011 Final Report of the Task Force on the Maine Learning Technology Endowment
<http://maine.gov/mlti/resources/history/mlterpt.pdf>

Michigan: 2010 State of Michigan Educational Technology Plan
<http://techplan.org/STP%202010%20Final.pdf>

New Jersey: Facilities Guide for Technology in New Jersey Schools
<http://www.nj.gov/education/techno/facstan/facstan.pdf>

Ohio: Ohio's State Educational Technology Plan (2009–2014)
<http://www.etech.ohio.gov/dotAsset/13275>

Vermont: Learning with 21st Century Tools: The 2009–2012 Vermont Educational Technology Plan
http://education.vermont.gov/new/pdfdoc/pgm_edtech/state_plan/educ_edtech_plan_2012_complete.pdf

Washington: School Board Policy Template: Acceptable Use of Electronic Resources
<http://www.k12.wa.us/EdTech/InternetSafety/pubdocs/AUPPolicyTemplate.doc>

Today there are over 5.9 billion mobile phone subscriptions worldwide, and for every one person who accesses the internet from a computer two do so from a mobile device. Given the ubiquity and rapidly expanding functionality of mobile technologies, UNESCO would like to better understand their potential to improve and facilitate learning, particularly in communities where educational opportunities are scarce.

This paper examines illustrative mobile learning initiatives and their implications for policy in North America. It reveals important lessons for policy-makers and other stakeholders seeking to better leverage mobile devices for education. Four additional papers review mobile learning efforts in other regions of the world: Africa and the Middle East, Asia, Europe, and Latin America. A 'Global Themes' paper synthesizes findings running across the five regional papers.

Complementing the initiative and policy papers is a separate set of six papers which explore how mobile technologies can assist teachers. These papers are also organized geographically.

Two 'Issues' papers will be added to the Series later in 2012. One will anticipate the future of mobile learning, and another will articulate considerations for creating policy environments in which mobile learning can thrive.

Collectively and individually, the papers in the UNESCO Working Paper Series on Mobile Learning scan the globe to illuminate the ways in which mobile technologies can be used to support Education for All Goals; respond to the challenges of particular educational contexts; supplement and enrich formal schooling; and, in general, make learning more accessible, equitable and flexible for students everywhere.

To access existing and forthcoming titles in the Series, please see:
<http://www.unesco.org/new/en/unesco/themes/icts/m4ed/>

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Exploring the Potential of Mobile Technologies to Support Teachers and Improve Practice

- ▶ Mobile Learning for Teachers in Africa and the Middle East
- ▶ Mobile Learning for Teachers in Asia
- ▶ Mobile Learning for Teachers in Europe
- ▶ Mobile Learning for Teachers in Latin America
- ▶ Mobile Learning for Teachers in North America
- ▶ Mobile Learning for Teachers: Global Themes