Looking to the Future to Understand the Past: A Survey of Pre-Service Teachers' Experiences with Digital Technologies in Relation to Teaching History

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Abstract

Digital technologies have the potential to enable history teachers to engage student learning, meet diverse learning styles, present a diversity of perspectives, and foster historical inquiry. Pre-service teachers entering today's Canadian faculties of education are surrounded by more technology than their predecessors. But are they equipped with requisite knowledge and strategies to integrate these technologies effectively into their classrooms? This exploratory study used a cross-sectional survey to investigate pre-service teachers' experiences with digital technologies in relation to teaching history. By doing so it provides a context for further research into the pedagogical impacts of integrating digital technologies into history classrooms.

Keywords: pre-service teacher education, technology integration, history education, digital technologies and literacies, educational technology

Introduction

While it seems paradoxical, historians are turning to the future to investigate the past. Digital archives, digitally-recorded oral histories, virtual museum exhibits, and web simulations are but some of the technologies being used to preserve and present the past. The corollary is that educators now have at their disposal innovative tools to teach and engage students in "doing history" (Levstik & Barton, 2001). Traditionally, students learned—and continue to learn—history by reading approved textbooks and memorizing established facts. In a survey on the popular uses of history in American life, "boring" was the most commonly used adjective to describe the school subject of history; many respondents cited teachers' overreliance on textbooks and rote learning for embittering their love for history (Rosenzweig, 2000, p. 275). At the other end of the spectrum are those who envision technology as a panacea for all pedagogical woes, imagining that once students are given technology, their engagement and learning will naturally follow (see, for example, Bennett, Maton, & Kervin, 2008; Prensky, 2001). Somewhere along the spectrum are history educators who, to varying degrees, are using technology in innovative ways to engage students in active and meaningful learning of history, using such platforms as the Virtual Historian. These teachers are not alone in their quest for more authentic learning with technology. Research suggests that new technological tools can make the implementation of authentic and critical historical learning both in university and K-12 classrooms more effective and engaging (Brush, Ottenbreit-Leftwich, Saye, Glazewski, & McCormick, 2011; Hillis, 2010; Marri, 2005).

Pre-service teachers entering our faculties of education today often surround themselves with technology in their personal lives such as but not limited to tweeting, blogging, googling, and social networking with each other outside of the classroom. Because of this overwhelming presence and extensive use of such emergent 2.0 technologies and their respective digital literacies, teacher educators sometimes assume that future teachers will naturally integrate technology into their pedagogical practices. But do they? This study is the first phase of a larger Canadian-funded project designed to help educators develop pedagogical strategies to make effective use of digital technologies in their history teaching.[1]

To accomplish this objective, the first phase of the project employed a comprehensive survey that examined pre-service teachers' perceptions of the digital literacies they employ to construct historical knowledge. Moreover, the survey examined students' experiences with the use of technologies to teach and understand history in the elementary, high school and university classrooms. Subsequent phases of this federally-funded project (an Insight Development Grant) utilized eye-tracking methodology and software to analyze pre-service teachers' use of historical thinking skills and digital literacies to negotiate a Web-quest examining the historical content of a virtual exhibit on Canadian residential schooling Where are the Children? These same students were then afforded an opportunity to use oral history technologies, like the Canadian online software Stories Matter, to construct life history narratives of Algonquin First Nation elders' educational experiences on and off their reserve located in northwestern Québec.

Each phase of this project in part seeks to address the following overarching question: If history educators and education policy makers are calling for the integration of historical thinking skills in the new social studies curriculum here in Ontario, Canada, and the Ministry of Education is also calling for the integration of emergent technologies to build public confidence in our schooling system, then what is the current status of teacher candidates coming into our program in terms of their digital literacies and historical thinking skills?

Although our larger research project examines the relationships among digital literacies and content areas like history, in this article we will specifically examine pre-service teachers' perceptions of their digital literacies in relation to their perceptions about technological, pedagogical, and content knowledges for teaching history. Therefore, during the first phase of the research project, we sought to investigate how pre-service teachers understood their relationship to digital technologies. More specifically, we asked the following research questions:

1. What are pre-service teachers' experiences with digital technologies?

2. Do pre-service teachers' perceptions of technologies shape their understandings of pedagogical content knowledge in school subject areas like history?

3. Do pre-service teachers perceive that digital technologies play a role in enhancing their historical content knowledge?

What follows is a review of work that has assessed the integration of technology and student perceptions of technology in relation to the acquisition of history content knowledge through technology.

Teacher Education as a Conduit for Technology Integration

In a recent memorandum to the directors of education, the Ontario Ministry of Education called for school boards to develop strategic pilot projects that will examine the shifting landscape of learning environments across the province in terms of integration of emerging technologies such as cloud-based computing and hand-held mobile devices.

> *While technology, including some emerging technologies such as cloud-based computing and mobile technologies, is an active component of these local innovations in teaching and learning practices, it is clear that the prime innovation focus is where it needs to be—on improving, strengthening, extending and sometimes transforming the instructional core, with students at the heart as important partners and active agents in the inquiry and continuous improvement process.* (Ontario Ministry of Education, 2012)

Consequently, the Ontario Ministry of Education has called for school districts and faculties of education to study what kinds of strategic plans are being developed to promote innovations that address the emergent educational relationships among pedagogy, technology, and change in order to educate what it calls "digital citizens" with the necessary "digital literacies" and prepare them to contribute to 21st century society. Moreover, part of the government's strategic plan is for school boards to assess the integration of 21st century cloud-based learning environments, school libraries, digital learning resources, and best practices for integrating Bring Your Own Device into this shifting landscape of the public school learning environment.

Until the digital revolution of the 1990s, communication was slower and information harder to find and retrieve. Now, the explosion of the Internet has brought with it an amazing mass of information generated at an astounding pace. As the aphorism goes, "Getting information off the Internet is like taking a drink from a fire hydrant" (Kapor, n.d.). Even domains of knowledge such as history have been affected directly by the digital revolution. Instead of searching for old scraps of paper in archives, historians are now confronted with an overwhelming number of sources, and what is worth preserving is a matter for continual decision making. Ministries, school districts, and teachers across Canada are in the midst of restructuring their systems, updating their physical infrastructure

with wireless technologies and SMART boards, revising their curriculum guidelines, as well as experimenting with the pedagogical practices necessary to address the societal, cultural and technological demands of the 21st century. However, within the contexts of educational research there is still relatively little experimental or exploratory research on how teachers and students, within a specific subject area such as history, are developing the necessary curricular and pedagogical strategies for responding to the new demands of the current digital media integration across the public school system. Therefore, our Making Digital Histories initiative seeks to examine how educational researchers and pre-service teachers can utilize the various digital media to develop the necessary research methodologies, teaching practices and respective digital literacies to critically consume, produce, and disseminate historical knowledge on the Internet.

For more than a decade, educators have witnessed a significant mobilization toward integrating technology within teacher education programs across North America (Owings Swan & Hofer, 2008; Zhang & Martinovic, 2008). Though some still see technology as a supplemental teaching tool—something to be used only once the curriculum has been covered—many now posit that it is an essential pedagogical element of training future teachers for the 21st century. It is no surprise then that school curricula across Canada are changing to reflect the importance of ICT in providing "a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' learning" (Ontario Ministry of Education, 2005, p. 25). Thus, today's teachers are challenged with devising appropriate pedagogical strategies for integrating technology into their classrooms in order to prepare students for the demands of a world where digital technology has become increasingly ubiquitous. It is worth noting a caveat here concerning the challenge of shifting understanding away from vague articulations toward meaningful praxis; in other words, there is "the notion that the students and teachers might be distracted by the 'bells and whistles' of the technology and be less focused on the achievement of expectations or evidence of critical thinking" (Beggs, Shields, Telfer, & Bernard, 2012, p. 159). This speaks to the overarching goal of the Making Digital Histories Project, which seeks to understand how faculties of education can prepare pre-service teachers not only to use technology, but also to use technology to further/promote historical thinking competencies in their classrooms.

Compounding the problem of vague articulations of technology integration are the *prima-facie* accounts of youth being inherently adept at using digital technologies in their personal and academic lives. On the contrary, a growing body of research suggests "young people's engagements with digital technologies are varied and often unspectacular—in stark contrast to popular portrayals of the "digital native" (Selwyn, 2009, p. 364). That youth lack the digital literacies presumed upon them further evinces the integral role for teachers in developing students' ability to critically consume and produce digital media. In a way, pre-service teachers present a unique opportunity for integrating technology in the history classroom because of their extensive exposure to technological devices and potential role as agents of change. This is suggested by one study's findings that established teachers gradually become entrenched in their existing teaching practices by integrating technology, if they do so, in traditional ways (Owings Swan & Hofer, 2008). Novice teachers, on the other hand, would presumably be more flexible in their teaching style and openness to new evolving approaches.

Leveraging Technology in the History Classroom

Historical thinking is not about memorizing facts and accumulating knowledge about who fought whom in which war. Rather, thinking historically is about fostering a deep understanding of historical events through the active and critical engagement of historical texts (Lévesque, 2008). Moreover, it

involves fostering a critical and inquiry-based mindset whereby students challenge their assumptions about the present in the light of an historical context. Following the initiative of the Centre for the Study of Historical Consciousness at the University of British Columbia, Canadian researchers have identified key concepts that provide the basis of historical thinking: establish historical significance, use primary source evidence, identify continuity and change, analyze cause and consequence, take historical perspectives, and understand the ethical dimensions of history (Centre for the Study of Historical Consciousness, 2012; Lévesque, 2008). In turn, the ability to use these concepts in doing history suggests an active rather than passive process of learning about the past, one in which knowledge is (co)constructed, not simply absorbed. If doing history requires active engagement with the content of history, how might digital technologies afford students and teachers this possibility?

Historical thinking, as Lévesque (2008) stresses, is about more than memorizing facts, it "requires the acquisition of such knowledge to understand the procedures employed to investigate its aspects and conflicting meanings" (Lévesque, p. 27). Similarly, appropriating digital literacies is about, as Glister (1997) suggests, "mastering ideas, not keystrokes" (p. 2). What Glister and others (Eshet-Alkalai, 2004; Lankshear & Knobel, 2008) are alluding to is that to become digitally literate, one must move beyond a simple mastering of technical skills (Lévesque, 2010b). Moreover, these kinds of literacies encourage students to develop the necessary intellectual and technical capacities for effectively locating, critically evaluating, synthesizing, and communicating (Leu et al., 2007; Lévesque, 2010a) information using a range of technologies, while being aware of how various media both afford and constrain the ways in which historical knowledge is constructed and/or represented. More recently, there has been a move to replace the term *digital literacy* (Glister, 1997) with *digital literacies* (Lankshear & Knobel, 2008) in order to acknowledge how language is always situated as a socially, culturally, and linguistically constructed phenomenon. That is to say, there is no single form of literacy just as there is no single interpretation of history; but rather, in the proverbial contexts of a global village, there exist a number of literacies and historical narratives, as reflected in the eclecticism of digital contexts.

Once grounded in the "trinity of the archive, the library, and the book" (Allison, 2008, p. 343), history teachers now have a plethora of digital tools at their disposal to engage student learning, meet diverse learning styles, present a diversity of perspectives, and foster historical thinking inquiry. While traditional textbook and lecture learning may have been the mainstay of history teaching, digital texts present novel and varied representations of historical events that have the potential to engage students with a multiplicity of learning styles and preferences (see, for example, Allison, 2008; Schneider, King, Kozdras, Welsh, & Minick, 2010; Taylor & Duran, 2006). Using these digital technologies not only helps level the playing field for some students with learning exceptionalities (Taylor & Duran, 2006), but also enables teachers to differentiate instruction and assessment for all learners. Instead of merely reading about history in print texts, students can use digital technologies to do history,[2] that is, to engage in the disciplinary process of investigating the past from relics and records (Levstik & Barton, 2001; Kohlmeier, 2005).

In addition to meeting a variety of learning styles while engaging students in doing history, digital technologies are often used to promote a diversity of perspectives. While many educators bemoan traditional classroom history textbooks for presenting a meta-narrative (Pinar, 2012) laden with a literature of dominance (Ng-A-Fook, 2007), digital history texts often subvert traditional gate-keeping functions allowing a greater diversity of perspectives. For example, a case study of an under-resourced high school demonstrates how one history teacher "presented viewpoints from both

Whites and African-Americans while studying both the events surrounding the 1964 murder of civil rights workers in Philadelphia, Mississippi, and desegregation" because he lacked textbooks and because the text resources to which he did have access "provide only one viewpoint" (Marri, 2005, p. 402). Although textbooks can certainly provide a multiplicity of perspectives (see Steinberg & Bar-On, 2009) just as digital spaces (such as Wikipedia) can reproduce certain dominant narratives, digital technologies can afford readers and users an opportunity to engage and shape historical knowledge. Aside from linear articles and essays, digital texts are increasingly taking the form of virtual simulations, serious games,[3] and massively multiplayer online role-playing games (MMORPGs) that provide a "breadth of real immersion in the historical past that was previously not possible" (Allison, 2008, p. 344). The History Game Canada, for example, is a serious game based on the well-known platform of Civilisation III where players are encouraged to revisit key chapters in Canadian history and engage in counterfactual ("what if?") scenarios using different actors and perspectives (French, English, Aboriginal).

Finally, technology affords greater opportunities for historical thinking. As mentioned earlier, one of the key concepts of thinking historically is the use of primary source evidence (Centre for the Study of Historical Consciousness, 2012). An example of leveraging technology to investigate primary source evidence is through virtual simulations or learning to assess material found within digital archives. In the past, viewing primary sources may have involved an expensive and time-consuming trip to a museum or to the archives located outside one's region or country. Now virtual reality simulations can be used on an on-going basis to examine a variety of primary sources. For example, Sykes (1999) outlines an example in which students "travel" to "a variety of three-dimensional historical locales as varied as Mayan temples to a battlefield from the War of 1812" (pp. 61–63), and in so doing, engage a variety of primary sources including maps, photographs and plans. In contexts like this, digital technologies offer innovative ways of learning that were previously more challenging (although not impossible) in a classroom without access to digital technologies.

Contesting Technology's Place in the History Classroom

In a recent edition of the *Nordic Journal of Digital Literacy*, Beck (2011) cites a joke popular among those in computer science: "This design provides a great solution, we just have to find the problem for which it's an answer" (p. 283). Beck extrapolates this to the state of education, noting that technology is often seen as *the answer* to the problem, but what that problem is, no one really knows. Unfortunately, in classrooms, this unquestioned use of technology often manifests itself in teachers using technology for technology's sake. Uncontested are the affordances and limitations of various technologies, the ways in which technology used superficially can mirror traditional learning, educational policy which values creating a skilled workforce over creating critical members of society, and issues of the digital divide in regards to access—physical, financial, social, political, and educational (Van Dijk, 2006). Additionally, although integrating technology into the classroom may be laudable in theory, in practice it is seldom done—or at least, seldom done effectively: "Many researchers have accounts of it either not happening, happening too slowly, or happening with no effect on teachers' or students' learning" (Mishra & Koehler, 2008, p. 2). While these are valid avenues for further investigation, the focus of this study is on describing pre-service teachers' perceptions and experiences with technology in relation to teaching history and acquiring historical content knowledge.

The Pedagogical Complexities of Diffusing Digital Literacies in the History Classroom

While technology has always been a part of learning—whether it has been in the form of traditional pen and paper or cable television—it has risen to the forefront with the advent and increasing ubiquity of digital technologies. As such, prescient educational researchers and policy makers have recognized the need for a model of preparing both pre- and in-service teachers to navigate the complex interplay between technology, pedagogy, and content knowledge. In places like Ontario, Canada, and elsewhere, this has been politically framed as an anteing up of educational reform predicated upon training teachers to better integrate technology so that students will be adequately prepared to meet the demands of the global economy (International Society for Technology in Education, 2000; National Council for Accreditation of Teacher Education, 1997). As such, there is a need for the diffusion of pre- and in-service teacher training for these digital technologies.

Compounding the challenge of technology integration and teacher development are discipline-specific challenges. For example, in history, reading and analyzing texts "present[s] challenges to readers that are qualitatively different from those presented by texts in other disciplines" (Lévesque, 2008, p. 42). Historians in effect read historical texts—whether print, visual, or oral—not as unvarnished truths but as constructed narrative arguments. This means getting students to "think like historians." Technology can be quite useful in these matters (Hicks, Doolittle, & Lee, 2004; Saye & Brush, 2006). However, knowing how to integrate technology successfully, coupled with knowing how to teach students to think historically, presents a daunting task—especially for novice teachers. To engage students in the 21st century, teachers must be able to effectively coalesce technological, pedagogical, and content knowledge with their daily teaching practices.

Until recently, a unified theoretical perspective has been lacking for those wishing to integrate technology into education. Research was piecemeal and researchers lacked a common vocabulary for describing the phenomenon. Mishra and Koehler's (2006, 2008) contribution of the TPCK/TPACK (Technological Pedagogical and Content Knowledge) model has been integral to understanding the complex, interrelated roles played by these three knowledge domains. While we did not draw upon the theoretical framework of TPACK to design our survey, we subsequently considered it as a tool to inform our analysis of data. We found it to be a valuable schema for understanding the relationship between pre-service teachers' technological and history content knowledges as well as, tangentially, their pedagogical knowledge. As a matter of fact, the Ontario Ministry of Education in Canada is asking educational researchers to study the relationships between emerging technologies and curriculum reform in disciplines such as history. Current reforms to the Ontario curriculum are calling for teachers to integrate both historical thinking and digital literacies into their pedagogical strategies for teaching history. However, the kinds of knowledges (technological, pedagogical, and content) and respective literacies that pre-service teachers bring with them into teacher education programs remain unclear. This critical problem is further complicated by a dearth of knowledge on how Canadian history educators prepare pre-service teachers for the integration of technological and disciplinary challenges in school education. In response to this, and in relation to the context and content of our survey, we believe that TPACK provides an effective conceptual representation to understand the complex relationship among technological, pedagogical, and content knowledges—despite some of its theoretical limitations (Graham, 2011; Roneau, Rakes, & Niess, 2012).

Mishra and Koehler's (2008) recognize that, though technology has long been a fixture in the classroom, it has recently manifested itself as an integral part of learning as digital technologies move to the forefront. Thus, they added technology as a third key knowledge domain to Shulman's (1986) PCK model, leading to the conceptualization of TPACK: "At the heart of TPCK is the dynamic, transactional relationship between content, pedagogy, and technology. Good teaching with technology requires understanding the mutually reinforcing relationships between all three elements taken together to develop appropriate, context-specific, strategies and representations" (Koehler, Mishra, & Yahya, 2007, p. 741). That is to say, it takes more than being technologically savvy to successfully integrate technology into teaching a given content area. According to Mishra and Koehler (2008), it is in the intersection of all three bodies of knowledge—not in isolation but as an emergent, dynamic form of integrative knowledge—that technology is successfully embedded in classroom teaching (see Figure 1). The TPACK model encompasses three major knowledge domains, those being Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK). Mishra and Koehler (2008) suggest that each of these knowledge domains exists in isolation, but also in relation to one another, thus adding an additional four knowledge domains created by the intersection of these domains with one another. These domains are known as Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), and finally, Technological Pedagogical Content Knowledge (TPACK), the sum of all the hitherto mentioned knowledge domains.[4]
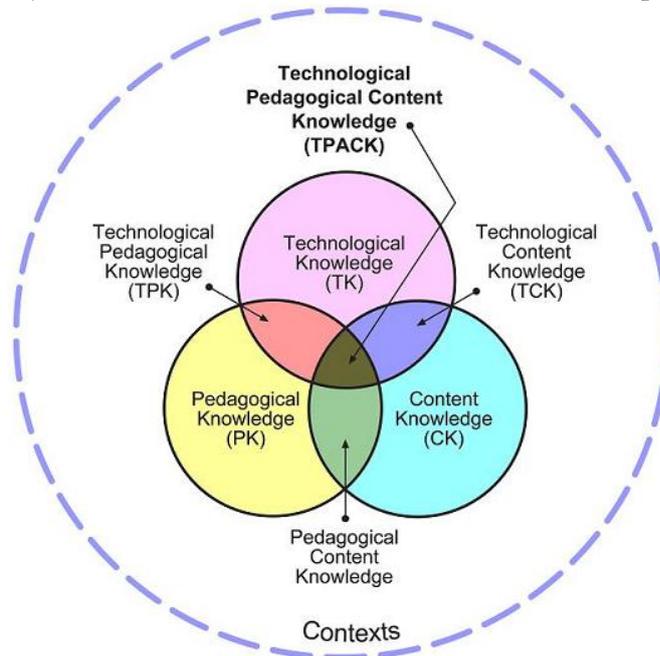

Figure 1. Mishra and Koehler's (2008) TPACK framework and its constituent knowledge domains. Reproduced by permission of the publisher, © 2012 by tpack.org

While we acknowledge the utility of TPACK as a conceptual framework, we also recognize its limitations, many of which are best summarized by Graham (2011). In Graham's view, while TPACK may have potential as a model, it suffers from flaws that limit its theoretical usefulness. Primarily, he suggests that the model is plagued by conceptual clarity and ambiguous boundaries between concepts. Additionally, Graham argues that "researchers must establish clearer rationales for why each construct in the framework is essential and how they all contribute to a better understanding of issues faced by practitioners" (p. 1959). Graham's critique of the ambiguity of

TPACK's constructs resonated in our own project as we were left grappling with the ways in which historical thinking and digital literacies both conformed to and were complicated by TPACK as a framework.

Finally, while TPACK serves a useful descriptive function for understanding the interconnections between technology, pedagogy, and content (Roneau, Rakes, & Niess, 2012), its consideration of the issue of technology adoption across disciplines such as history is inchoate. For a complex, yet nuanced, discussion of technology adoption, we favour Rogers' (2003) theory on the diffusion of innovations. While it is beyond the scope of this article to discuss theory in any detail, we briefly describe it here.

Rogers' (2003) diffusion of innovations model[5] is arguably the most prominent of diffusion models. In his seminal work *Diffusion of Innovations*, first published in 1962, Rogers synthesized 508 studies in order to generate this model. The appeal of the model lies in its comprehensive approach to understanding innovation diffusion, drawing from both the fields of psychology and sociology to explain the complex mechanisms involved in the spread of innovations through a population. For Rogers, innovations are broadly defined as any idea, practice, or object that is perceived as novel by an individual (Rogers, 2003). Rogers' model is by far the most comprehensive, taking into account the numerous stages involved before, during, and even after, a person's innovation-decision—the term Rogers uses to describe a person's eventual adoption or rejection of an innovation. In the context of the Making Digital Histories Project, we are concerned with the innovation-decisions of pre-service teachers, who for various reasons, choose to adopt or reject the integration of technology in the history classroom. Our survey seeks to contextualize this very issue.

Methods

Research Design

To better understand the context from which pre-service teachers enact digital and historical literacies, quantitative data were collected in the form of a cross-sectional survey. The Making Digital Histories (MDH) survey was influenced by the Educational Center for Applied Research (ECAR, 2010) Study of Undergraduate Students and Information Technology, an annual large-scale survey of North American undergraduate students' experiences of learning and daily practices with digital technology. The survey design and content of ECAR asked key questions that could help us situate and learn more about our participants' experiences with digital technologies. While our MDH survey asked questions similar to those of ECAR in terms of general digital technology use, it went beyond that to specifically examine pre-service teachers' knowledge of and experiences with using digital technologies in the context of their differing pedagogical approaches for teaching history. The survey included 12 items about demographics, 10 about technological knowledge (TK) and practices, and eight about (historical) content knowledge (CK) and practices. There were no survey items directly concerning the participants' pedagogical knowledge (PK) since the pre-service teachers were only at the beginning of their program. However, PK and experiences were indirectly assessed through questions about participants' perceptions of their teachers' technological, pedagogical, and content knowledge. In Table 1, we provide sample survey items for each section of the MDH survey. Most of the survey items used a four-point Likert-type scale, though there were also some multiple-choice items.[6]

Table 1. Sample Survey Items

Survey Section	Sample Survey Items
Demographics	• Gender, Year of Birth, Citizenship, etc. • What program of study are you currently enrolled in at the Faculty of Education?

TK & Experiences	• How often do you do the following for school or work?
	  • Social networking, texting, instant messaging, blogging, etc.
	
	• What is your skill level for the following?
	  • Using the Internet to effectively and efficiently search for information; Evaluating the reliability and credibility of online sources of information; Etc.

CK & Experiences	• In your opinion, what is the most pertinent source of information to use in history class? (Rank in order of importance.) • Textbooks, archives, movies/TV, Internet, computer games/simulations
PK & Experiences	• My professors provide their students with adequate training to use technology for their coursework. (Likert scale)

Setting and Participants

Volunteer participants for this study (n = 124) were recruited from the compulsory history methods courses in a faculty of education at a large Canadian bilingual university, of which the participants were 23% Francophone and 77% Anglophone. A typical student in the study was born in the 1980s (87.5%), has lived in Canada his or her entire life (94.8%), has history as a favourite high school subject (50.9%), and is enrolled in the Bachelor of Education Intermediate/Senior program (57.3%) to teach students at the Grades 7–12 level. Data were collected in the Fall of 2011, during the beginning of the participants' teacher education training, using an online survey software program.

Results and Discussion

Both descriptive and inferential statistics were computed using quantitative data analysis software. The data obtained from our MDH survey provide important contextual information for understanding the digital practices of pre-service teachers learning how to teach history at a faculty of education in a large Canadian university. While these results might be extrapolated to pre-service history teachers more generally, more research is needed to establish external validity.

Participants' Technological Knowledge (TK) and Experience

In terms of TK and use, the majority of students (55.7%) in our MDH survey describe themselves as "early adopters" of technology ($M = 3.95$, $SD = .84$) according to Rogers' (2003) adopter categories. To determine adopter categories, researchers used the same survey item as used in ECAR (2010). Table 2 describes the survey item used to measure this variable, and displays the results of participants' adopter category scores. Our finding that the majority of pre-service teachers consider themselves early adopters of technology corresponds to the National Center for Education Statistics (2000, 2007) finding that novice teachers feel better prepared to teach with technology than experienced teachers, of whom only a third expressed their preparedness to do so. Research shows that many factors influence technology adoption including the attributes of the technology itself (namely relative advantage, compatibility, complexity, trialability, and observability), the nature of the social system (norms, degree of networking, opinion leaders, etc.), as well as individual factors (such as socio-economic status, culture, age and gender) (Corrigan, 2012; Rogers, 2003). Clearly, addressing technology integration will require a multifaceted approach. And even though our participants may be early adopters of technology in their personal lives, subsequent phases of our study reveal that many are still reticent to integrate technology in the history classroom.

Table 2. Participants' Technology Adoption Scores

ECAR Survey Item: Which best describes you?	ECAR Descriptor	Percent of MDH (2011) Participants
I am skeptical of new technologies and use them only when I have to.	1 = Laggard	0.9
I am usually one of the last people I know to use new technologies.	2 = Late adopter	6.1
I usually use new technologies when most people I know do.	3 = Mainstream adopter	13.9
I like new technologies and use them before most people I know.	4 = Early adopter	55.7
I love new technologies and am among the first to experiment with and use them.	5 = Innovator	23.5
	Mean Median Mode *SD*	3.95 4.00 4.00 .84

Another survey item asked students to self-assess their skill level at a variety of technological tasks, from searching for information online to using graphics software (see Figure 2). Not surprisingly, there is a significant, positive relationship between the participants' mean self-assessed technology skill level and technology adopter categories, $r(113), = .26, p < .01$, which corresponds to a medium effect size. In other words, the data suggest that the more comfortable participants feel using a variety of technologies, the more likely they are to adopt new technologies.
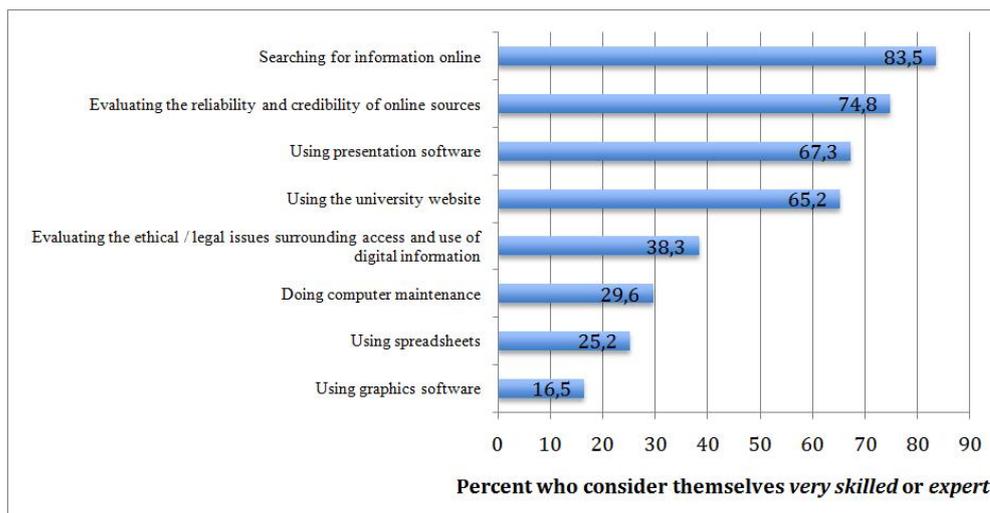
Figure 2. Participants' self-assessed ICT skill level

An independent-samples *t*-test was then conducted to compare adopter categories between males and females. The test revealed that females ($M = 3.65$, $SD = .832$) have significantly lower adopter category scores than males ($M = 4.29$, $SD = 4.29$), $t(112) = p < .05$, $d = .83$, which is considered a large effect size. Females ($M = 3.07$, $SD = .67$) are also significantly less likely than males ($M = 3.37$, $SD = .69$) to prefer courses that integrate technology, $t(109) = p < .05$, $d = .44$, which constitutes a medium effect size. There was no correlation between age and adopter categories, $r(114) = .02$, $p < .05$. It should be noted, however, that the large majority of students who participated in our survey were born in the 1980s (87.5%), leaving a relatively small sample size for comparison among other age cohorts. These results suggest that gender plays a role in determining students' use of technology, while age does not. Specifically, males are more likely to be what Rogers (2003) classifies as "early adopters" and females "mainstream adopters" when it comes to integrating technology into their classroom teaching. Similarly, male students tend to prefer courses with more technology integration than their female counterparts. These findings are consistent with those of ECAR (2010), which has also noted a "persistent gender difference, and once again this year [2010] about half of the male respondents see themselves as innovators or early adopters (52.0%), while just a quarter of females (25.6%) choose these categories" (ECAR, 2010, pp. 38-39). It is therefore incumbent upon faculties of education to recognize and address this gender gap, though the issues of technology adoption are anything but facile.

Aside from gender differences on the use and perception of technology, we also found a difference between the way participants use technology at school or work versus for recreation or leisure (see Figure 3). The university library website, presentation software, and spreadsheets are technologies that are used considerably more for school or work than for recreation or leisure. Conversely, virtual worlds, MMORPGs, and Webcasts are used more frequently for recreation or leisure. There was no significant disparity between home and work environments in the use of technologies such as audio software, video software, using the Internet from a hand-held device, downloading music or videos, social networking, and text messaging.
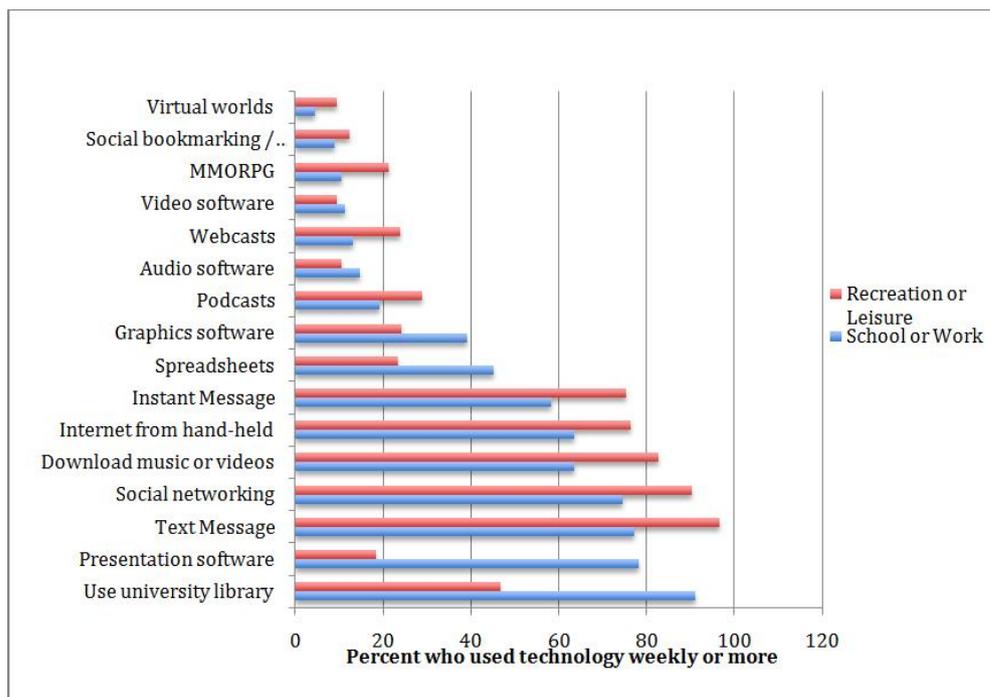
Figure 3. Technology use at 'school or work' versus 'recreation or leisure'

Therefore, although teacher candidates perceived themselves as competent at using more established digital technologies such as websites and presentation software, they were less so with newer online technologies such as MMORPGs, virtual worlds (such as Second Life), and Webcasts. This corroborates other research findings such as those of DeWitt (2004) who found that the primary approach most social science teachers have to technology integration is that of "technology enhanced traditionalism." Other studies support this finding according to which teachers favour technologies that supported traditional, teacher-centred instruction (e.g. using PowerPoint to present a lesson; see also Tondeur, van Braak, & Valcke, 2007). As Earle (2002) asserts, "[i]ntegration is defined not by the amount or type of technology used, but by how and why it is used" (p. 8). In light of this, more work needs to be done with pre-service teachers to further their understandings of technology's capacity to broaden student engagement with disciplinary techniques.

Our data also concerned participants' ownership of electronic devices, their opinions regarding learning with ICT, and their opinions about professors' ICT use. Figure 4 compares computer ownership between the MDH (2011) and ECAR (2010) surveys. Our results show a decline in desktop usage combined with an upsurge in mobile device usage, though the extent of the increase was surprising.[7] Figure 5 illustrates students' learning preferences with ICT. While the majority of students (62.5%) prefer learning with a moderate amount of technology, it is also noteworthy that nearly one out of 10 students prefer a classroom with limited or no technology at all. Thus, discussions of integrating technology in the classroom would benefit from the recognition that some history teachers, even digital native teachers, are averse to using technology for learning. Figure 6 shows students' opinions of their professors' use of ICT. What we find problematic is that, while nearly half of education professors are using technology effectively, they are only about a third as likely to teach their students to do the same. This is a disconcerting finding when we consider that teacher educators play a key role in modeling effective use of technology. Effective technology integration, as suggests the research, begins with it being modelled in teacher education programs:

"[W]hen pre-service teachers are exposed to the use of technology in their preparation program, there is a strong probability that they will in fact use it later in their own classrooms" (Doppen, 2004, p. 254).
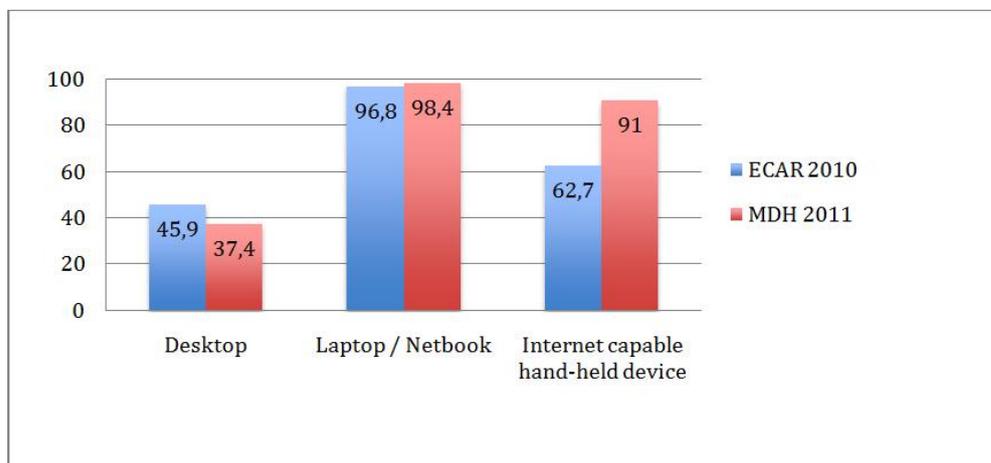

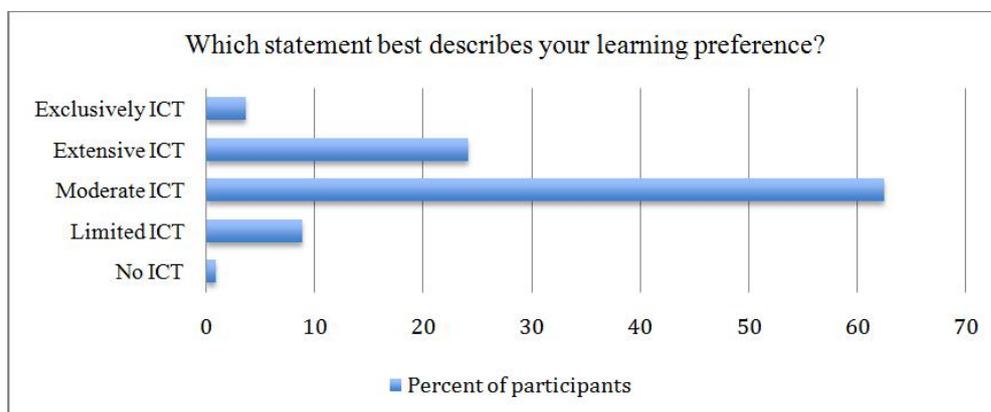*Figure 4. Computer ownership ECAR 2010 vs. MDH 2011*

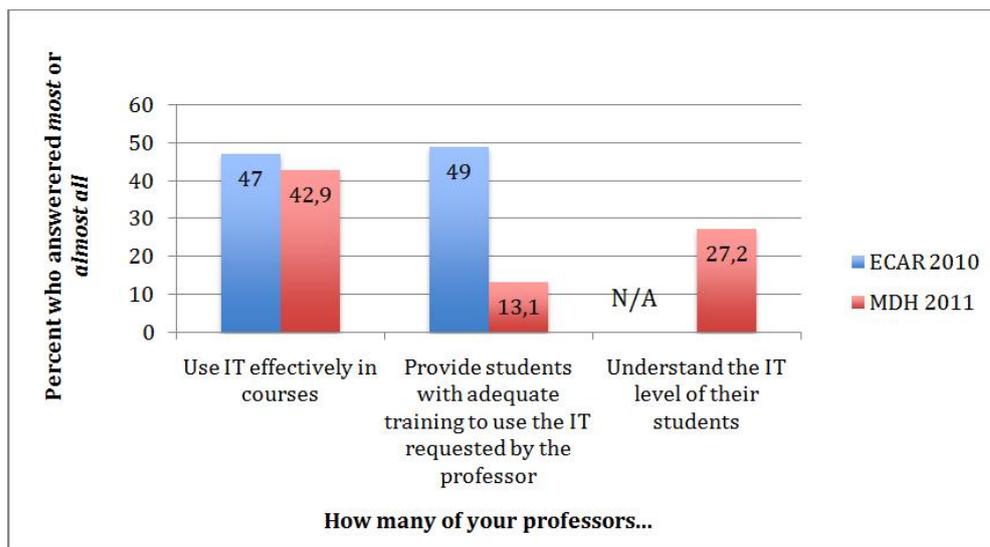*Figure 5. Students' learning preferences with ICT*

Figure 6. Professors' use of technology in the classroom

For pre-service teachers, merely having TK is insufficient: "Unfortunately, learning about technology is equivalent to asking teachers to hit a moving target. Teachers will never have 'complete' knowledge about the tools available, as they are always in a state of flux. This often results, then, in teachers being perpetual novices in the process of technology integration" (Ertmer & Ottenbreit-Leftwich, 2009, p. 259). Ertmer and Ottenbreit-Leftwich's (2009) research points to the need for faculties of education to engender in their teacher candidates strong self-efficacy for teaching with technology. Additionally, a growing body of literature suggests that knowing about technology and pedagogy in isolation is insufficient for preparing teachers for the discipline-specific demands of teaching with technology (Angeli & Valanides, 2009; Harris & Hofer, 2011; Mishra & Koehler, 2006, 2008).

Participants' Content Knowledge (CK) and Experience

In addition to TK, the TPACK framework also includes content knowledge (CK) as one of its major knowledge domains. One of our survey items looked at which sources our participants turned to for their historical content knowledge. We found a significant, positive relationship between those who use the Internet to search for historical information and those who consider the Internet a reliable source of historical information, $r(69) = .24$, $p < .05$, which corresponds to a small/medium effect size. In other words, those who consider the Internet a reliable source of information are more likely to use it to find historical information. However, in terms of how participants perceive the reliability of historical sources, 80.5% indicated that historians are the most reliable, while only 25% rank the Internet as a reliable source, as demonstrated in Figure 7. Ironically, the Internet is also the source that participants use most often, with 87% of students saying that they have used it to search for historical information seven or more times in the past year (see Figure 8). Also, only half of participants believe that the Internet is an important or very important source of information to use in history class, as shown in Figure 9.
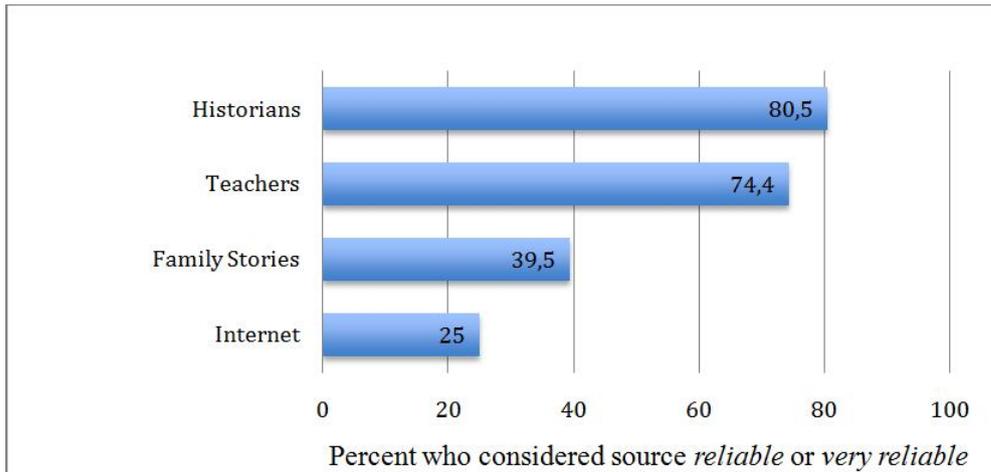
Figure 7. Participants' perceptions of the reliability of historical sources of information
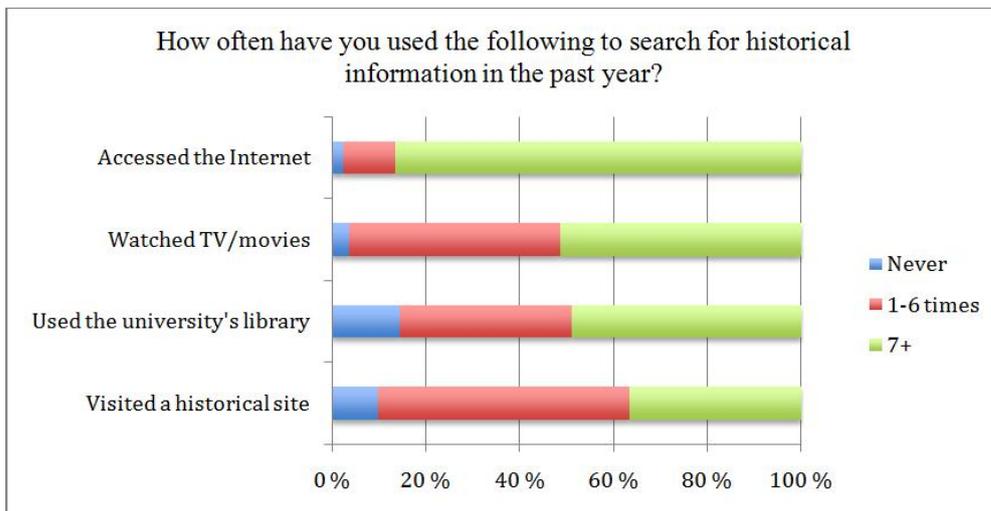

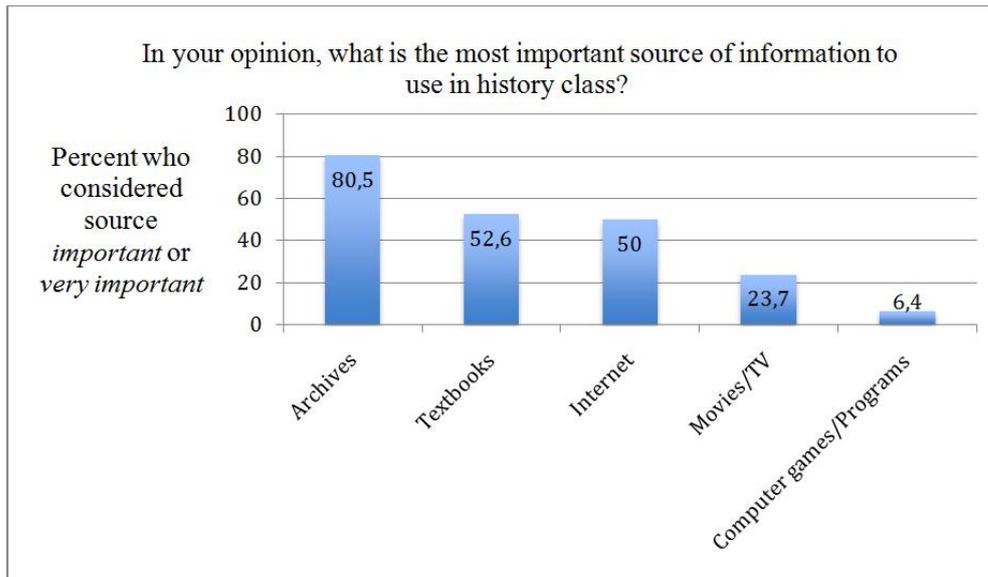*Figure 8. Use of resources to find historical information*

Figure 9. Perceptions about the importance of sources in history class

Even though pre-service students in the MDH study consider themselves early adopters of technology, it does not follow that they are necessarily adept at technology integration in the history classroom. We posit that the functions of technology in daily life are different from those required to teach history. Referring back to Figure 3, we notice how students more often use technologies associated with the context of day-to-day living (e.g. texting), and less often use technologies that the literature (e.g. Marri, 2005; Schneider et al., 2010) associates with student-centred historical learning (e.g. MMORPGs and virtual worlds). There are a number of explanations for this finding. For one, it is unclear whether technologies that student teachers typically use in their daily lives necessarily translate into meeting the current educational objectives of the Ontario Ministry of Education as well as the call by educational historians to integrate historical thinking practices in the classroom. Our research will continue to attempt to address this pressing question. However, as the literature shows (e.g. Mishra & Koehler, 2008), a key reason why many teachers adopt a traditional approach to technology in history is the lack of adequate training and relevant subject-specific learning objects. Though there now exists a plethora of digital resources (online archives, virtual exhibits, games, etc.), these are not necessarily designed as educational learning objects. This is one crucial reason why a number of experts have developed their own software and learning objects (e.g. Virtual Historian, Great Unsolved Mysteries in Canadian History, and the History Game Canada) better suited for the needs of the educational environment.

Our results show that pre-service teachers are technologically savvy, but these so-called digital natives are not necessarily competent in teaching with technology because, as the TPACK model suggests, technology use in the classroom is context bound. Along this same vein, research by Hughes (2005) posits that "the more content-specific the example, the more likely the teacher will see value and learn it" (p. 295). Sadly, only 46% of respondents in our MDH survey agree that their education is adequately preparing them for the workplace demands of technology use. Further compounding this problem is that, according to our survey, only 42.9% of professors effectively integrate IT in their courses, and merely 13.1% of professors provide their students with adequate training to use technology for their coursework. For today's secondary, university, and teacher

education students, existing digital practices in their institutions play an integral part in their learning experiences (Drotner, 2008).

Successfully integrating technology into history classrooms requires a complex interplay between both digital and historical literacies. MDH results revealed that, although pre-service teachers do not trust the Internet as a historical source, it is the resource they turn to most readily for historical information. This result has serious implications, forcing historians and history educators to ask questions about the reliability and perception of digital resources, and well as their place in the history classroom. A-linear texts (virtual simulations, MMORPGs, etc.) are especially suspect, with many regarding them as a "threat to the tradition of print literacies" and appropriate only for "non-school" literacy activities (Schneider et al., 2010, p. 186). As the data of our MDH study reveal, only 6.4% of pre-service history teachers believe that computer games and programs are an appropriate source of information for history class. But might these texts not be in some ways *more* representative of historical studies than traditional, linear texts? Holscher (1997) argues that, "one must look at every event in the past not simply as one historical narrative or through one perspective, but rather with the view that there can be an infinite number of histories for every event" (p. 319; as cited in Allison, 2008, p. 349). MMORPGs and virtual simulations can assist students in developing such a multi-perspective approach. Further, if pre-service teachers acknowledge that the Internet is the tool they use most often to seek historical information (Figure 8), yet also claim that it is the source that is the least reliable (Figure 7), it becomes all the more critical for teacher education programs to introduce historical thinking concepts to pre-service teachers so that they can critically and competently integrate online tools into the history classroom. In a follow up to our survey of pre-service teachers, we devised a series of professional development workshops to introduce pre-service teachers to the concepts of historical thinking in relation to their teaching practice, as well as ways in which to integrate online tools into the history classroom that support digital and historical literacies. This model shows great promise.

The TPACK model makes it clear that technology integration is context bound. In the history classroom, for example, students might play a MMORPG or serious game to develop a clearer historical perspective of people's social, political, and economic values during the time period of a significant historical event. In the context of the history classroom, teachers could use technologies in ways that challenge students to *do* history, not just *learn* history; this will entail moving away from teacher-centred practices and towards student-centred ones. This demonstrates the situated nature of learning in relation to TPACK. One cannot and should not integrate technology in the same way in history as in other subject areas. Our study highlights some of the tensions inherent with using technology to teach history, when the technology itself is gendered as a male practice, and further deemed unreliable and pedagogically suspect.

Conclusion

There is an urgent demand for research that informs faculties of education, teacher educators, school districts, and policy makers as to how to successfully prepare history teachers to integrate technology into the classroom. Our MDH study has attempted to provide some context for the current literature, while serving as a foundation for future studies. Teachers in general are hesitant to adopt educational technology, especially those outside of the fields of mathematics and science (Ertmer & Ottenbreit-Leftwich, 2009; Schneider, et al., 2010). Pre-service teachers are especially vulnerable, for "when faced with the stresses of teaching (an emerging skill) with technology (an emerging skill)

they may fall back on their personal classroom experiences as students and gravitate to the familiarity of traditional literacies" (Schneider, et al., 2010, p. 186).

Our research was designed to address three questions about the use of technologies amongst pre-service educators. In light of the results, we suggest that although pre-service teachers have extensive knowledge of and use technology on a fairly consistent basis, this does not translate perfectly into a penchant for using technology in their own learning and developing orientation to pedagogy. Second, the pre-service teachers, although largely dependent on technology in their daily lives, do not confer upon it a sense of trust when it comes to content knowledge in relation to other sources. In part, this may be reflective of their experiences with teachers who do not sufficiently train students to use technology effectively. Finally, there remains some ambiguity with regards to whether or not pre-service teachers see digital technologies as enhancing their history content knowledge. As noted, many pre-service teachers do not believe that digital sources such as the Internet are reliable yet they depend heavily on the Internet as a source. Although this may pose a problem, it does draw attention to the need to teach historical thinking skills, not historical content consumption, as the primary method through which to gain historical understandings.

It is incumbent upon faculties of education to model best practices of technology integration in a subject-specific manner. Further, teacher training must also offer a safe and supportive training ground for teacher candidates to experiment with educational technologies, and be exposed to a variety of technologies that encourage constructivist approaches to learning. Beyond that, beginner teachers must be provided with the resources and professional development needed to continue learning, especially as technologies rapidly evolve. Little is known about how teachers—pre-service and in-service alike—use digital technologies to enact and teach historical thinking. The purpose of this study was to provide a context to better facilitate this understanding. Though our understanding of this problem is nascent, we find the paradoxes that emerged from our study noteworthy. For one, pre-service teachers acknowledge that traditional archives are the most important source of historical information in the classroom. However, these same students stress that they use the Internet as the primary source of their history content and that, ironically, the Internet is the source they deem least reliable. If that is the case, what will future teacher educators need to take into account in order to prepare pre-service history teachers for the demands of converging historical thinking with digital literacies? Also, if teacher educators are to be models of technology integration, how do we address the issue that less than half of teacher candidates say that their professors use technology effectively, and even more worrisome, that just over one in 10 professors provide adequate support for their students to learn technology? By addressing these challenges, researchers and policy makers will be better informed as they construct theories and pedagogical strategies such as, but not limited to, TPACK, digital literacies, historical literacies, and historical thinking for preparing teacher candidates to teach disciplines such as history in a world gone digital.

References

Allison, J. (2008). History educators and the challenge of immersive pasts: A critical review of virtual reality 'tools' and history pedagogy. *Learning, Media and Technology, 33*(4), 343–352. doi: 10.1080/17439880802497099.

Angeli, C., & Valanides, N. (2009). Epistemological and methodological issues for the conceptualization, development, and assessment of ICT–TPCK: Advances in technological pedagogical content knowledge (TPCK). *Computers & Education, 52*(1), 154–168. Elsevier Ltd. doi: 10.1016/j.compedu.2008.07.006.

Beck, E. E. (2011). Computers in education: What for? *Nordic Journal of Digital Literacy*, *6*, 282–295.

Beggs, P., Shields, C., & Telfer, S., & Bernard, J. L. (2012). *A shifting landscape: Pedagogy, technology, and the new terrain of innovation in a digital world*. A report for the Ontario Ministry of Education and the Council of Ontario Directors of Education. Retrieved from http://www.edu.gov.on.ca/eng/research/Shifting_LandscapeE.pdf.

Bennett, S., Maton, K., & Lisa Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology*, *3*(5), 775–786.

Brush, T., Ottenbreit-Leftwich, A., Saye, J., Glazewski, K. & McCormick, T. (2011). PBL-TECH: Using Web 2.0 Tools and Resources to Support Problem-Based Curricular Innovations in Pre-Service Teacher Education. In M. Koehler & P. Mishra (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference 2011 (pp. 3959–3963). Chesapeake, VA: AACE.
Retrieved from http://www.editlib.org/p/36950.

CBC. (2008, June 11). PM cites 'sad chapter' in apology for residential schools. CBC News. Retrieved from http://www.cbc.ca/news/canada/story/2008/06/11/aboriginal-apology.html.

Centre for the Study of Historical Consciousness. (2012). Historical thinking. Retrieved from http://historicalthinking.ca/

Corrigan, J. A. (2012). The implementation of e-tutoring in secondary schools: A diffusion study. *Computers & Education, 59*, 925–936. Elsevier Ltd. doi:10.1016/j.compedu.2012.03.013.

DeWitt, S. W. (2004). *Computer use in high school social studies classrooms: a comparative case study within social class context*. (Doctoral dissertation). Retrieved from ACM Digital Library. Order number AAI3128004.

Doppen, F. H. (2004). Beginning social studies teachers' integration of technology in the history classroom. *Theory and Research in Social Education*, *32*(2), 248–279.

Drotner, K. (2008). Leisure is hard work: Digital practices and future competencies. In D. Buckingham (Ed.), *Youth, identity, and digital media* (pp. 167–184). Cambridge, MA: MIT Press.

Earle, R. S. (2002). The integration of instructional technology into public education: Promises and challenges. *ET Magazine, 42*(1), 5–13. Retrieved from http://bookstoread. com/etp/earle.pdf.

ECAR. (2010). Study of undergraduate students and Information Technology. Retrieved from http://www.educause.edu/library/resources/ecar-study-undergraduate-students-and-information-technology-2010

Ertmer, P., & Ottenbreit-Leftwich, A. (2009). Teacher technology change: How knowledge, beliefs, and culture intersect. Proceedings from the annual meeting of the *American Educational Research Association*. San Diego, CA, USA. Retrieved from http://www.edci.purdue.edu/ertmer/docs/ AERA09_Ertmer_Leftwich.pdf

Eshet-Alkalai Y. (2004). Digital literacy: A framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, *13*(1), 93–106.

Glister, P. (1997). *Digital literacy*. New York: John Wiley & Sons Inc.

Graham, C. R. (2011). Theoretical Considerations for Understanding Technological Pedagogical Content Knowledge (TPACK). *Computers & Education*, *57*(3), 1953–1960.

Greitzer, F. L., Kuchar, O. A., & Huston, K. (2007). Cognitive science implications for enhancing training effectiveness in a serious gaming context. *ACM Journal of Educational Resources in Computing, 7*(3), 2:1–16. doi10.1145/1281320.1281322.

Harris, J. B., & Hofer, M. J. (2011). Technological Pedagogical Content Knowledge (TPACK) in action: A descriptive study of secondary teachers' curriculum-based, technology-related instructional planning. *Journal of Research on Technology in Education*, *43*(3), 211–229.

Hicks, D., Doolittle, P. E., & Lee, J. (2004). History and social studies teachers' use of classroom and web-based historical primary sources. *Theory and Research in Social Education. 32*(2), 213–247.

Hillis, P. (2010). Helping trainee teachers realize the potential of Information and Communication Technology: A case study from Scottish history. *Contemporary Issues in Technology and Teacher Education*, *10*(4), 435–456.

Holscher, L. (1997). The new annalistic: A sketch of a theory of history. *History and Theory, 36*(3), 317–335.

Hughes, J. (2005). The role of teacher knowledge and learning experiences in forming technology-integrated pedagogy. *Journal of Technology and Teacher Education, 13*, 277–302.

International Society for Technology in Education. (2000). National Educational Technology Standards for Teachers. Retrieved from http://www.iste.org/ standards/index.html.

Kapor, M. (n.d.). Internet quotation appendix. Retrieved from http://cyber.law.harvard.edu/ archived_content/people/reagle/inet-quotations-19990709.html

Koehler, M. J., Mishra, P., & Yahya, K. (2007). Tracing the development of teacher knowledge in a design seminar: Integrating content, pedagogy, & technology. *Computers and Education, 49*(3), 740–762.

Kohlmeier, J. (2005). The impact of having 6th graders 'do history.' *The History Teacher, 38*(4), 499–524. doi:10.2307/30036718.

Lankshear, C., & Knobel, M. (2008). *Digital literacies: Concepts, policies, and practices.* New York, NY: Peter Lang Pub Inc.

Leu, D., Zawilinski, L., Castek, J., Banerjee, M., Housand, B., Liu, Y., & O'Neil, M. (2007). What is new about the new literacies of online reading comprehension. In A. Berger, L. Rush, & J. Eakle (Eds.), *Secondary school reading and writing: What research reveals for classroom practices.* (pp. 37–68). Chicago, IL: NCTE/NCRLL. Retrieved from http://www.newliteracies.uconn.edu/pub_files/ What_is_new_about_new_literacies_of_online_reading.pdf

Lévesque, S. (2008). *Thinking historically: Educating students for the 21st century.* Toronto: University of Toronto.

Lévesque, S. (2010a). . Final report. Canadian Council on Learning. Retrieved from http://www.ccl-cca.ca/pdfs/fundedresearch/Levesque-FinalReport.pdf

Lévesque, S. (2010b). On Historical Literacy: Learning to Think like Historians. *Canadian Issues/ Thèmes canadiens*, Winter 2010, pp. 42–46.

Levstik, L. S. & Barton, K. C. (2001). *Doing History: Investigating with Children in Elementary and Middle Schools.* Mahwah, NJ: Lawrence Erlbaum Associates.

Marri, A. R. (2005). Educational technology as a tool for multicultural democratic education: The case of one US history teacher in an underresourced high school. *Contemporary Issues in Technology and Teacher Education, 4*(4), 395–409.

Mishra, P. & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Mishra, P., & Koehler, M. J. (2008). Introducing technological pedagogical content knowledge. Proceeedings from the annual meeting of the *American Educational Research Association.* New York City. Retrieved from http://punya.educ.msu.edu/presentations/AERA2008/ MishraKoehler_AERA2008.pdf

National Center for Education Statistics. (2000). *Teachers' tools for the 21st century.* (No. NCES 2000-102). Washington DC: U.S. Department of Education.

National Center for Education Statistics. (2007). *Internet Access in U.S. Public Schools and Classrooms: 1994-2005* (No. NCES 20007-020). Washington D.C.: U.S. Department of Education.

National Council for Accreditation of Teacher Education. (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom.* Retrieved from http://www.ncate.org/accred/projects/tech/tech-12.htm.

Ng-A-Fook, N. (2007). *An indigenous curriculum of place: The United Houma Nation's contentious relationship with Louisiana's educational institutions.* New York: Peter Lang Publishing.

Ontario Ministry of Education. (2005). *Canadian and World Studies Curriculum – Grades 9-10.* Toronto: Queen's Printer for Ontario.

Ontario Ministry of Education. (2012). *Round 2: 21st Century Pilots for System Learning and 21st Century Strategic Pilots.* Toronto, ON. Retrieved from http://www.edu.gov.on.ca/eng/policyfunding/memos/september2012/21CenturyPilot.pdf.

Owings Swan, K. & Hofer, M. (2008). Technology and social studies. In L. Levstik & C. Tyson (Eds.), *Handbook of research in social studies education* (pp. 307–328). New York: Routledge.

Pinar, W. F. (2012). *What is curriculum theory?* (2nd ed.). New York: Routledge.

Prensky, M. (2001). Digital Natives, Digital Immigrants. *On the Horizon, 9*(5), 1–6. doi: 10.1108/10748120110424816

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Roneau, R. N., Rakes, C. R., & Niess, M. L. (eds).(2012). *Educational technology, teacher knowledge, and classroom impact: A research handbook on frameworks and approaches.* Hershey, PA: Information Science Reference.

Rosenzweig, R. (2000). How Americans use and think about the past: Implications from a national survey for the teaching of history. In P. N. Stearns, P. Seixas, & S. Wineberg (Eds.), *Knowing, Teaching, and Learning History: National and International Perspectives* (pp. 262–283). New York, NY: New York University Press.

Saye, J. & Brush, T. (2006). Comparing teachers' strategies for supporting student inquiry in a problem-based multimedia-enhanced history unit. *Theory and Research in Social Education, 34*(2), 183–212.

Schneider, J., King, J.R., Kozdras, D., Welsh, J., & Minick, V. (2010). Chapter 11: Multimedia, oral history and teacher education: From community space to cyberspace. In D. L. Pullen, C. Gitsaki , & M. Baguley (Eds.), *Technoliteracy, Discourse and Social Practice: Frameworks and Applications in the Digital Age,* (pp. 185–199) Hershey, PA: IGI Global. doi: 10.4018/978-1-60566-842-0.ch011.

Selwyn, N. (2009). The digital native – myth and reality. *Aslib Proceedings: New Information Perspectives, 61*(4), 364–379. doi:10.1108/00012530910973776.

Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.

Steinberg, S., & Bar-On, D. (2009). The Other Side of the Story: Israeli and Palestinian Teachers Write a History Textbook Together. *Harvard Educational Review, 79*(1), 104–112.

Sykes, W. (1999). Virtual reality in schools: The ultimate educational technology. *Transforming Education through Technology Journal, 26*(7), 61–63. Retrieved from http://www.thejournal.com/articles/14132

Taylor, J. A., & Duran, M. (2006). Teaching social studies with technology: New research on collaborative approaches. *The History Teacher*, *40*(1), 9–25.

Tondeur, J., van Braak, J., & Valcke, M. (2007). Curricula and the use of ICT in education: Two worlds apart? *British Journal of Educational Technology, 38*, 962–976.

Van Dijk, J. A. G. M. (2006). Digital divide research, achievements and shortcomings. *Poetics*, *34*(4–5), 221–235. doi:10.1016/j.poetic.2006.05.004.

Zhang, Z., & Martinovic, D. (2008). ICT in teacher education: Examining needs, expectations and attitudes. *Canadian Journal of Learning And Technology/La Revue Canadienne de l'Apprentissage et de la Technologie, 34*(2). Retrieved from http://cjlt.csj.ualberta.ca/index.php/cjlt/article/view/498.

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[2] During a subsequent phase of this study, participants had the opportunity to 'do history' by digitally preserving oral histories from indigenous elders. Many of the elders interviewed were survivors of the era of residential schooling, for which the Canadian government has recently issued a formal apology calling it a "sad chapter in [Canadian] history" (Canadian Broadcasting Corporation [CBC], 2008). Not only was collecting these oral histories a powerful way for teacher candidates to capture and preserve important historical data, but it also offered an opportunity for them to practice how they will model doing history with their own students.

[3] Serious gaming can be defined as "a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives. A key difference between computer games and serious games is that the latter use pedagogy to infuse instruction into the game play experience, thus providing a delivery system for organizational video game instruction and training" (Greitzer, Kuchar, & Huston, 2007, p. 2:2).

[4] For a more detailed discussion of these knowledge domains, see Mishra & Koehler, 2006, 2008.

[5] See Corrigan (2012) and Rogers (2003) for more on diffusion theory.

[6] The following is a link to this year's Making Digital Histories Survey: https://www.surveymonkey.com/s/MakingDigitalHistories

[7] A test of statistical significance was not possible as we do not have access to the raw data from ECAR.