Inquiry, Immigration and Integration: ICT in Preservice Teacher Education

Jennifer Lock
University of Calgary

Abstract

Within the Master of Teaching Program at the University of Calgary, two teacher educators collaborated in facilitating an inquiry-based project with a group of preservice teachers in examining real-world issues related to English as Second Language students. A learning environment was created and modeled, where preservice teachers were challenged to think about teaching and learning with technology, the relationship between technology and learning, and to become designers of learning with digital media and network technologies. This article describes one teacher educator's perceptions of the project and presents her insights into planning and facilitating a learning environment that purposefully integrated technology to foster a rich, deep learning experience.

With the infusion of technology in our personal and professional lives, educators in teacher preparation programs are challenged to provide learning environments where preservice teachers learn how to learn and learn how to teach, *with* and *through* digital technology. Within their programs, how are teacher educators to design intentional learning environments, where preservice teachers develop new understandings of learning and teaching with rapidly evolving digital technology? How are teacher educators to assist preservice teachers in developing an understanding of the critical relationship between pedagogy and technology, in fostering the seamless integration of pedagogy and technology?

As a teacher educator within the Master of Teaching program at the University of Calgary, I worked as a co-instructor with a group of 16 preservice teachers for one semester. During the semester through the integration of information and communication technology (ICT), preservice teachers explored how children cope and respond to such situations as war and political oppression. ICT was integrated throughout various stages in the inquiry to gather information, to make decisions, to communicate, to collaborate, and to represent their understandings. This article describes the project experience in terms of my perceptions of the work and insights into planning and facilitating an inquiry-based project that purposefully integrates technology. The article is based on my analysis of my teaching and experience with and perceptions of the project. The analysis did not directly involve students' work.

With this group of preservice teachers many of them would be referred to by Prensky (2001) as "Digital Immigrants," while others as "Digital Natives." Digital natives are identified as people who are "all 'native speakers' of the digital language of computers, video games and the Internet" (Prensky, 2001, p. 1). In contrast, he referred to digital immigrants as those who, more recently, have entered and adopted this networked, digital world, but were not born into it. Whether digital natives or digital immigrants, those individuals are now students of, and present a radically new challenge to, our current teacher preparation programs. As educators in this new digital networked world, we are in the early stages of redefining the context of and our approach to teacher preparation. As teacher educators, we must recognize and address the issues flowing from this new, more-sophisticated, pedagogic challenge.

Information and Communication Technology in Teacher Education

Jacobsen and Lock (2004) asked, "How are student teachers taught to leverage today's digital technologies for their own, and for children's learning, learning and collaboration needs?" (p. 76).   A number of researchers have examined the challenges that impact integration of ICT and learning (e.g., The CEO Forum on Education & Technology, 2000; Duhaney, 2001; Meltzer & Sherman, 1997; Moursand & Bielefeldt, 1999; Pierson & McNeil, 2000; Vannatta & Beyerback, 2000). They suggest that ICT has been delivered as stand-alone introductory courses, has been marginalized within programs, and suffers from an absence of modeling. To address these challenges, a number of recommendations are offered in the research. From their review of the literature, Jacobsen and Lock (2004) found that the following conditions are required for efficacious technology integration in teacher education programs:

> (a) implement a vision and values driven technology integration plan, (b) encourage education faculty members to infuse and model effective technology use across the curriculum, (c) provide authentic learning opportunities for student teachers to integrate technology in campus and field experiences, (d) foster greater campus and K-12 school partnerships that cultivate and nurture technology integration, (e) provide ubiquitous access to a more than adequate technology infrastructure, and (f) disseminate research on effective use of technology for learning. (p. 82)

In their study of five teacher education programs in Alberta, Canada, in 2004, Clifford, Friesen, and Lock (2004) found that preservice teachers who were technologically fluent did not have to "understand what it means to teach *with* technology. They were enormously appreciative of the efforts of their instructors to help them bridge the gap between their own levels of fluency and their ability to think like teachers" (p. 157). The challenge faced by faculties of education is to learn how to "leverage this new knowledge and skill set in fostering innovative, technology-based pedagogical practices within teacher education? How will pre-service teachers learn *how* to appropriately use the technology to foster meaningful, deep learning?" (Clifford, Friesen & Lock, 2004, p. 56).

Information and Communication Technology Standards and Mandates

Ministries of education and various educational organizations see the need for students to develop understandings and proficiencies in using ICT in appropriate ways to support learning and to develop appropriate technology knowledge, skills, and dispositions for the 21st century. For this to occur, standards need to be determined and teachers need to have a framework to help guide them as they design learning that uses and integrates technology.

One example of a professional organization that has made a commitment to supporting educational technology is the International Society for Technology in Education (ISTE). ISTE has created the National Educational Technology Standards (NETS) initiative. According to the NETS Web site (http://cnets.iste.org),

> The primary goal of ISTE Nets Project is to enable stakeholders in PreK-12 education to develop national standards for educational uses of technology that facilitate school improvement in the United States. The NETS Project will work to define standards for students, integrating curriculum technology, technology support, and standards for student assessment and evaluation of technology use.

A second example of support for technology enhanced learning environments in schools is in the province of Alberta, Canada. The dedication of the Alberta Education Ministry to providing technology-enhanced learning experiences for students and teachers in kindergarten to Grade 12 is reflected in two acts of legislation. First, a Ministerial Order (#016/97) requires all Alberta teachers who hold Interim Professional Certificates to demonstrate they understand the following:

> The functions of traditional and electronic teaching/learning technologies. They know how to use technologies and how to engage students in using these technologies to present and deliver content, communicate effectively with others, find and secure information, research, word process, manage information and keep records. (Alberta Education, 1997, p. 2)

Second, Alberta Education mandated the implementation of an ICT Program of Studies in September 2000 (Alberta Learning, 2000). It emphasized "(1) the seamless relationship between technology and subject disciplines, (2) the process nature of technology itself, and (3) the co-existence of KSAs (knowledge, skills, and attributes) for technology alongside those for the subject areas" (Jacobsen & Clark, 1999, p. 2). The program of studies further acknowledges, "Technology is best learned within the context of applications. Activities, projects and problems that replicate real-life situations are effective resources for learning technology" (Alberta Learning, 2000-2003, p. 1).

Given these initiatives, faculties of education have a critical role in preparing preservice teachers to work within innovative technological learning environments. Clifford et al. (2004) argued that one of the tasks of teacher education programs is to find "ways to bring educators' attention to the implications of digital technologies for learning, to leverage rather than to dampen their power and to bring those technologies into classrooms in increasingly meaningful, effective, innovative and just ways" (p. 11). Therefore, teacher educators within their assigned course loads must find ways to create opportunities for preservice teachers to experience and to learn how to design learning environments that integrate technology in a way that enhances and extends learning.

The Teacher Education Context for the Inquiry-Based Learning Project

The Master of Teaching (MT) Program at the University of Calgary is a 2-year, after-degree program. The philosophical underpinnings of the program can be articulated in three key characteristics: inquiry-based, field-oriented and learner-focused (Faculty of Education, Division of Teacher Preparation, 2004-2005). Inquiry-based learning fosters the expansion of and depends on the learners' current understandings and skills and invites them to explore the complexities of the topic being investigated. Through the inquiry process, preservice teachers work cooperatively and collaboratively to identify and grapple with critical questions, research issues, engage in critical dialogue and assess and disseminate information and ideas with their peers and instructors. Through the inquiry process, they enhance their critical and creative thinking skills, refine their questioning techniques, and build their capacity as lifelong learners within the education profession.

There is a strong field-orientation in the MT Program. Preservice teachers are in school placements during first, second, and third semesters of the program. Within the first two semesters, preservice teachers spend 2 days per week in a school placement and/or community placement. In addition to the school experience, students meet with their field instructor on campus for a 2-hour weekly seminar. The field experience component of the program helps them to link theory and practice and to bridge their campus and field experiences.

The Inquiry-Based Project

In planning the inquiry project, two themes guided the work. First, preservice teachers who participated in this project had been placed in schools with high enrollments of English as second language (ESL) students. In these schools, preservice teachers were confronted with the challenge of addressing diversity. Preservice teachers were developing an understanding of some of the factors that impact these ESL children's education. To build on these experiences and initial understandings, the project was designed to give preservice teachers an appreciation and understanding of the realities and complexities of refugee children, children who have experienced war, and immigrant children in Canadian urban school settings. To be able to work effectively with ESL children, teachers need to develop a relationship with the children and understand the

challenges they and their families encounter because they are not part of the mainstream. Consequently, the ESL students in the schools provided the impetus for this inquiry.

Second, Clifford et al. (2004) argued that meaningful technology integration in preservice teacher education must be addressed within the core curricula and not as an isolated methodology course. In their view, preservice teachers need to "experience intentionally designed learning environments that incorporate learning through technology in authentic and creative ways that challenge, deepen and extend current assumptions about teaching and learning, and about the role of technology in the lives of global citizens" (p. 163). In light of this assertion, a major goal was to create a collaborative inquiry in which preservice teachers would use technology as an integral and purposeful component within an authentic learning context in fostering rich understandings of global events and issues that impact children and their education. The selection and use of technology was intentional, yet flexible, to meet the needs and purpose of the learning experience. Further, the work was designed to foster functional, critical and rhetorical literacy (Selber, 2004) to nurture greater student-teacher commitment to the role of technology in teaching and learning and gave them the opportunity to design, create, and reflect using various digital tools.

The following six guidelines were used to support the design and facilitation of the preservice teachers' learning experience with technology integration:

> (a) Technology is best learned just-in-time, instead of just-in-case, (b) planning, designing, implementing and evaluating are best done in collaboration with others, (c) learning must be situated in authentic, challenging and multidisciplinary tasks, (d) a culture of inquiry around technology for learning supports risk-taking and knowledge creation, and (e) teachers need intentional and meaningful opportunities to reflect on professional development and growth. (Jacobsen et al. 2002, p. 370)

In terms of logistics, arrangements were made to move the class out of a regular classroom setting to occur within a networked computer lab. Each preservice teacher had access to a networked computer and a suite of computer applications during the weekly 2-hour seminar. Further, Blackboard®, a learning management system, was used as an online gathering space for the preservice teachers and instructors. Within Blackboard, preservice teachers learned to post messages in the asynchronous discussion forum and to use the group communication feature as an online space to work on their particular projects. Over the semester, it became the space where project work and various resources were shared and where online communication was used to connect with their colleagues and instructors.

Watts, Gould, and Alsop (1997) identified three categories of students' questions: consolidation, exploration and elaboration. To a degree, these three question categories framed the nature of this inquiry project. In consolidation, the learners "are attempting to say what they think, clarify the rationale for classroom tasks, confirm explanations and consolidate understanding of new ideas..." (p. 59). In exploration, their "questions seek to both expand knowledge and test constructs that they have formed" (p. 59). In elaboration, the questioning is to examine "claims and counterclaims, *elaborating* on and challenging both their previous knowledge and experience and that being presented to them..." (p. 59). These three categories capture the essence of the preservice teachers' inquiry experience.

Consolidation

The project began with groups of preservice teachers reading one of the following novels: Ellis*'s (*2002*) Parvana's Journey,* Filipovoc's (1994) *Zlata's Diary,* Levine's (2002) *Hana's Suitcase,* and Laird's (2003) *A Little Piece of Ground.* Each novel group posted a one-page information overview of the novel that included a synopsis of the book, suggestions of possible reading subject areas and theme connections, an illustrative passage, a critique of what is good and problematic, and research about the author and related writings. Through a cooperative learning jigsaw activity, group members each presented their overview to the three members from the other novel study groups. As part of their presentation, they were to include a digital artifact representing some facet of the novel. Preservice teachers searched the Internet and selected various digital images (e.g., map of the region) as artifacts.

The activity concluded with preservice teachers each reflecting on their experiences with the jigsaw activity and the use of the technology. As part of this reflection, they included a statement about the possibilities of using this type of forum and the challenges a teacher might encounter using technology in this manner. They e-mailed their reflections to their instructors. Some of the key issues outlined in the reflections were examined and addressed throughout the course of the work.

From working in their schools, reading the selected novels and discussions that emerged from the jigsaw activity, preservice teachers began to identify issues and topics that formed the foundation of their inquiry projects. To investigate these questions, the preservice teachers choose to work within their school cohort groups. By working in cohorts, they could continue conversations around their projects outside of the weekly on-campus seminar sessions and within their school placement environments. Being in their schools 2 days per week for the greater part of the semester gave them opportunities to talk about their projects and to consider the ESL students within their classrooms.

The instructor for the class organized and facilitated an Introduction to ESL Multicultural Understandings field trip to three Calgary facilities that work with new immigrant families. At one facility, the preservice teachers met with a multicultural assessment consultant, who shared with them services provided to new immigrant families and how these families are given orientation to one of the city school systems. She also explained how the language facility of ESL students was assessed and how appropriate grade and program placements were determined and made. At the second facility, a resettlement center, they learned how it offers new immigrants temporary accommodations and assists them in integrating into Canadian society. The day ended with a visit to a multicultural school that is an ESL Center of Teaching and Learning and where a large number of languages are spoken. This experience shed new insight into the challenges that confront immigrant children and their families in Canadian schools and society.

To define and focus their future work, the preservice teachers were required to submit a project proposal, which was posted in Blackboard for their instructors and colleagues to review. The proposal included a digital concept map that gave an overview of the project. In addition, they were to identify key concepts and questions, possible tasks and assessment of the tasks, preliminary resources, and a curriculum mapping of the connections to the Alberta curricula.

In conceptualizing their projects, preservice teachers were encouraged to consider the moral and ethical issues that influence how they would take up this study with their own students. They needed to consider how to honor and respect others' ways of life, particularly ESL students and their families. The heightened sensitivity and awareness needed to be evident in the proposal and in the project.

After reading and discussing their feedback, preservice teachers were provided with written and oral feedback on their project proposals. Two issues emerged in the review of their project proposals.

First, students struggled in bounding their inquiries. Their projects tended to be broad and potentially gave preservice teachers a shallow inquiry experience rather than a deeper and more meaningful one. They had difficulty identifying what Clifford and Friesen (2007) referred to as the essential questions. "Essential Questions develop foundational understandings. They provide the fundamental organizing principles that bound an inquiry and guide the development of meaningful, authentic tasks" (Clifford & Friesen, 2007). A key goal for this work was to achieve a deep rather than a shallow constructivist learning experience. According to Scardamalia and Bereiter (2003), a shallow approach has the learner describing the tasks they complete. However, they "show little awareness of the underlying principles that these tasks are to convey" (p. 1371). In contrast, deep constructivist learning is described as the following:

> Overt practices such as identifying problems of understanding, establishing and refining goals based on progress, gathering information, theorizing, designing experiments, answering questions and improving theories, building models, monitoring and evaluating progress, and reporting are all directed by the participants themselves toward knowledge building goals. (Scardamalia & Bereiter, 2003, p. 1371)

Second, their lack of understanding of technology and software applications potentially restricted their work. For example, one group wanted to use one specific electronic presentation software application because they knew how to use that particular application, even though their project was better suited for a more hypermedia environment. As a result, I provided a just-in-time minilesson on Web development, using a Web authoring tool and ways to launch a Web site for this group's project that proved to be a valuable learning experience for them.

Exploration

Later in the semester, as the preservice teachers were beginning to gather information, I facilitated a Moving Learning Beyond the Classroom Walls session. In this seminar, preservice teachers were introduced to telecollaboration, the use of various digital media in representing ideas, consideration of infrastructure to support digital projects, and safety and privacy issues. The objective of the presentation was to challenge students to think seriously and differently about how to design learning environments that meaningfully integrate technology. This presentation raised awareness in terms of conceptualizing how digital technology and computer applications can be used to facilitate teaching and learning and how such computer programs can be used with various instructional strategies (e.g., problem solving). The goal of the presentation was to open new avenues for ways preservice teachers could represent their understandings and how they could design meaningful learning experiences with technology in new ways.

During the last 5 weeks of the semester, preservice teachers worked on developing their digital projects. Three groups designed Web pages, and the fourth group created a hyperlinked concept map that included Microsoft Word and Microsoft PowerPoint files. As part of their project work, they purposefully selected and shared numerous resources, strategically created some teaching materials, and made available references to appropriate materials for both students and teachers. Through the design and the development using digital media (e.g., digital concept maps, importing and resizing digital images, creating hyperlinks to connect and interconnect information, and designing Web pages using Web-authoring software to present information) their projects reflected a rich understanding of their inquiries that addressed such items as transition, resiliency, oppression, war, and the connection between time and space when studying cultures and people.

Elaboration

At the end of the semester, a day was used for preservice teachers to share their projects and celebrate their work. Each group had an hour to showcase its project. The preservice teachers articulated their understandings and provided opportunities for their colleagues to review and interact with various components of their work. It was observed that they confidently engaged in rich conversations sparked by colleagues' questions and comments. The issues emerged from the presentations, as well as penetrated other areas related to being a professional.

After the public presentation of the projects, preservice teachers submitted a self-assessment. They used the following questions to guide their reflections:

1.   Where was your work strong?
2.   Describe how your group worked.
3.   Describe your most important learning.
4.   What do you need to learn/do to strengthen your work?

Through their reflections, they acknowledged the strength of the work and the challenges they individually and as a group encountered and had to address.

Discussion

As the preservice teachers designed and developed their digital projects, they drew upon each other's and their instructors' expertise. Given the nature of the work, just-in-time learning of applications (e.g., Inspiration and Netscape Composer) and ICT principles were all part of the learning experience.   Onsite, online, and ongoing support was critical for this work. What preservice teachers needed to know and be able to do to develop their ideas required a great degree of responsiveness by the instructors to provide the needed one-to-one, one-to-small group and one-to-large group instruction and facilitation. When they were working on their projects off-campus, they were provided with online support through e-mail. At times, outside expertise (e.g., technical support and technical training) was accessed to address questions or problems that arose in the development of the projects.

As an instructor, to work within this type of learning environment required me to observe and listen carefully to what the preservice teachers were saying and doing so to determine what support and expertise they needed and to be responsive to that particular need. I found that I had to be comfortable knowing my personal limits (e.g., technical skill set) around the nature of this work. When I was unable to address questions or issues that

emerged, I had to be open to finding and directing the preservice teachers to the needed expertise and appropriate resources. For example, time was limited in class to provide the preservice teachers with various technical training for the specific software they wanted to use in their work. As a result, information was provided on upcoming technical workshops hosted within the faculty, which led to some preservice teachers enrolling in these workshops that gave them assistance with their projects. The success of this type of project requires "expeditious support to be effective in using technology" (Bitner & Bitner, 2002, p. 98), so that the preservice teachers did not become frustrated by technical glitches. At the same time, they were introduced to a breadth of possibilities.

Because ICT was used as an integrated component of the learning environment, preservice teachers developed new understandings, skills, and dispositions with regard to technology integration into teaching and learning. As they created their digital media projects (e.g., Web pages), they developed authoring skills. They were encouraged to consider their audience and their point of view in terms of the message being communicated. They developed an appreciation for design principles as they considered color, graphics, and readability of text in the presentation of their information. As they searched for information and created their projects, they had to be "critical and ethical producers and consumers of media" (Roblyer, 1998, cited in Robyler & Schwier, 2003, p. 169). The decisions they made throughout the evolution of their work are reflected both in the message and the medium. From this experience emerged an appreciation of the moral and ethical use of technology and of intellectual property rights (e.g., access to and use of copyrighted digital artifacts). Evidence of these items was apparent in the final product that the preservice teachers shared with their colleagues.

In review of the process the preservice teachers experienced and in the development of their work they achieved a number of general and specific learning outcomes related to the three competency areas identified in *Information and Communications Technology* Program of Studies (Alberta Learning, 2000-2003). First, for the competencies related to communicating, inquiring, decision making and problem solving outcomes, the preservice teachers thoughtfully assessed information, learned how to manage their inquiries, engaged in problem solving throughout the work, and communicated their understandings using various and appropriate means. Second, for the processes for productivity, they had access to and used a variety of software to compose, create and communicate their understandings. Third, for the foundational operations, knowledge and concepts competencies, they continued to develop an understanding of the nature of ICT, became more discerning consumers of information, and developed a greater awareness of moral and ethical issues related to use of technology (e.g., copyright).

Throughout the design and development of the projects, they were engaged in meaningful learning using technology to assist with knowledge construction, conversation, articulation, collaboration and reflection (Jonassen, Peck, & Wilson, 1999). Throughout the inquiry, they worked together collaboratively in negotiating their understandings and using technology to access and present information and represent their cocreated knowledge. They drew upon their personal expertise in various areas as they worked on their integrative technology projects. Slotte and Tynjälä (2005) argued that collaboration provides opportunities for learners to develop "higher-order thinking skills and problem-solving skills in the construction of their ideas about practice" (p. 193).

From working with the small groups and helping to facilitate seminar discussions, it was evident that the preservice teachers were engaging in rich dialogue, thoughtful reflection, and critical thinking. Further, through their reflections they acknowledged the strengths in their work, what was important in their learning, and what they need to learn or do to strengthen their work. Throughout this experience, the technology was an intricate

component of the learning process, yet the selection and use of the various applications were in direct response to the needs of the preservice teachers.

At the time of this work, I was not aware of the *NETS for Teachers: Achievement Rubric* (Learning Point Associates, 2005). The standards with criteria as set out in the rubric would have been a helpful instrument to assess preservice teachers' knowledge, skills, and disposition in the use of technology in teaching and learning in this project.

Inquiry That Fosters Meaningful ICT Integration

Throughout the semester after each class the instructors debriefed the session together and planned for the next class. The debriefing was valuable because it helped the instructors refine the focus of the work and better facilitate student learning. Further, after reflecting on the semester, I have developed deeper appreciation and greater insight into inquiry-based learning, the nature of questioning, and the role people play in questioning, living the inquiry experience, and the co-instructor and co-inquirer relationships.

First, learning through inquiry is "a *serial or sequential* process...Inquiry does not solve problems by returning to a previous, stable situation, but by means of a transformation of the current situation into a *new* situation" (Biesta & Burbules, 2003, p. 57). From the experience of this work and ongoing discussions with preservice teachers, this inquiry offered a stepping-stone to a greater appreciation of student-teacher relationships, teaching students who have English as a second language, and the capacity of using digital technology within the learning environment. The question to be explored is how these preservice teachers will continue to take up this work in the next semester of the program. How will their inquiries be infused into a wide range of experiences throughout their teacher preparation program? How will the questions that emerged from their work help guide their own learning and teaching? As an instructor, how will I take up what I have gained through this experience and use it to further develop such projects within the program?

Second, the nature of the questions identified by learners impacts the inquiry and the construction of knowledge. Watts et al. (1997) argued, "A learner's questions have the capacity to expose both sophisticated and naïve thinking, to tackle complex issues and to focus on minutiae and detail" (p. 58). Questions are a critical element of inquiry and, as an instructor, it is important for me to help the students learn how to ask and explore essential questions. As an instructor and co-inquirer, I have a role in helping to identify and refine questions to help bound an inquiry. At the start of the project, time needs to be spent exploring and refining the essential questions that frame the inquiry. It cannot be assumed that students are doing this on their own. As a facilitator of learning, I have a role in helping to guide and nurture the essential questions framing the inquiry.

Further, within the inquiry process, various types of questions need to be used to mine the depths of the topic or issue.   Watts et al.'s (1997) general categories of student questions, consolidation, exploration, and elaboration, are useful to frame the inquiry. With consolidation, preservice teachers were sorting out conceptual issues and clarifying the rationale for tasks and consolidating their understandings of the topic. With the security of what they know they began to question and venture into new areas related to ESL understandings, issues, and realities. In this exploration category they were expanding their knowledge and testing their new constructs. In the elaboration category, they were examining claims, challenging previous knowledge, and elaborating on what they know. As a facilitator, I have a role to play in asking these types of questions at the

various stages throughout the inquiry but also in helping learners explore ideas using these questions to foster deep, rich inquiries.

Third, living through this type of inquiry gives new insights to preservice teachers as they move forward in planning inquiry-based learning experiences for their students. According to Jonassen, Howland, Moore, and Marra (2003), designing hypermedia programs "is among the most engaging and complex forms of problem solving that students can accomplish" (p. 175). Major decision-making occurs throughout the planning, designing, and development process, which requires, at times, negotiation and conflict-resolution skills among the group members. As preservice teachers worked through the project, they searched, accessed, and assessed information and used this information in constructing knowledge. In assessing the credibility, reliability, and relevance of information, they continued to develop and strengthen their information gathering and selection skills. As they examined information and shared it with their colleagues, they were exposed to multiple perspectives, which required them to negotiate understandings and to reflect on and evaluate their knowledge base. Furthermore, the skills and competencies nurtured in the project parallel what they will want their students to develop. Their reflections indicated that they were developing a new appreciation of the power and capacity of the role of technology in and throughout a project.

As a teacher educator, I hope to continue to develop this capacity in my own work, to develop more opportunities for this type of learning within my courses, and to help these preservice teachers continue to build upon what they have learned. This work is but one project, but it is one that helps build the capacity of preservice teachers and the capacity within a teacher education program. As a teacher educator, how do I continue to be part of this capacity building?

Fourth, I developed a greater appreciation for co-instructor and co-inquirer relationships that occurred and were modelled for the preservice teachers. To work as co-facilitators, I valued what the other instructor brought to the work and what I gained through the experience both on a personal and professional level. Further, to be able to model co-teaching effectively, I had to have confidence in our professional relationship and to know when one or the other of us should take the lead role and when I should seek additional expertise and support.

Conclusion

Using an integrative curricular approach that invites real world issues through the infusion of technology has assisted in preparing preservice teachers to be competent and confident in collaborative and integrative multicultural and multi-ethnic classrooms. Through this work, a learning environment was created and modeled where learners were challenged to think about teaching and learning *with* technology, to experience the "intricate interplay" (Whitla, 2003, p. 3) of the relationship among technology and learning, and to be designers of learning with digital media and network technologies.

Dawson (2006) argued, "Teacher inquiry should be explored as a strategy to help perspective teachers in the process of learning to become effective technology-using teachers" (p. 288). It has affirmed for me, based on my experience with this inquiry project, that opportunities to purposefully design rich authentic learning experiences in which preservice teachers and teacher educators are learning through inquiry and reflecting on their practice of technology integration, need to become part of the mainstream in teacher education rather than an add-on project.

Within our teacher education programs and as teacher educators, how do we foster an inquiry stance in relation to technology use and integration? The notion of an inquiry stance, according to Cochran-Smith and Lytle (2001), involves "teachers and student teachers working within communities to generate local knowledge, envision and theorize their practice, and interpret and interrogate the theory and research of others" (p. 50). Therefore, working from an inquiry stance, how can preservice teachers and teacher educators explore and experience technology integration across the curriculum? Further, this work needs to foster a "deeper understanding of the complexity of both the *how* and the *why* of technology integration in relation to teaching and learning" (Lock & Clark, 2004, p. 6).

In addition, Kay (2006) argued "Every effort [must] be made to model and construct authentic teaching activities" (p. 394). The modeling of this work within teacher education programs is a critical factor to be addressed. Preservice teachers can begin to design learning experiences for their students that appropriately integrate technology based on the modeling and experiences they have observed and experienced in their teacher education programs.

The nature of this type of work opens a new learning space to explore and address the disconnect between preservice teachers' technology knowledge, skills, and disposition and the pedagogical foundation in how to use ICT to think differently about and to design purposefully rich teaching and learning experiences with technology. The work presented in this paper begins to explore the capacity and the impact that inquiry-based technology learning has on preservice teachers' and teacher educators' thinking about teacher-student relationships, curriculum, teaching, and technology.

Acknowledgement

References

Alberta Education. (1997). Directive 4.2.1 – *Teaching quality standard applicable to the provision of basic education in Alberta*: *K-12 learning system policy, regulations and forums manual.* Retrieved February 15, 2007, from http://www.education.gov.ab.ca/educationguide/pol-plan/polregs/adobe/421.pdf

Alberta Learning. (2000-2003). *Information and communication technology: Complete program of studies, kindergarten to grade 12.* Retrieved February 15, 2007, from http://www.learning.gov.ab.ca/ict/pofs.pdf

Biesta, G. J. J., & Burbules, N. C. (2003). *Pragmatism and educational research.* Lanham, MD: Rowman & Littlefield Publishers, Inc.

Bitner, M., & Bitner, J. (2002). Integrating technology into the classroom: Eight keys to success. *Journal of Technology and Teacher Education, 10*(1), 95-100.

CEO Forum on Education & Technology. (2000). *Teacher preparation STaR chart: A self-assessment tool for colleges of education.* Retrieved February 15, 2007, from http://www.ceoforum.org/downloads/tpreport.pdf

Clifford, P., & Friesen, S. (2007). Creating essential questions. Retrieved February 15, 2007, from http://www.galileo.org/tips/essential_questions.html

Clifford, P., Friesen, S., & Lock, J. (2004). *Coming to teaching in the 21st century: A research study conducted by the Galileo Educational Network.* Report for Alberta Learning. February 15, 2007, from http://www.galileo.org/research/publications/ctt.pdf

Cochran-Smith, M., & Lytle, S. L. (2001). Beyond certainty: Taking an inquiry stance on practice. In A. Lieberman & L. Miller (Eds.) *Teachers caught in the action: Professional development that matters* (pp. 45-58). New York: Teachers College Press.

Dawson, K. (2006). Teacher inquiry: A vehicle to merge prospective teachers' experience and reflection during curriculum-based, technology-enhanced field experiences. *Journal of Research on Technology in Education, 38*(3), 265-292.

Duhaney, D. C. (2001). Teacher education: Preparing teachers to integrate technology. *International Journal of Instructional Media, 28*(1), 23-30.

Ellis, D. (2002). *Parvana's journey.* Toronto, Ontario: Groundwood Books.

Faculty of Education, Division of Teacher Preparation. (2004-2005). *Handbook for the BEd master of teaching program: Year 1.* Calgary, Alberta: University of Calgary.

Filipovoc, Z. (1994). *Zlata's diary.* New York: Penguin.

Jacobsen, D. M., & Clark, W. B. (1999, April). *Using online research methods to target technology professional development in an inquiry-based teacher education program.* Proceedings of the Fourth Annual Teaching in the Community Colleges Online Conferences: Best Practices in Delivering, Supporting, & Managing Online Learning, Kapiolani Community College, Honolulu, HI. Retrieved February 15, 2007, from http://www.acs.ucalgary.ca/~dmjacobs/mt/jacobsen_clark_tccl.html

Jacobsen, M., Clifford, P., & Friesen, S. (2002). Preparing teachers for technology integration: Creating a culture of inquiry in the context of use. *Contemporary Issues in Technology and Teacher Education* [Online serial], *2*(3). Retrieved January 8, 2007, from http://www.citejournal.org/vol2/iss3/currentpractice/article2.cfm

Jacobsen, D. M., & Lock, J. V. (2004). Technology and teacher education for a knowledge era: Mentoring for student futures, not our past. *Journal of Technology and Teacher Education, 12*(1)*,* 75-100*.*

Jonassen, D.H., Howland, J., Moore, J., & Marra, R. M. (2003). *Learning to solve problems with technology: A constructivist perspective* (2nd ed.). Upper Saddle River, NJ: Merrill Prentice Hall.

Jonassen, D.H., Peck, K. L., & Wilson, B. G. (1999*). Learning with technology: A constructivist perspective.* Upper Saddle River, NJ: Merrill.

Kay, R. (2006). Evaluating strategies used to incorporate technology into preservice education: A review of the literature. *Journal of Research on Technology in Education, 38*(4), 383-408.

Laird, E. (2003). *A little piece of ground*. London: Macmillian.

Learning Point Associates. (2005). NETS for teachers: Achievement rubric. Retrieved from the North Central Regional Educational Laboratory Web site February 15, 2007, from http://www.ncrel.org/tech/nets/nets-t-rubric.pdf#search=%22NETS%20for%20teachers%3A%20Achievement%20Rubric%22

Levine, K. (2002). *Hana's suitcase.* Toronto, Ontario: Second Story Press.

Lock, J. V., & Clark, W. B. (2004, December). *Pushing the envelope of technology integration*. Paper presented in Best Practices in E-Learning: Showcase, University of Calgary, Calgary, AB.

Meltzer, J., & Sherman, T. M. (1997). Ten commandments for successful technology implementation and staff development. NASSP *Bulletin*, 81, 23-32.

Moursund, D., & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education*. Beverly Hills, CA: Milken Family Foundation. (ERIC Document Reproduction Service No. ED 428 072)

Pierson, M., & McNeil, S. (2000). Preservice technology integration through collaborative action communities. *Contemporary Issues in Technology and Teacher Education, 1*(1). Retrieved February 15, 2007, from http://www.citejournal.org/vol1/iss1/currentpractice/article1.htm

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1-6. Retrieved February 15, 2007, from http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf

Robyler, M. D., & Schwier, R. A. (2003). *Integrating educational technology into teaching* (Canadian Ed.). Toronto, Ontario: Prentice-Hall.

Scardamalia, M., & Bereiter, C. (2003). Knowledge building. In G. W. Guthrie (Ed.), *Encyclopedia of education* (2nd ed., pp. 1370-1373). New York: Macmillan Reference.

Selber, S. A. (2004). *Multiliteracies for a digital age*. Carbondale, IL: Southern Illinois University Press.

Slotte, V., & Tynjälä, P. (2005). Communication and collaborative learning at work: Views expressed on a cross-cultural e-learning course. *International Journal on ELearning, 4*(2), 191-207.

Vanatta, R. A., & Beyerbach, B. (2000). Facilitating a constructivist vision of technology integration among education faculty and preservice teachers. *Journal of Research on Computing in Education, 33*(2), 132-149.

Watts, M., Gould, G., & Alsop, S. (1997). Questions of understanding: Categorising pupils' questions in science. *School Science Review, 29*(286), 57-63.

Whitla, J. (2003). Ubiquitous learning: How technology is expanding learning opportunities in U.S. homes, schools and communities. *Mosaic, 5*(3), 2-3.

Author Note:

Jennifer Lock
University of Calgary
jvlock@ucalgary.ca