Mobile Learning and Indigenous Education in Canada: A Synthesis of New Ways of Learning

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# Mobile Learning and Indigenous Education in Canada: A Synthesis of New Ways of Learning

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Key Messages

The use of wireless technology is revolutionizing e-learning: helping to create, deliver, and facilitate learning regardless of the location and enabling the delivery of comprehensive, individualized, and dynamic learning content in real time. According to current projections, global mobile internet use is expected to grow to 90.1 percent in 2017.

In fast developing regions like Asia and Africa, mobile learning is helping to bypass the establishment of costly education infrastructure; and is providing opportunities to develop culturally relevant and contextually based learning materials to support and supplement new curriculum development. And in developed regions such as Europe and the Untied States, mobile learning is emerging as a new and innovative response to outdated approaches to curriculum delivery to younger generations of “digital natives.”

The rapid adoption of mobile technologies amongst Indigenous peoples both in Australia and Africa suggests that m-learning may be highly successful with students from indigenous cultures. The portability, low cost, and versatile features of these emerging mobile learning technologies makes sense for remote and rural Indigenous learners who do not have access to formal “bricks and mortar” schools and their associated resources; in fact, mobile technologies may be the only option for some Indigenous learners where there is no substitute for a formal school.

In Canada, e-learning for Indigenous secondary school students is proving to be a successful tool to support positive educational outcomes. Virtual high-schools are providing First Nations students with equal access to education by minimizing distance as a barrier, and in some instances allowing students to access learning opportunities from their communities and homes. And while m-learning for Indigenous students is still in its infancy, this is the next step to enhancing and growing the success of these e-learning frameworks.

Canada continues lags behind the global community in innovating, implementing, and reporting on the broad use of mobile learning in support of Indigenous education. And while countries like Australia, New Zealand and South Africa are much farther advanced in their adoption of mobile learning technologies and applications in support of Indigenous learners, there are some exciting case examples of the use of mobile learning in support of Indigenous education in Canada. More detailed and targeted research is required, however, to fully explore and report on the impact of these initiatives on advancing mobile learning paradigms within a Canadian context.
Executive Summary

This research provides a synthesis of existing research knowledge and identifies knowledge gaps relating to mobile learning (m-learning) technology and its applications to urban, rural and remote Indigenous communities and learners in Canada. The use of wireless technology is revolutionizing e-learning: helping to create, deliver, and facilitate learning regardless of the location and enabling the delivery of comprehensive, individualized, and dynamic learning content in real time. M-learning is a natural extension of e-learning and has the potential to make e-learning even more widely available and accessible. It is also unique from e-learning with a focus on contextual and ubiquitous forms of knowledge sharing and generation. In 2010, there were an estimated 5.3 billion mobile users worldwide, and in 2013 73.4 per cent of the global online population accessed the internet from their mobile phone. According to current projections, global mobile internet use is expected to grow to 90.1 percent in 2017.

In fast developing regions like Asia and Africa, mobile learning is helping to bypass the establishment of costly education infrastructure; and is providing opportunities to develop culturally relevant and contextually based learning materials to support and supplement new curriculum development. And in developed regions such as Europe and the United States, mobile learning is emerging as a new and innovative response to outdated approaches to curriculum delivery to younger generations of “digital natives.”

Research exploring the adoption, use, and augmentation of m-learning by Indigenous communities throughout the world is an emerging field. On the one hand there remains a general suspicion amongst some traditional cultures of these technologies, limiting the rate of its adoption and innovative use; and on the other hand, research highlights how some Indigenous cultures are using and augmenting digital and mobile technologies to support their cultural empowerment and language revitalization efforts. The rapid adoption of mobile technologies amongst Indigenous peoples both in Australia and Africa, for example, suggests that m-learning may be highly successful with students from indigenous cultures. The portability, low cost, and versatile features of these emerging mobile learning technologies makes sense for remote and rural Indigenous learners who do not have access to formal “bricks and mortar” schools and their associated resources; in fact, mobile technologies may be the only option for some Indigenous learners where there is no substitute for a formal school.

In Canada, e-learning for Indigenous secondary school students is proving to be a successful tool to support positive educational outcomes. Virtual high-schools are providing First Nations students with equal access to education by minimizing
distance as a barrier, and in some instances allowing students to access learning opportunities from their communities and homes. Case examples include: Credenda Virtual High School in Saskatchewan; the Sunchild E-Learning community in Alberta; the Wapawskwa Virtual Colligate in Manitoba; the Keewaytinook Internet High School in Ontario; and Gai Hon Nya Ni—The Amos Kelly Jr. E-Learning Institute—also in Ontario. And while m-learning for Indigenous students is still in its infancy, this is the next step to enhancing and growing the success of these e-learning frameworks.

The application of mobile learning to Indigenous education in Canada is such an emerging area of investigation that there is virtually no research currently to report on. The data examined relating to the global context for m-learning clearly indicate that Canada lags behind the global community in innovating, implementing, and reporting on the broad use of mobile learning in support of Indigenous education. And while countries like Australia, New Zealand and South Africa are much farther advanced in their adoption of mobile learning technologies and applications in support of Indigenous learners, there are some exciting case examples of the use of mobile learning in support of Indigenous education in Canada. More detailed and targeted research is required, however, to fully explore and report on the impact of these initiatives on advancing mobile learning paradigms within a Canadian context.

M-learning holds great potential for expanding the success of e-learning opportunities to underserved Indigenous communities in the North, and even in urban centers, that are at risk of exclusion from affordable, high-quality learning experiences. The technical advantages of having mobile technology to deliver educational curricula and assess outcomes, however, must not overshadow the continuing need for culturally relevant teaching modalities that work for Indigenous learners. The data from the global context indicates that, when used innovatively, mobile learning can be integrated successfully into a context of existing practices, beliefs, experiences, and values related to Indigenous epistemologies and pedagogies. These mobile technologies are not only helping Indigenous learners to develop new media aptitudes, they are providing an opportunity for learners and instructors to develop stronger links between formal and informal learning opportunities—building on the inherently mobile and contextual traditions of Indigenous peoples across Canada. Educators need to be able to be better leverage the use of informal and contextual learning opportunities afforded by mobile technologies to support for the co-creation of cultural relevant and contextually based learning materials. Mobile learning, for example, could help to expand current e-learning frameworks by supporting the incorporation of learner-generated knowledge that plays to both the visual and oral strengths of Indigenous cultures and provides a flexible and interactive medium for learners to engage with.
Mobile assisted language learning (MALL) offers new opportunities to facilitate Indigenous language revitalization efforts. It provides a safe and non-judgmental environment for learners to build their language proficiencies; and mobile learning devices are versatile: they can be used for language learning even without an internet connection. This versatility is a key aspect of supporting Indigenous language learning in remote and rural communities that may lack reliable internet connections and formal spaces to house learning resources. MALL also supports the development of flexible and interactive learning programs that support visually enhanced and contextual learner-generated knowledge. This plays to both the visual and oral strengths of Indigenous cultures and provides a medium for learners to engage with. Research on mobile gaming and language learning also suggests that language “gamification” provides opportunities to engage learners with a new and interactive medium that innovates mobile language learning beyond the development of digital dictionaries, flash cards and crossword puzzles.

Four broad research implications relating to the emerge from this knowledge synthesis analysis on the use of mobile learning technology and its applications to urban, rural and remote Indigenous communities and learners in Canada:

1) Efforts are still required to address connectivity and cost issues to bridge the increasing digital divide in Canada;

2) Mobile learning can provide crucial links between formal and informal learning environments to align with the diverse array of indigenous epistemologies and pedagogies within Canada;

3) Mobile assisted language learning efforts need to ‘move beyond the dictionary’ to focus on interdisciplinary approaches to language learning that incorporate principles of mobile game design and Indigenous epistemologies; and

4) Schools and school boards need to develop the capacity of their leaders and educators to guide the adoption and augmentation of mobile learning into their curricula.
Introduction

With a focus on learners in remote and rural communities and at-risk youth in urban environments, this report explores broadly the potential of mobile learning (mLearning) and mobile learning technologies (MLTs) to support the needs of Indigenous learners in Canada. This report is part of an emerging research project whose objectives are to:

a) provide a synthesis of existing research knowledge relating to MLTs and their applications to urban, rural and remote Indigenous communities and learners in Canada; and

b) identify knowledge gaps relating to mobile learning (m-learning) technology and its applications to urban, rural and remote Indigenous communities and learners in Canada.

The inspiration for this research came in 2012 when I was conducting field research in Canada’s North documenting three case studies related to successful Indigenous Youth Wellness programs (Pulla 2014). During the course of my research I was struck deeply by a comment made by a respected member of the Yellowknives Dene Community. He acknowledged that even though today’s Indigenous youth in the North have many more options for education and work than their parents and grandparents ever did, it is increasingly hard for these youth to put their “gadgets and gizmos” away “to stop and look at Nature, at wildlife, and just relax.” But what if it was possible to leverage the use of these “gizmos and gadgets” by youth as an educational strength and not as a distraction? What if smartphones, tablets and other mobile devices could be used as powerful tools to facilitate further interactions between Indigenous youth, their Elders and their cultures?

Research suggests that, in fact, mobile technologies do provide powerful learning affordances (Lai et al. 2007; Cochrane and Bateman 2010; Dalgarno and Lee 2010). This includes mobile connectivity to education resources for learning communities disadvantaged by traditional educational curriculum delivery (Malisuwan, Settapong and Sivaraks, 2008; Keegan 2005: 53); and supporting positive student achievement outcomes in populations who typically struggle with traditional approaches to learning (Gray 2011; McFarlane et al. 2008; Wallace 2011). Within the context of Indigenous education in Canada, MLTs may allow for learners and educators to build on the successes of e-learning and virtual high school initiatives such as Sunchild Learning, Wapawskswa Virtual Collegiate, and Keewaytinook Internet High School. While these e-learning initiatives have successfully substituted the traditional delivery of education curriculum for Indigenous learners through the use of technology, they are not necessarily able to augment or innovate the delivery
of education to align with the diverse array of indigenous epistemologies and pedagogies within Canada.

At its heart mobile learning provides an opportunity to build contextual, ubiquitous and participatory forms of learning. This includes student-generated knowledge that has the potential to link and merge formal and informal learning environments (Mbati, 2015; Wishart 2015). In order to effectively address and move beyond the lasting legacy of residential schools and forced relocations, these kinds of new and innovative approaches to learning provide crucial avenues to further build trust and reconcile cultural values through the delivery of appropriate, collaborative, and culturally relevant educational programming for Indigenous learners. The integration and promotion of this type of Indigenous cultural content in turn will provide an incentive for parents to keep their children in school and rebuild their trust of the educational system while supporting pride by youth in their Indigenous cultures. This is an important area of investigation that has not been examined by others.

Context: An Emerging Mobile Paradigm for Learning
Smartphones today are significantly smaller, less expensive and more powerful than the supercomputers of 15 years ago. A young Indigenous person in a remote area of the world now has better communications technology than the President of the United States had only twenty-five years ago (Dimandis and Kotler, 2012). In 2010, there were an estimated 5.3 billion mobile users worldwide, and in 2013 73.4 percent of the global online population accessed the internet from their mobile phone. (Ally and Palalas, 2011: 6; ITU, 2010; Statista 2015). According to current projections (see figure 1), global mobile internet use is expected to grow to 90.1 percent in 2017 (Statista 2015). In Africa, for example, more people are forecast to have mobile-network access in 2015 than electricity in their homes, with a predicted off-grid, on-Net population of 138 million (Rao, 2011; Isaacs, 2012: 12).

In education, standalone MLTs, and their applications (apps) and established e-learning systems are rapidly evolving to support m-learning and foster anytime, anywhere access to course-work and learning. Mobile technology includes various mobile devices: (1) highly mobile devices like smartphones, feature phones, and small devices like the iPod touch that can fit in your pocket; (2) very mobile devices like slates, tablets, and netbooks; and (3) mobile devices such as laptops (Brown and Diaz, 2010: 2). This emerging e-revolution in learning is helping to create, deliver, and facilitate learning regardless of location. It is also facilitating greater access to e-learning and enabling the delivery of comprehensive, individualized, and dynamic learning content in real time (Malisuwan and Sivaraks, 2008; Keegan 2005: 53; Atwell et al., 2010; Bandalaria 2005; Bjerede and Dede 2011).
Current research shows that the integration of mobile technologies into teaching and learning are also producing positive student achievement outcomes (Gray, 2011; McFarlane et al., 2008; Wallace, 2011); and opening up new vistas “for extending the scope, scale and quality of education” (Isaacs, 2012: 12; Mishra, 2011). For example, the results of a study that examined the impact of mobile-based English lessons on Japanese university students’ vocabularies concluded that using mobile phones extends learning beyond class time and allows students to manage and direct their own learning at different times and locations throughout their day. The students in the mobile phone group performed significantly better than those who studied identical materials on websites or with paper-based resources (Thornton and Houser, 2005). M-learning, however, 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” (Fritschi and Wolf, 2012: 7). This includes an increasing demand for academic student achievement and the importance of digital literacy and the use of skills now required to compete in the twenty-first century global economy (Fritschi and Wolf, 2012: 7).

**Research Implications**

Four broad research implications emerge from this knowledge synthesis analysis on the use of mobile learning technology and its applications to urban, rural and remote Indigenous communities and learners in Canada:

![Figure 1: Global Mobile Internet Use (Statista, 2015)](image)
1. **Connectivity is still not adequate to support innovation with education technology:** While many researchers note an increasing digital divide in developing regions such as Asia and Africa, the digital divide continues to impact the delivery of innovative approaches to Indigenous education in Canada. Addressing this divide requires ongoing and concerted efforts to ensure that all regions of Canada have access to affordable high-speed and mobile connectivity infrastructure, modern hardware, and skilled technicians.

2. **Using mobile learning to link formal and informal learning environments:** The e-learning paradigm has proved very successful at addressing some of the challenges faced by Indigenous learners across Canada. Merely substituting technology for bricks and mortar schools however does not support the augmentation and innovation of education technology to align with the diverse array of indigenous epistemologies and pedagogies within Canada. Educators need to be able to be better leverage the use of the informal and contextual learning opportunities afforded by mobile technologies to support the co-creation of cultural relevant and contextually based learning materials. This includes more emphasis on incorporating learner-generated knowledge that plays to both the visual and oral strengths of Indigenous cultures and provides a flexible and interactive medium for learners to engage with.

3. **Mobile assisted language learning:** Mobile technology provides powerful affordances to support language learning. It’s crucial, however, that efforts are made to ‘move beyond the dictionary’ to focus on interdisciplinary approaches to language learning that incorporate principles of mobile game design and Indigenous epistemologies.

4. **Building sustainable communities of practice in mobile learning:** Schools and school boards need to develop the capacity of their leaders to guide the adoption and augmentation of mobile learning into their curricula. This also requires building the capacity of educators and supporting them in their use of mobile learning technologies and applications.

**Research Methodology**
Mobile learning is an emerging field in education that requires careful study, analysis, and reporting (Traxler, 2009). To help contribute to this emerging field of research, I conducted a literature review of approximately 80 peer reviewed scholarly sources, published reports, and case studies. These data were examined to better understand the broad theoretical and pedagogical contexts of mlearning; to draw out best practices through case studies of successful international and
domestic mlearning initiatives (Barth and Thomas, 2012; Charmaz, 2006; Dredge et al., 2013; Flyvbjerg, 2006; Stewart, 2012; Woodside, 2010); to provide a synthesis of existing research knowledge relating to MLTs and their applications to urban, rural and remote Indigenous communities and learners in Canada; and to identify knowledge gaps relating to MLTs and their applications to urban, rural and remote Indigenous communities and learners in Canada.

Data collected through this literature review were systematically themed, and these themes provided the broad outline for this report. These data also provided the context for the development of presentation to the International Association of Mlearning held in Venice Italy October 15-24, 2015. Comments and questions on my presentation from conference delegates also provided an informal peer-review of this research; and informal conversations with international Mlearning experts such as Mike Sharples, Marcus Specht, Tom Brown, and Dave Parsons provided me with additional insights into the data collected for this research. I am anticipating that additional comments and questions on my presentation to the SSHRCH community in November will provide me with further insights into this research and allow me to continue to develop and unpack the research presented in this report.
Mobile Learning and Indigenous Education in Canada: A Synthesis of New Ways of Learning

In this research synthesis I provide an analysis of existing research knowledge and identify knowledge gaps relating to mobile learning (m-learning) technology and its applications to urban, rural and remote Indigenous communities and learners in Canada. I begin the synthesis by providing a global context for m-learning initiatives and then tie this context into an emerging global context for mobile learning and Indigenous peoples. I then connect these data to a brief and broad discussion on Canada’s adoption of mobile learning. The analysis then becomes more specific to the potential applications of mobile learning for Indigenous learners in Canada and their associated challenges. These data are examined within the broad context of Indigenous education in Canada. I conclude my research synthesis with some discussion on specific challenges and constraints related to the adoption and innovation of these new and emerging education technologies in support of Indigenous learners and education in Canada.

Global Contexts for Mobile Learning

It is challenging to narrow down the vast amount of exciting and innovative m-learning initiatives occurring across the globe. Every month there seems to be new reports emerging about the global potential of mobile learning; and the scale of technological innovation continues to grown at an unprecedented speed. For example, in 2013 Google introduced its Project Loon in response to connectivity challenges faced by the world’s remote and rural populations. This project utilizes balloons in Earth’s stratosphere to provide mobile connectivity to remote and rural populations. The balloons share the cellular spectrum and enable people “to connect to the balloon network directly from their phones and other LTE-enabled devices. The signal is then passed across the balloon network and back down to the global Internet on Earth” (Google 2015). And Facebook’s “Connectivity Lab” is also seeking solutions to connect the worlds marginal populations to the internet. Facebook hopes to provide affordable access to basic internet services available to every person in the world by using “drones, satellites and lasers to deliver the internet to everyone.” In 2014, for example, its “Internet.org” project “doubled the number of people [in the Philippines and Paraguay] using mobile data with the operators we’ve partnered with, helping 3 million new people access the internet” (Zuckerberg, 2014).

It is clear from my research that mobile internet connectivity and use is a global phenomena that is contributing to new innovations in technological development. In many areas around the globe these trends in mobile technology use and development are contributing to advancements in educational delivery and
curriculum development. In fast developing regions like Asia and Africa, mobile learning is helping to bypass the establishment of costly education infrastructure; and is providing opportunities to develop culturally relevant and contextually based learning materials to support and supplement new curriculum development. And in developed regions such as Europe and the United States, mobile learning is emerging as a new and innovative response to outdated approaches to curriculum delivery to younger generations of “digital natives.” The following brief discussion provides some broad based case data from Asia, Europe, the United States, and Africa to highlight some of this emerging global context. Further case research is required to provide a deeper level analysis to provide greater details and measure the potential impact of these initiatives within the theoretical and pedagogical contexts of m-learning.

**Asia**

For over a decade, international e-learning communities have been developing, implementing and testing innovative m-learning programs and infrastructure. As early as 2000, China launched its advanced distance learning satellite broadband multimedia transmission platform. This satellite initially served 10,000 students living in remote areas of western China and other regions with underdeveloped education resources. In 2012 there were “over 200,000 students in the distance education network nationwide, and the figure is estimated to be one million in the coming three years” (China.org.cn, 2012).

Two of the most significant characteristics of mobile learning in Asia continue to be the ability to provide basic education and continuous learning for people living in rural areas (So, 2012: 11); and the use of MLTs to facilitate a pedagogical shift toward self-directed learning by linking formal and informal learning spaces (So, 2012: 15-16). For example, Singapore’s FutureSchools@Singapore project, active since 2007, is a government initiative to build a new education model by exploring innovative pedagogical approaches to the integration of Information Communications Technology (ICT) into school curricula (So, 2012: 18; Koh and Lee, 2008). Two schools in Singapore, Nan Chiau Primary and Crescent Girls’ School, are leading the way in m-learning integration. Crescent Girls’ School integrates the use of tablets into lessons; all students use a tablet pre-loaded with interactive digital textbooks. And Nan Chiau Primary has been experimenting with the integration of mobile devices into its curriculum since 2005 (So, 2012; Koh and Lee, 2008).

**Europe**

European m-learning initiatives have actively explored the application of these new technologies to education since the late 1990s. Many of these early projects focussed on the development of educational software for mobile devices and supporting learning in informal settings, such as museums or neighbourhood training centres for at-risk youth (Hylén, 2012: 12). The Handheld Learning Resources Project
HandLER was one of the most important of these early projects. Launched in 1998 by the School of Engineering’s Education Technology Research Group at the University of Birmingham in the UK, HandLER helped to establish the concept of mobile and contextual learning outside the classroom. Most importantly this included highlighting eight very important elements required to develop effective m-learning technologies. According the HandLER these technologies needed be: (1) highly portable: available whenever the user needs to learn; (2) individual: personalized to suit the individual learner’s abilities, knowledge and learning style, and designed to support personal learning; (3) unobtrusive: learners can capture situations and retrieve knowledge without the technology becoming overly noticeable or imposing on the situation; (4) available: learners need to able to use the technology anywhere, to enable communication with teachers, experts and peers; (5) adaptable: adapted to the context for learning and the learner’s evolving skills and knowledge; (6) persistent: ability to support lifelong learning and provide learners with access to their accumulated knowledge and resources despite changes in technology; (7) useful: be suited to everyday needs for communication, reference, work and learning; and fundamentally (8) easy to use: hardware and software that is easily comprehended and navigated by people with no previous experience using it (Kukulska-Hulme et al., 2011: 153; Hylén, 2012: 13-14).

As mobile technologies, digital educational content and applications became more widely available in Europe, there was a shift toward using mobile technologies to transform pedagogical models and promote innovative practices in teaching and learning, both in and outside of school (Hylén, 2012: 12). In 2002, for example, the European Union (EU) launched its “M_Learning” program. This four year and €4.5 million euro Information and Systems Technology (IST) project was “large and complex” and focussed on “developing, exploiting and integrating a range of innovative technologies and devices, and delivering mobile learning to hard-to-reach youngsters who were economically and educationally marginal” (Attewell, 2005). The project culminated in 2004 with large-scale m-learning trials across a diverse set of situations, organisations and learners (Attewell, 2005).

Other innovative m-learning programs in Europe include the MOBILearn project, the Leonardo da Vinci project (Keegan, 2005: 7; Hylén, 2012: 12 ), and the E-Mapps program. MOBILearn was interesting because it involved a worldwide European-led research consortium of 24 partners with a focus on “exploring context-sensitive approaches to informal, problem-based and workplace learning by using key advances in mobile technologies” (MOBILearn, 2013; Hylén, 2012: 14). An important result of this project was a widespread shift in focus by educators and policy makers away from learning with hand-held devices toward support for the mobility of learning in general (Kukulska-Hulme et al., 2011; Hylén, 2012: 14).
The 2005-2008 eMapps program – Motivating Active Participation of Primary Schoolchildren in Digital Online Technologies for Creative Opportunities through Multimedia—encouraged students ages 9 to 12 “to build communities of creative, technologically-savvy and internationally-minded children who would generate digital content about their local culture and communicate with peers in other countries through the program’s platform and network.” (Hylén, 2012: 15). Another aim of the project was to develop adaptable interactive tools – primarily games played on a mobile platform – to deliver learning objectives and help integrate the use of ICT into education (eMapps, 2008; Hylén, 2012: 15). What is so interesting about the eMapps program is that we see not only the successful and practical large-scale application of gamification theory (Hunter, 2011) but also the application of networked learning. This kind of peer-networked approach to learning not only helps to leverage the possibilities of connecting students regardless of race, class, and gender; it is now recognized as an essential element that encourages greater innovation and application of new ideas (Johnson, 2010; 2012).

Recent projects are now focusing on primary and secondary education, possibly because hand-held devices have become more user-friendly and thus easier for younger children to use. There has also been a growing recent interest in experimenting with tablets and similar devices in schools, with pilot projects typically conducted on a small scale and driven by enthusiastic teachers (Hylén, 2012: 7). In September 2013, for example, 04NT, a Dutch education foundation, opened seven “Steve Jobs Schools” in the Netherlands whose goal is to cultivate individual strengths and prepare children for a future supported by technology (Jacobs, 2013).

The practice of using mobile phones for education in Europe, however, is still emergent, and the concept of mobile learning, with few exceptions, has not yet reached the policy level (Hylén, 2012: 7). The Danish government, for example, has established national guidelines and instructional materials to support the broad adoption of mobile-learning. Its 2012 digital strategy plan includes upfront investment in the development and distribution of digital learning materials for fixed and mobile devices, with projected access to individual computers and wireless networks for all students in Denmark by 2014 (Hylén, 2012: 7).

**The United States**

The United States has also been active in developing innovative e-learning and m-learning programs. In 2009, more than three million K–12 students were enrolled in an online course. Most of the growth in e-learning in the US is occurring through blended-learning environments where students learn online in an adult-supervised environment at least part of the time (Horn and Staker, 2011; Fritschi and Wolf, 2012). Research indicates that ‘conversations in the United States about transforming learning in technology-rich environments are not slowing down.
Rather, the push to transform teaching and learning via the use of technology is being fueled at the national level” (Garcia Garza, 2015: 31). This includes recent initiatives such as President Obama’s Future Ready Call to Action and P21’s Framework for 21st Century Learning that “are encouraging educators, students, and communities to commit to preparing students to be critical thinkers, problem solvers, communicators, and innovators” (Garcia Garza, 2015: 31).

Focussed efforts are therefore being made to ensure that teachers can not only use technology in the classroom, but that they can understand how to integrate and innovate with technology in the context of effective pedagogy (Garcia Garza, 2015: 41). Since 2008, for example, the small coastal Encinitas Union School District (EUSD) in Southern California, has provided iPads for students across its district as part of its curriculum delivery. In order to ensure the technology was “leveraged to innovate and drive powerful learning”, the EUSD developed a system of support to meet its teachers’ needs (Martin, Miyashiro, and Baird, 2015: 20). This system of support includes a “district wide vision and alignment, site based learning and development, personalized learning, instructional coaching and communities of practice” (Martin, Miyashiro, and Baird, 2015: 20). Similarly, the Cajon Valley Union School District (CVUSD), a K-8 district of 24 schools in eastern San Diego California, has focused on developing digital literacy amongst its teachers. In this case, the CVUSD developed its digital academy which is an online platform to support teachers in learning about and applying digital tools in their instructional practice. This Cajon Valley Digital Academy platform was specifically designed “so educators have all the resources needed to master the digital-age skills” required by their school district and embodied in California’s standards for teachers (Martin, Miyashiro, and Baird, 2015: 22). And The Houston Independent School District (HISD), “PowerUp” program, for example, is “a digital transformation initiative that provides each high school student a laptop to ensure students have the knowledge, skills, and resources to be globally competent and competitive.” (Martin, Miyashiro, and Baird, 2015: 24). The success of this program came from ensuring that teachers had the requisite skills to leverage the technology “to provide new and better learning experience for students” (Martin, Miyashiro, and Baird, 2015: 24).

**Africa**

Between 2003 and the end of 2008 the mobile penetration level across Africa rose from 5% to well above 30%, with an estimated total of 246million mobile subscribers (ITU 2009). Eight years ago, in 2002, Africa became the first region in the world where mobile phones outnumbered fixed-lines (Hollow, 2010: 60).

A 2007 survey on ICT and Education in Africa, however, “observed that high levels of poverty, limited rural electrification, and frequent power disruptions result in limited access to ICT in secondary schools.” (Hennesey, 2010: 32) The research concluded that the “integrated use of ICT needs much more incubation time, better
access for individual learners, more operational reliability and much more training and support” (Hennesey, 2010: 32). In particular, Physical access to ICT is recommended as the first step towards “making technology accessible accessible to the local people” (Hennesey, 2010: 49). Unfortunately, inadequate technological infrastructure, “such as lack of hardware and software, and internet, limit individual and community access to ICT and also pose a barrier to its integration with the curriculum in schools” (Hennesey, 2010: 49). The lack of electricity and frequent power outages, poor technology infrastructure, overcrowded computer labs and low bandwidth, high costs of (mainly satellite) internet connectivity, software licences and equipment maintenance, insufficient and inappropriate software. Non-competitive telecommunications policies and regulations may impede connectivity and sustainability (Hawkins, 2002). Geographic and demographic factors include population density and dispersion, linguistic and political factors. Wider socioeconomic factors such as extreme poverty and increasing HIV/AIDS levels exacerbate the situation and political will is needed to alleviate the situation through further “joined-up thinking” in terms of devising an integrated framework to improve standards of living, education and health provision, along with ICT infrastructure enhancement (Hennesey, 2010: 99).

The JIBU m-learning project for nurses and midwives in East Africa is an excellent example of the extension of a successful e-learning program into the mobile platform. The project, funded by the Dutch Postcode Lottery is testing the use of mobile technology by nurses and midwives to increase access to health information and ultimately improve service delivery.

**An Emerging Global Context for Mobile Learning and Indigenous Peoples**

Research exploring the adoption, use, and augmentation of m-learning by Indigenous communities is an emerging field; and the research on the adoption of these digital technologies by Indigenous peoples varies. On the one hand research indicates that there remains a general suspicion amongst some traditional cultures of these technologies, limiting the rate of its adoption and innovative use (Samuel-Azar’s 2012; Hahn & Kibora, 2008; Molony, 2007). And on the other hand, research highlights how some Indigenous cultures are using and augmenting digital and mobile technologies to support their cultural empowerment and language revitalization efforts (Crow and Parsons, 2015; Donner, 2008; Hahn & Kibora, 2008; Wirth et al., 2008; Bar, Pisani, & Weber, 2007;; Forte, 2006; Gideon, 2006;; Smith et al., 2000; Trahant, 1996).

The rapid adoption of mobile technologies amongst Indigenous people both in Australia and Africa, however, suggests that m-learning may be highly successful with students from indigenous cultures (Auld, Snyder, and Henderson, 2012; Hartnell-Young and Vetere, 2008; Litchefield 2007: 588;). The portability, low cost, and versatile features of these emerging mobile learning technologies makes sense
for remote and rural Indigenous learners who do not have access to formal “bricks and mortar” schools and their associated resources; in fact, mobile technologies may be the only option for some Indigenous learners where there is no substitute for a formal school (Kim, Miranda, and Olaciregui 2008).

In Australia, for example, Indigenous peoples in remote communities now have access to mobile technologies more than any other digital technology. Auld, Snyder, and Henderson (2012), for example, highlighted that, in the Maningrida Indigenous community where they conducted their research there was not a single computer in any of the homes of the community members they worked with. The cost of using these technologies, however, in these remote Indigenous communities remains high (Auld, Snyder, and Henderson, 2012: 283) As such, mobile technologies are consistently used by members of the Maningrida Indigenous community as a “shared resource” (Auld, Snyder, and Henderson, 2012: 284-288).

Research on the use mobile learning technologies in these remote Indigenous communities is providing important insights into how Indigenous youth are using these technologies to connect the often diverse cultures of their informal learning environments (home/communities) with their formal learning environments (schools). Hartnell-Young and Vetere (2008), for example, highlight how mobile phones can support the integration of western and Indigenous educational paradigms by fusing together their distinct values, priorities and perspectives through the development and sharing of creative and personalized educational content. The use of story-telling and life narratives as a pedagogical tool to connect these learning environments, in particular, can be facilitated by using video on mobile devices to capture oral stories, and edited images. This intersection of mobile technology with Indigenous orality plays to both the visual and oral strengths of Indigenous cultures; and provides a flexible and interactive medium for learners to engage with (Brady 2008: 383).

Additional researcher, however, is required to provide a deeper context for assessing how this type of learner-generated knowledge facilitated by mobile technologies can further support Indigenous learning and their associated epistemologies.

**Canada’s Adoption of Mobile Learning**

In Canada, although all thirteen provinces and territories maintain some kind of e-learning program for K–12 students, growth in this programming is uneven and only experienced in certain jurisdictions (Barbour, 2012: 9). Unfortunately, Canada still does not have a comprehensive or coherent approach to align the incredible potential of e-learning and the fast developing area of m-learning with an informed understanding of what it could or should accomplish (Canadian Council on Learning, 2009: 7). According to a 2009 report published by the Canadian Council of Learning,
“e-learning in Canada consists of loosely connected provincial, territorial and federal e-learning networks, educational providers (public and private) and targeted initiatives. The consequences of this approach include duplicated efforts, fragmented goals and objectives, and sporadic and short-term initiatives” (2009: 7).

Recent trends indicate, however, that K-12 distance education continues to grow each year. In 2011-2012 there were approximately 245,252 K-12 distance education students; a growth of more than 200,000 students in just over 10 years (Barbour, 2012: 13). Yet, “the more traditional, print-based correspondence education continues to be prevalent within K-12 distance education offerings.” (Barbour, 2012: 15). And blended learning continues to be seen “simply as a more effective use of information communications technology (ICT)” (Barbour, 2012: 15).

Considering the absence of a national strategy in Canada, increasing research is required to identify best and next practices with regard to MLTs and their applications for K-12 learners in Canada. And most importantly, Canadian education researchers need to be re-focusing their efforts away from the theoretical frameworks of education technology and toward the practical application of the lessons learned from the international learning community in the design and delivery of scalable, accessible and inexpensive MLT education applications.

**Technology and Indigenous Education in Canada**

It is estimated that, between 2001 and 2026, more than 600,000 Indigenous youth in Canada will turn 15, including more than 100,000 in each of British Columbia, Alberta, Saskatchewan, Manitoba, and Ontario. This growth represents a massive influx into the working-age population, particularly in Saskatchewan, where it is projected that by 2026, 36% of the population aged 15 to 29 will be Aboriginal (Townsend and Wernick, 2008: 4). Projections suggest that this growth will continue for several years to come and that the Prairies and the North will also continue to maintain the youngest Aboriginal population in Canada (Steffler, 2008: 15). The Inuit population in Canada, in particular, will remain the youngest of all Canadian Indigenous populations and is expected to grow by 62 percent by 2026 (Steffler, 2008: 17).

Indigenous learners, including adult learners, in Canada are one the most disadvantaged segments of the Canadian school population. (Kawalilak 2012: 2-3) For many of these learners, high school has become a major site of struggle. Recent data from Statistics Canada (2011) indicates that more than twice as many non-Indigenous Canadians have a high school degree than do First Nations people living on a reserve; and more than five times as many non-Indigenous Canadians have a university degree. The high school graduation rates of Inuit, for example, are approximately 25 per cent (Sisco et. al 2011: 9). This is over 60 per cent lower than Canada’s national average high school completion rate of 88.4 per cent (The Conference Board of Canada 2014). It is clear from these data that large educational
gaps between Indigenous and non-Indigenous Canadians continue to highest in universities (Stats Canada, 2011).

A closer look at these data also indicates that Indigenous learners living on reserves and/or rural and remote communities have less successful educational outcomes than their urban counterparts. For the 40 percent of the First Nations population living on a reserve, access to education is limited (Brant Castellano, 2008: 7). Many First Nations communities, for example, do not have high schools or libraries, and residents do not have access to computers. Unfortunately, many of these rural and remote Indigenous learners need to relocate long distances or face long commutes in order to attend school. They also “feel disconnected from the curriculum and the school environment and uneasy about ‘leaving behind’ peers and relatives if they achieve too much” (Brant Castellano, 2008: 7). Many of these learners do not want to leave their home communities and their families to attend school. The discrimination and racism they face in schools negatively impacts their educational experiences, forcing them to leave programs early or to drop out of school completely. These experience are further augmented by the trans-generational traumas of residential school that impact so many Indigenous learners across the country. The cumulative impact of these experiences is a deep mistrust of Canada’s formal educational system (Kawalilak 2012: 4-5). Technology is helping to reconcile these issues by addressing issues of access and relevancy.

The successes of Indigenous E-learning frameworks
Research indicates that e-learning opportunities are helping to address the many systemic failures in traditional education delivery to Indigenous learners in Canada. Education technology is helping to address the rural/urban gap by providing educational supports and opportunities for Indigenous learners in their home communities. And online learning curriculum is being developed that is more sensitive and relevant to the needs and paradigms of Indigenous learners (Kawalilak 2012: 5-6). E-learning paradigms are also helping Indigenous students to develop and enhance their time management and digital literacy skills. And these paradigms are providing Indigenous learners with increased access to qualified and specialized instructors, “a resource often lacking in rural or remote, onsite, public and post-secondary institutions” (Kawalilak 2012: 5-6).

Virtual high-schools in Canada, for example, are providing First Nations students with equal access to education by minimizing distance as a barrier, and in some instances allowing students to access learning opportunities from their communities and homes (Barbour, 2012: 63; Sisco, 2010: ii). Credenda Virtual High School in Saskatchewan, for example, was a First Nations online high school that used Blackboard Collaborate to deliver online synchronous learning. Established in 2005, the program grew from a modest e-population of 55 students to approximately 500 in 2014. In 2012–2013 Credenda expanded its program to offer
the Credenda Online Extension Program (COEP) to First Nations schools on reserve. This program enabled these schools to use their own teachers, on their schedules, to deliver Credenda online programming (Barbour, 2012: 60). Unfortunately, in 2014 the school Credenda had to close due to new program funding regulations introduced and enforced by Aboriginal Affairs and Northern Development Canada.

The Sunchild E-learning Community program is another successful example of a Canadian First Nations e-learning initiative. This online program has maintained course completion rates for Aboriginal students of greater than 70 per cent and graduation rates of greater than 80 per cent in each of its 12 years of operation (Barbour, 2012: 63). These outcomes should be compared to graduation rates of less than 4 per cent and course completion rates of less than 20 per cent in northern Alberta’s public school divisions. The success of the program comes for the developers “passion to dramatically improve education through Aboriginal people’s inclusion and participation into Alberta’s and Canada’s economy” (Barbour, 2012: 63). Other examples of successful Indigenous e-learning initiatives in Canada include the Wapawskwa Virtual Colligate in Manitoba; the Keewaytinook Internet High School in Ontario; and Gai Hon Nya Ni—The Amos Kelly Jr. E-Learning Institute—also in Ontario.

**Indigenous mobile learning in Canada: Exploring possibilities**

There is virtually no research currently relating to mobile learning and Indigenous peoples in Canada. Most of the available data examined for this synthesis focused specifically on e-learning as a broad extension of technology integration and Indigenous education in Canada. The data presented on the global context for m-learning earlier in this synthesis clearly indicate that Canada lags behind the global community in innovating, implementing, and reporting on the broad use of mobile learning in support of education. And Canada also lags behind the global community in the application of mobile learning to support Indigenous learners. These data show that countries like Australia, New Zealand and South Africa are much farther advanced in their adoption of mobile learning technologies and applications in support of Indigenous learners.

There are some exciting examples, however, of the use of mobile learning in support of Indigenous education in Canada. And based on the data examined for this synthesis, I can confidently report on two very broad next steps relating to mobile learning (m-learning) technology and its applications to urban, rural and remote Indigenous communities and learners in Canada: the extension of successful e-learning programs to include mobile and contextual based learning formats to better support and link formal and informal learning opportunities; and the incorporation of game design principles and processes to support Indigenous mobile assisted language learning (MALL) to ‘move beyond the dictionary’.

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SSHRC Knowledge Synthesis Report
Siomonn Pulla
1) M-Learning as the next step for e-learning: Linking formal and informal learning

M-Learning holds great potential for expanding the success of e-learning opportunities to underserved Indigenous communities in the North, and even in urban centers, that are at risk of exclusion from affordable, high-quality learning experiences (Isaacs, 2012: 26-27). As already noted in this synthesis, Indigenous learners in Canada are the most disadvantaged segment of the national school population. Typical challenges of communities include the lack of on-site educational infrastructure schools—requiring learners to move from home to attend secondary school, or face lengthy commutes to the nearest school (CCLL, 2009: 86). The Cree community of Attawapiskat in Northern Ontario, for example, was without an elementary school for fourteen years “after the old school was closed due to diesel fuel contamination” (Sisco et. al, 2011: 24) And crowded housing, single-parent families, and crime, continue to be key social determinants impacting the successful educational outcomes of Indigenous learners (Sisco et. al. 2011: i).

And while e-learning is helping to provide Indigenous students with equal access to education by minimizing distance as a barrier, the mere substitution of technology in place of traditional curriculum delivery is not adequate. Access to technological infrastructure, for example, continues to be a challenge. In a study relating to adult Indigenous learners in a remote community, the authors noted that a significant challenge to the the project “was that not every learner has access to personal computers in their households, making them rely on shared computers at local community or learning centres, if available.”(Kawalilak et. al 2012: 5).

In an attempt to address this increasing “digital divide”, since 2010 the non-profit organization One Laptop Per Child (OLPC) has provided 8,000 Indigenous students, ages 6 to 12, with laptops and tablets in rural and urban communities across Canada. The demand is so high that at present they “have requests for technology from more than 150 communities representing more than 15,000 Aboriginal students.” (OLPC, 2015a). Its most recent initiative was the provision of tablets to 1,200 Indigenous youth in northern Alberta, Ontario and New Brunswick (OLPC, 2015b). The OLPC design their tablets and laptops with Indigenous learners and communities in mind. The mobile learning devices come pre-installed with “educational apps for skill development in areas such as financial literacy, health, math, science and Aboriginal languages” (OPLC, 2015c). Each device is equipped with up to three separate user accounts for children, “allowing students to progress through interactive lessons at their own pace” (OLPC, 2015c).

The “Help Me Tell My Story” project in Saskatchewan is another great example of the innovative use of mobile technology to support Indigenous learning in Canada. In order to linking formal assessment processes with informal dialogue around
early language literacy for First Nation and Metis early learners, the Government of Saskatchewan in partnership with First Nations organizations developed a series of Ipad applications (apps). The apps facilitated the development of this personalized and holistic assessment process by ensuring that the local contexts and cultures of First Nations and Metis students and their communities were embedded in the process. The apps included four digital story books and an assessment tool for instructors. The digital story books were designed for children aged 3 to 5 that tell “a story using First Nation and Métis content and ideas in an easy-to-understand way.” (Laughlin, 2014: 10). Each book could be accessed in English, Cree, Dene, and Michif. The assessment app was a mobile based tool to provide a contextual on-site literacy assessment of the early learners engaged in the program. The tool also include three additional surveys to support the assessor in engaging with caregivers, teachers and Elders as part of the learner’s assessment. (Laughlin, 2014: 10). This process was piloted in more than 65 schools across 21 school divisions and/or First Nation Regional Education Organizations. Based on the success of the program, a “Help Me Talk About Math” assessment for grade 1 students is currently being piloted by schools in Saskatchewan (Laughlin, 2014).

The technical advantages of having mobile technology to deliver educational curricula and assess outcomes must not overshadow the continuing need for culturally relevant teaching modalities that work for Indigenous learners. The data from the global context indicates that, when used innovatively, mobile learning can be integrated successfully into a context of existing practices, beliefs, experiences, and values related to teaching and learning (Murphy, 2005: 532). These mobile technologies are not only helping indigenous learners to develop new media aptitudes, they are providing an opportunity for learners and instructors to develop stronger links between formal and informal learning opportunities—building on the inherently mobile and contextual traditions of Indigenous peoples across Canada.

Current research indicates, for example, that Indigenous youth in Canada are increasingly using social media to connect with each other. Even in the north where connectivity continues to be an issue, facebook and youtube are popular and frequently used sites by Inuit and First Nation youth for social networking (Taylor, 2011: 14; Gibson et al., 2012; Gray-McKay et al., 2014; Lockhart et. al., 2014). These social media sites are providing important informal learning opportunities, acting “as a gateway to engage people in information exchange and cultural communication” (Molyneaux et al. 2014: 277; Henley, 2010).

Canadian educators need to be able to be better leverage the use of these informal and contextual learning opportunities afforded by mobile technologies. This could include greater support for the co-creation between learners and teachers of cultural relevant and contextually based learning materials; and more emphasis incorporating learner-generated knowledge that plays to both the visual and oral
strengths of Indigenous cultures and provides a flexible and interactive medium for learners to engage with.

2) Mobile assisted language learning and Indigenous language revitalization

Efforts at Indigenous language revitalization have been ongoing since the mid-1900s (Bourget 2014: 19; Hinton, 2008c; McCarty, 2008; Richards & Burnaby, 2008). And even though Canada’s 2011 Census of Population recorded over 60 Aboriginal languages grouped into 12 distinct language families, only three of those 12 language families remains strong and viable (Statistics Canada, 2014). The inclusion of Indigenous language training and immersion as a core part of Indigenous education programming is helping to making a difference in keeping Indigenous languages strong and health. And digital media technologies continue to support these educational efforts at language revitalization and retention amongst Indigenous youth (Park 2011; Brady 2008).

Research (Bourget, 2014: 31-32; Hermes and King, 2013) suggests that there are three core areas where digital technology can support Indigenous language revitalization efforts: by enhancing communication; by supporting materials production; and by supporting documentation efforts. Software has been available for sometime to provide a technologically-enhanced simulated-immersion experience for Indigenous language learners. The Ojibwemodaa software, for example, “includes movie clips, flashcards, interactive games, grammar quizzes, and pronunciation and conversation practices” (Bourget, 2014: 31). The use of these CD and DVD types of software, however, feels stale and outmoded. These types of software also do not honour the inherently contextual and mobile nature of traditional indigenous language learning experiences.

Digital applications are being, developed that integrate Indigenous cultures, languages, and traditional knowledge into learning resources. Digital language boards and fonts are providing Indigenous youth with enhanced opportunities to learn, practice and use their traditional languages, and there are a considerable amount of mobile and web based Indigenous language dictionaries now available for use and download (First Voices 2000–2011; Sisco 2010; Sisco et al., 2012, Thornton Media, Inc. 2012). The Gift of Language and Culture project, for example, is an online resource-based instructional and immersion Cree language curriculum for learners pre-k to grade 9. The program offers an Indigenous knowledge-centred curriculum in the Cree language that meets both the learning needs of students and provincial expectations. The program was developed in 2003 through the collaborative efforts of Saskatchewan’s Lac La Ronge Indian Band (LLRIB), Onion Lake First Nation (OLFN), and Peter Ballantyne Cree Nation (PBCN) to address Cree language revitalization and retention needs across Saskatchewan First Nation schools (Sisco et. al, 2011: 24).
Mobile assisted language learning (MALL) offers new opportunities to facilitate cultural preservation and language revitalization amongst Indigenous learners in Canada. Mobile technology, in particular, provides a “non-judgmental environment for learners to test ideas and make mistakes.” (West 2012: 9). Language learners from all over the world are now using their mobile devices “to learn new languages without the fear of botching a sentence or mispronouncing a word in a high-stakes social situation, and unlike in a class environment, they can study during short, irregular intervals of time, according to their schedules and preferences” (West 2012: 9). And mobile learning devices are versatile: they can be used for language learning even without an internet connection. For example, a mobile device with “8 giga bytes of memory equipped with a MP3 player, movie player, and sound recorder allows for over 800 textbooks in PDF with 200 minute educational videos in the mobile video format.” (Bahrani 2011: 245) This versatility is s a key aspect of supporting Indigenous language learning in remote and rural communities that may lack reliable internet connections and formal spaces to house learning resources.

Many Indigenous Elders and community leaders, however, continue to be skeptical about the potential of digital media to support Indigenous language development and cultural pride amongst youth (Taylor 2011: 15). Research suggests that to overcome these challenges, the successful use of digital media to support language revitalization hinges upon alignment of the technology with the language goals of the community (Bourget, 2014; Gala, 2010: 17). Understanding which technology students regularly use is the first step to identifying which technology will ultimately support language revitalization efforts. Current research indicates that social networking sites in particular are providing an important avenue for Indigenous youth to learn informally and share about their cultures and “stay connected with the communities in which they were raised but no longer lived” (Molyneaux et al. 2014: 283-284). Isuma TV is a an excellent example of an interactive digital media network of Inuit and other indigenous artists. Launched in 2008, Isuma TV provides users with an extensive online archive of indigenous video and multimedia projects, as well as support for live webcasting, video on demand, content customization, and online marketing s (Fiser and Jeffrey, 2013: 55).

Recent research on MALL also suggests that building flexible and interactive programs that support visually enhanced learner-generated knowledge is not only effective for teaching language, but is also fun for the learners (Charitonos and Charalampidi, 2015). MALL has the added potential of playing to both the visual and oral strengths of Indigenous cultures and provides a medium for learners to engage with. Research on mobile gaming and language learning also suggests that language “gamification” provides opportunities to engage learners with a new and interactive medium that innovates mobile language learning beyond the development of digital dictionaries, flash cards and crossword puzzles (Crow and Parsons 2015; Chen & Yang, 2013; Peterson, 2010; Piirainen-Marsh & Tainio, 2009).
In New Zealand, for example, researchers (Crow and Parsons 2015) designed and developed a mobile mobile game world to support Maori language learning. The virtual game world “provided a highly engaging context for learning which students instantly wanted to explore. The ability of the game engine and game world to run its own logic and rules meant that there was no explanation needed for students to start interacting and learning” (Crow and Parsons, 2015: 97). The game world also provided students with an easy to interpret series of feedback “relating to where they were within the learning task and what they should do next.” And the game world also provided the instructional designer with an easy framework to structure “the learning experiences in a way that gives users a sense of freedom and exploration while maintaining a high level of control over the overall structure and progression of learning” (Crow and Parsons, 2015: 97).

**Connectivity and Cost: Some challenges and constraints**

The data analysed for this research synthesis report clearly indicate that the adoption of mobile learning platforms, activities, and paradigms to support Indigenous learners and education in Canada holds great potential. Connectivity and cost continue to be the most substantial challenges and constraints to impact the adoption of mobile learning to support Indigenous learners in Canada.

Just as Africa is faced with an increasing digital “divide” (Hennesey, 2010: 50), good broadband connectivity is limited in many parts of Canada—especially in areas with a high concentration of Indigenous peoples. Canada is also consider one of the most expensive countries in the developed world when it comes to connectivity fees (OECD, 2013). So while many Canadians are able to take advantage of advancements in education technology, including mobile learning technologies and their applications, access to mobile internet connectivity continues to be rare and good broadband internet continues to be expensive. In remote Northern regions, for example, carrier backhaul costs compel service providers “to selectively satisfy customer demands.” (Fiser and Jeffrey, 2013: 62). This results in residents having expensive Internet access but extremely limited capabilities to engage in multimedia applications and the deployment of media-rich services (Fiser and Jeffrey, 2013: 62). Not surprisingly, a recent study based on a survey of 626 Indigenous Internet users in the Sioux Lookout region of Northwestern Ontario highlighted four areas of less frequent internet use that highlight connectivity issues. All four of these uses require high bandwidth: updating websites, Blogs and Vlogs; making video calls via the internet; uploading a video to share with others online; and shopping online (Molyneaux et al. 2014: 281).

The cost and lack of connectivity is a significant barrier to the use of technology in accessing educational opportunities. (Kawalilak et. al 2012: 5). And efforts continue to be required to ensure that Indigenous peoples in remote and rural areas of Canada have access to affordable and reliable critical connectivity infrastructure;
and functioning and capable devices that can benefit from this next-generation connectivity infrastructure (Fiser and Jeffrey, 2013: 64-67) Sectors need to cooperate on developing strategies to lower the cost of connectivity and increase access to bandwidth.

**Further research, and research gaps**

There is virtually no research currently relating to mobile learning and Indigenous peoples in Canada. Most of the available data examined for this synthesis focused specifically on e-learning as a broad extension of technology integration and Indigenous education in Canada. The data presented on the global context for m-learning earlier in this synthesis clearly indicate that Canada lags behind the global community in innovating, implementing, and reporting on the broad use of mobile learning in support of education. And Canada also lags behind the global community in the application of mobile learning to support Indigenous learners. Concerted efforts need to be made by researchers to fill these gaps. I propose three specific areas of future research based on my current research agenda and gaps identified in this knowledge synthesis report.

1. **Mobile Assisted Language Learning: A Hul'q'umi'num' case study**

I am currently part of a team of Hul’q’umi’num’ knowledge holders and researchers, including members of the University community, the Coast Salish Education and Training Society and the Cowichan Tribes, that were awarded a 3 year $200,000 SSHRC partnership grant to construct a program aimed at supporting the revitalization of the Hul’q’umi’num’ language by teaching language through canoe culture. Canoe culture is central to the traditional and modern life of the Hul’q’umi’num’, a Coast Salish people of British Columbia. Our team of Hul’q’umi’num’ knowledge holders and researchers are documenting the language of canoe culture and developing a variety of resources to be used by teachers and coaches in their efforts to integrate the use of the language into canoe club activities. There are a dozen clubs in the Hul’q’umi’num’ territory, each with around twenty members of all ages and genders. An overarching goal of the project is to support a fun, interactive, and culturally authentic approach for youth to connect with their Coast Salish heritage.

I am currently working with project and community stakeholders to discover the most accessible and practical mobile delivery platform to host the online Hul’q’umi’num’ multimedia reference material being developed by the project’s linguists and Elders. These e-learning materials include pictures, audio files, and videos of paddling events. Many Hul’q’umi’num’ do not have home computers, but most under the age of fifty have smart phones or tablets with connection to the Internet. Due to the widespread use of handheld devices, developing mobile learning resources is one of the most practical approaches to supporting culturally-
based language immersion. Mobile learning applications are ideally suited for the delivery of comprehensive, individualized, and dynamic learning content in real time at whatever location. This project just received additional funding from a Telus Community grant to assist in exploring best practices related to developing MALL Hul’q’umi’num’ resources.

2. **Aligning Indigenous epistemologies and pedagogies with education technologies**

More research is required to further explore how the development of mobile learning resources can closely integrate and align with indigenous epistemologies and cultural pedagogies. It is essential to reach out to Indigenous communities, learners, educators, and organizations to explore collaborative opportunities for mobilizing educational technologies as tools of empowerment to support decolonization and reconciliation within the Canadian education sector.

3. **Broad based case study research: Linking theory with practice**

It would be very worthwhile to conduct additional deeper research on the impact of the case studies highlighted in this synthesis report. Of particularly importance is additional research to further explore and report on the few Indigenous mobile learning initiatives currently being piloted in various regions across Canada; and the possibilities of integrating mobile and contextual learning to expand and build upon the successes of Indigenous e-learning frameworks. This case study research provides and excellent opportunity to link the excellent work of Canadian mobile learning experts and instructional designers with practical examples of Indigenous mobile learning within a Canadian context. Efforts should also be made to learn and apply lessons from the extensive global context of mobile learning research.

**Knowledge mobilization**

As a scholar-practitioner I value the dissemination of my research results and mobilization of the knowledge generated to multiple sectors and stakeholders. This knowledge mobilization plan focusses on reaching out to both academic and non-Academic audiences, with key deliverables highlighted in both areas, and an understanding that there is broad overlap between these sectors.

**Academic**

1) *Write 1 Journal article: A critical analysis of MLTs in the Canadian context and their application to Indigenous education issues: Childhood Education; Diaspora, Indigenous, and Minority Education; Cultural Survival:*

A large portion of this journal article is written. I anticipate submitting this article to peer review in January 2016. I have not yet selected the journal to submit the article to.
2) **Present at 1 International academic conference:**

In October I attended the 14th annual mLearn International Conference held in Venice Italy. This conference is hosted by the International Association for Mobile Learning and is considered the most important event in the area of mobile and contextual learning. I presented a short paper based on the results of this synthesis research and received excellent feedback from delegates. I also had an opportunity to build my network of mLearning experts and spent some quality time discussing new and emerging trends in the area with international mLearn experts like Mike Sharples, Marcus Specch, Tom Brown, and David Parsons.

3) **Present at SSHRC Knowledge Synthesis workshop:**

In November 2015, I will present the findings of this knowledge synthesis research at the SSHRC KSG workshop in Ottawa.

4) **SSHRC KSG Final Report**

This substantial final research synthesis report was prepared for SSHRC and submitted October 30, 2015.

5) **Presentation of research to Royal Roads Academic community: Roads to Research:**

I will work with the research office at Royal Roads University to develop a strategy to mobilize my research synthesis findings to the wider university community. Instead of hosting a synchronous face-to-face meeting I am considering posting an interactive video presentation to my online portfolio ([www.siomonn.pulla](http://www.siomonn.pulla)) to make the results more widely available.

**Non-academic**

1) **A policy report highlighting mLearning and Indigenous Education in Canada:**

I will use this SSHRC KSG report as a template to develop a policy report on the findings. This report will be geared towards the public, private and education sectors identifying best and next practices with regard to MLTs and their applications for Indigenous learners in Canada (Aboriginal Affairs and Northern Development/BC Ministry of Education/ First Nation Schools Association/the BC School Trustees Association/the BC Teachers' Federation/the BC Principals and Vice Principals’ Association/Assembly of
First Nations/Nunavut Tungaavik Inc/Inuit Tapiriit Kanatami/Metis Nation of Canada/Telcom Companies) This report will be available as a free download from the Royal Roads University website and I am working with the University media relations office to develop and issue a press release to national, regional and provincial press outlets.

2) **Blog posts on research on Website: [www.siomonnpulla.com](http://www.siomonnpulla.com):**

I will be posting excerpts from this report as blogs on my website. I will also use this platform to share my interactive video presentation.

3) **Twitter updates and cross posts:**

I continue to use social media to highlight aspects of mLearn and Indigenous education and connect with interdisciplinary experts in the field. I will also use this platform to share links to my interactive video presentation.

4) **Public posts on Royal Roads social media**

I will be posting an article on Royal Roads University's social media platform “Crossroads” to share research findings and help to raise awareness and mobilize knowledge to wider community. I will also use this platform to share links to my interactive video presentation.
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