

**EXPLORING LITERACY PEDAGOGY WITH DIGITAL
TECHNOLOGIES IN TEACHER EDUCATION**

by

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ABSTRACT

Despite current emphasis in teacher preparation programs on developing pre-service teachers' comfort and competence with digital learning technologies (DLT), research suggests that pre-service teachers struggle to transfer innovative applications of technology into their eventual teaching practice. In particular, they resist change from traditional constructs of teaching and learning. In this dissertation, I suggest that disrupting pre-conceived notions of teaching and learning is a requisite step to facilitating change in classroom practice. Neuman (1990) observed that classroom practice is "disrupted" when digital technologies are integrated "in a way that fundamentally alters the instructional environment so that teaching and learning occur differently than before the technology was appropriated" (p. 110).

This thesis is composed of five chapters. The first chapter provides the theoretical framework that has informed the study and describes the case study methodology employed to explore the following two research questions: (a) How do pre-service teachers experience DLT in the context of a 12-month elementary teacher education program? (b) How do we disrupt pre-service teachers existing conceptions of literacy pedagogy?

Chapters 2-4 are co-authored manuscript chapters. Chapter 2 examines the manner in which a community of learners working collaboratively within a wiki environment establish social hierarchies and negotiate power. Student engagement in this activity revealed much about social negotiation within such settings, and about the affordances of such software for formal education. This paper is included in its published form. Chapter 3 explores the participants' experiences with "Slowmation" (a form of stop-motion animation). Findings reveal that reluctant uptake of slowmation on practicum by pre-service teachers appeared to be to the result of the

weak support structure for the pedagogy and the lack of encouragement from some sponsor teachers. Chapter 4 explores pre-service teachers use of GarageBand™ and an electronic bulletin board in the context of a 3-month curriculum and instruction course in music education. Results reveal that the integration of digital learning technologies facilitates a reconceptualization of music education as well as a sociocultural interpretation of music literacy. In chapter 5, I draw comparisons across each of the manuscript chapters in light of current research in the field.

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DEDICATION

This thesis is dedicated to my parents, Maria and Kimon Vratulis, who are the two most extraordinary people I know. Thank you for always encouraging me to follow my heart. Your faith, patience, humour and extraordinary vision are an inspiration. I also dedicate this thesis to my sister Tania who inspires me to see the humour in life. Thank you with all my heart for your ongoing support and encouragement. Finally, I dedicate this thesis to Sebastian and Olivia who have filled my life with love and laughter since the moment they were born.

CO-AUTHORSHIP STATEMENT

The papers in the manuscript portion of this thesis are co-authored with Teresa M. Dobson, Tony Clarke, Garry Hoban, Gaalen Erickson and Charlene Morton. The projects discussed herein were designed by instructors and consultants working with a cohort of 36 students in a twelve-month elementary teacher education program. Authorial credit is given to those individuals, reflecting both their role as designers of the projects and their contributions to the writing of the respective papers. I collected all data discussed in this thesis, conducted the literature reviews, and took the lead on data analysis (co-authors reviewed the data as well to increase rigor). I also wrote the initial draft for each of the papers. My co-authorship contribution for each of the papers in the manuscript portion of the thesis is, therefore, 80%.

1 EXPLORING LITERACY PEDAGOGY WITH DIGITAL TECHNOLOGIES IN TEACHER EDUCATION

1.1 Introduction

Reinking, Labbo and McKenna (2000) state that literacy learning in schools has traditionally meant developing students' print based reading and writing skills. In contemporary North American society, however, skills with print technologies are no longer enough to improve students' opportunities for success in academic communities, the workforce, and society (Kress, 2003; New London Group, 1996). The proliferation of accessible digital learning technologies (DLT) demands that schools reinterpret what is required for students to emerge as literate citizens. Hull and Nelson (2005) state, "there are unmistakable signs that what counts as text and what constitutes reading and writing are changing — indeed, have already changed" (p. 224). For Reinking et al. (2000), the expectation is that students graduate from high school and enter university digitally fluent (p. 274). Reinking and his colleagues assert that in this new "knowledge based digital economy the workplace requires an enhancement of old skills, development of new skills and understanding of new digital forms of literacy" (p. 274).

1.1.1 Research purpose

The purpose of this study is twofold: (a) To describe how pre-service teachers experience DLT in the context of a 12-month elementary teacher education program; (b) To explore pre-service teachers' existing conceptions of literacy.

1.2 Significance of the Study

As new technologies proliferate in society, so too does the urgency to integrate these technologies into students' educational experiences (Wiske, 2004). Over the past 15 years, DLT

have found their way into many classrooms in North America; yet concerns remain that improved access has not translated into significant educational gains (McGrail, 2005; Selfe, 1999). While researchers such as the New London Group (1996) have theorized about shifting notions of literacy, such writings to date appear to have had minimal impact on transforming classroom practice in ways that prepare students for the linguistic and cultural diversity they experience in their local communities and through global connectedness.

One reason for this apparent disjuncture between theory and practice may be a tendency on the part of educators to overlook the particular affordances of new technologies (Kimber & Wyatt-Smith, 2006). For example, computer-based applications are commonly used to support conventional print practice (Labbo, 2005). The Internet is used like an encyclopedia to research topics, students' traditional reports or essays are posted online, and so on. Yet the Internet is also host to a range of social software environments such as wikis or weblogs that facilitate the development of communal writing spaces not feasible in a print environment. Spaces such as these transform conceptions integral to print, such as the notion of "ownership" of ideas (Dobson 2007).

Innovation in teaching and learning with DLT, it seems, is most likely to occur when we attempt to look beyond traditional notions of literacy and to experiment with new forms of representation that are possible in multimedia, interactive, socially constructed, networked spaces (Dobson, 2006, 2007). Along these lines, Neuman (1990) suggests that DLT are best integrated with the intention to disrupt pre-conceived notions about classroom practice. According to Neuman, this requires a process whereby technology integration "disrupts" existing classroom practice in a way that "fundamentally alters the instructional environment so that teaching and learning occur differently than before the technology was appropriated" (p. 110).

Teachers who encourage moments of disruption in existing classroom practice recognize that to take advantage of the particular affordances of DLT requires a shift in pedagogy, an understanding of changing notions of language and literacy, and a flexible approach to learning (Brown & Davies, 2004). Such educators teach with a view to fostering new processes of expression, analysis, synthesis, understanding, and communication (Leu, Mallette, Karchmer & Kara-Soteriou, 2005). In this dissertation, I suggest that exploring and articulating moments of disruption creates opportunity for educational change.

In the following section, a review of the research literature is provided with attention to sociocultural theory, New Literacy Studies, and multiliteracies theory. Subsequently, the research literature is reviewed on DLT integration with attention to examples that illustrate disruption in conceptions of pedagogy and practice in K-12 schools and teacher education. The chapter concludes with a description of the case study methodology employed herein to answer the following two research questions: (a) How do pre-service teachers experience DLT in the context of a 12-month elementary teacher education program? (b) How do we disrupt pre-service teachers' existing conceptions of (literacy) practice?

1.3 Theoretical Framework

1.3.1 Sociocultural theory

One of the theoretical frameworks guiding this study is sociocultural theory. The perspectives on learning and development proposed by Vygotsky (1978) provide a “lens” through which to view sociocultural theory as foundational to principles shaping the elementary teacher education program in which this study took place. There are two principles that define Vygotsky’s view of learning. The first is that learning occurs through purposive, social interaction with others within an environment of cultural and historical contexts. Within this

environment, a diverse group of learners work to negotiate meaning from cultural tools and artifacts that already exist. Learners construct meaning with one another and from such “environmental texts” (Kong & Pearson, 2005). For Vygotsky (1978), “every function in the child’s cultural development appears twice: first, on the social level, and later, on the individual level; first between people (interpsychological), and then inside the child (intrapyschological)” (p. 57).

The second principle is that learners can advance their cognitive development by working within the higher end of their *zone of proximal development*. Working with others who are more competent and knowledgeable facilitates the processes of learning and development. Social interaction (i.e., interpersonal activity) encourages students to reconstruct meaning with others so they can subsequently construct meaning on their own (i.e., intrapersonal activity). For Bruner (1975), *scaffolding* is what facilitates the process of social learning. As described by Clay and Cazden (1990),

Scaffolding is Bruner’s metaphorical term that has come to be used for interactional support, often in the form of adult-child dialogue that is structured by the adult to maximize the growth of the child’s intrapsychological functioning. Scaffolding refers to the gradual withdrawal of adult control and support as a function of children’s increasing mastery of a given task. (p. 5)

Vygotsky (1978) suggested that language plays a critical role by mediating between cognitive development and the cultural and historical context(s) of learners. The external world of social interaction contributes to the construction of language and thought development. It is through language that learners negotiate “messages” from cultural tools and artifacts within the environment. Vygotsky’s theories negate any assumption that students are merely empty vessels

to be filled. Possibilities for purposive, social interaction and scaffolding to impact processes of learning and development are foundational to sociocultural theory.

The notion of mediation is also a central tenet of sociocultural theory. Mediation refers to how tools and signs transform all human behavior. Warschauer (1997) supported Vygotsky's concepts and posited that the transformative power of these tools is not derived from the "action that could not have occurred without them, [but rather, from] being included in the process of behaviour [as they] alter the entire flow and structure of mental functioning" (p. 2). This notion of mediation has been especially useful in considering the implications of integrating DLT into classroom praxis where literacy learning is the goal (Cruickshank, 2004; Head & Dakers, 2005).

Fang (2005) described sociocultural theory as placing emphasis on the potential for learning to be an "interrelated historical, cultural, institutional, and communicative process" (p. 3). According to Cope and Kalantzis (2000), the sociocultural knowledge of students is what empowers them to speak from "cultural spaces and frameworks of relationship(s) and communities" (p. 123). Linguistic and cultural diversity encourages students to appropriate new social discourse and sociocultural knowledge in order to learn. Learners' sociocultural knowledge can impact how, why and if they use DLT.

1.3.2 New literacy studies

Gee (1990) and Street (1995) also position literacy as a social practice. This understanding is distinct from the traditional concept of literacy as a discrete set of skills to be passively acquired (Lankshear & McLaren, 1993; Luke, 1999). As stated by Kendrick, McKay & Moffat (2005), extending the term literacy to include multiple literacies "signals a movement away from the ordinary worldview and a greater openness to more social and value-laden notions of literacy" (p. 172). Street (2003) recognized that "multiple literacies, varying according to time and space, [are] contested in relations of power" (p. 77). Embedded within the notion of multiple

literacies is a distinction between an ideological and autonomous model of literacy (Street, 1995). The autonomous model assumes the existence of an intrinsic quality to literacy that is transformative in nature. Street (2003) stated that “literacy in itself — autonomous — will have effects on other social and cognitive processes” (p. 77). The autonomous model refers to the imposition of Western conceptions of literacy. For Street (1995), however, the ideological model positions literacy as a social and cultural construct, inextricably tied to a “culture’s or a social group’s political and economic conditions, social structure and local ideologies” (p. 61). Street positions literacy as partially ideological, stating, “Particular versions of it [literacy] are always rooted in a particular world-view and in a desire for that view of literacy to dominate and marginalize others” (p. 78).

Researchers such as Scribner and Cole (1981) support Street’s claim that an autonomous model (schooled literacy) does not foster equity of access in the classroom; yet, this model continues to dominate curriculum and pedagogy (Street, 1995; 2003). The autonomous model is maintained (and perpetuated) within mainstream schools through the socialization of students in the discourse practices of the school. This often occurs even before students’ arrival at the school. Heath (1983) asserted that “schools are an appropriate place to practice mainstream literacy once you have the foundations, but they are not good places to acquire these foundations” (p. 11). Street (1995) identified literacy as embedded within the processes of reading and writing. The definition of *literacy*, however, includes all forms and functions of communication that venture beyond traditional notions of language. Music, art, gesture, and vernacular language are a few of the literacies recognized by Street (2005) as prevalent within 21st century society.

Gee (1990) identified the transition toward new literacy studies as the result of “the collapse of the old oral culture-literate culture contrast” (p. 49). This merger of oral and written cultures created the necessity to extend *literacy* to its plural form of *literacies*. This initial shift created opportunities to approach literacy learning as a social and situated practice (Gee, 1990; Street, 1995). Street (2003) suggested that the manner in which language is used (i.e., spoken or written) can be determined through cultural contexts rather than “linguistic or cultural standards or norms” (p. 15). Willinsky (1994) suggested that “the New Literacy Studies consists of those strategies in the teaching of reading and writing which attempt to shift the control of literacy from the teacher to the student” (p. 6). Street (1995) identified ‘New Literacy Studies’ as a “shift in perspective on the study and acquisition of literacy” (p. 417). This approach to literacy learning opened possibilities for educators and researchers to move away from viewing literacy as a dominant cognitive model with its emphasis on reading. Street states, “Literacy practices extend beyond the traditional text, paper, and pen to a broader understanding of literacy practices in their social and cultural context” (p. 417). How individuals use literacy to create meaning within their daily lives became paramount to redefining literacy within educational institutions.

According to Street (2005), literacy teaching and learning is driven by political agenda(s) that have the potential to liberate, empower, repress, and subdue. This illustrates why it is critical that educators become aware of how their views and applications of literacy impacts their students’ sense of self-worth and belonging. Culturally and linguistically diverse student populations all have a right to the universal promise of education. According to Cope and Kalantzis (2000), “Through education everyone has the opportunity to access material resources, the public realm in the form of participatory citizenship, and the symbolic realm of belonging” (p. 122).

1.3.3 Multiliteracies

I use the term *multiliteracies* as it is defined by the New London Group (1996). The New London Group suggests that it is no longer adequate to define literacy as primarily based in the written representation of language. In contemporary society, literacy is redefined as *multiliteracies* to include the negotiation of all modes of representation including the rearticulation of various textual forms including information and multimedia technologies. The term multiliteracies also accounts for the proliferation of linguistic and cultural diversity experienced within local communities and through global connectivity. Multiliteracies provides a new language of meaning making for the purpose of our “working, public and private lives” (p. 6).

The emergence of multiliteracies has encouraged a pedagogical shift. Teachers are now encouraged to “step away” from a more traditional pedagogy (i.e., transactional and teacher-directed model of learning) to a platform of multiliteracies pedagogy which emphasizes *multiple modes of representation*. According to Cope and Kalantzis (2000), traditional pedagogy involves teaching students “to read and write page-bound, official, standard forms of the national language” (p. 8). Modes of representation refer to the many ways in which meaning is constructed and communicated. Cope and Kalantzis, as well as Kress (2003), refer to visual, audio, spatial, behavioral, and written communication as modes of representation used to communicate and express meaning. The term *multimodality* is used when one or more of these modes are combined. Cope and Kalantzis state that multiliteracies pedagogy frames language and other modes of meaning making as representational resources that are constantly “remade by their users as they work to achieve their various cultural purposes” (p. 5). This requires an approach to literacy teaching that allows for flexibility and change in the “what and how” of literacy pedagogy and practice. Multiliteracies pedagogy affords students, regardless of linguistic

or cultural diversity, access to the languages of work, power and community; yet students are able to access these *dominant literacies* without displacing their own personal *subjectives* (Street, 1995). Multiliteracies pedagogy requires that teachers encourage students to draw from their own experiences, values and sociocultural knowledge as a way to connect with their peers both socially and academically.

1.4 Digital Literacy

1.4.1 Developing digital literacy

In the following section, I highlight what is “digital” in the midst of existing and emergent literacies in our current technological era. I describe the necessary skills for developing digital literacy and highlight several distinctions between print and digital culture. In the final section I explore both a disruptive and additive model of integration with attention to studies from K-12 schools and teacher education.

Labbo and Reinking (1999) defined the term *digital* as “electronic representations of alphabetic and graphic information using binary code. This coding enables computers to transmit and transform text and pictures quickly and fluidly” (p. 276). Thus, the term *digital literacy* refers to the multiple ways of constructing, expressing, and representing meaning using such binary code. Digital literacy requires an understanding of how to critically construct and represent meaning with DLT (Merchant, 2007). Withrow (2004) suggested that digital literacy requires the ability to navigate print, visual (e.g., photographs, videos, or animation), and audio (e.g., music or audio narration) in ways that represent critical engagement, personal preference and intent in a digital environment. Those who are digitally literate “create new, meaningful materials from existing ones; construct knowledge from nonlinear, hypertextual navigation;

evaluate the quality and validity of information; and have a mature and realistic understanding of the ‘rules’ that prevail in the cyberspace” (O’Brien & Scharber, 2008, p. 93).

Kress (2003) suggested that digital literacy is the ability to persuade, understand, evaluate, communicate, and creatively express meaning through multimodal, digital representations. Digital literacy requires an understanding of how to renegotiate digital texts within a variety of “symbolic formats” (Davies, Szabo, & Montgomerie, 2002, p. 7). Becoming digitally literate requires the ability to represent meaning in various forms, drawing from different modes and tools while developing the skills necessary to critically use multimodal texts in ways that spatially and temporally juxtapose the texts to best represent ideas (Koutsogiannis, 2007). O’Brien and Scharber (2008) purported, “Digital literacies enable the bridging and complementing of traditional print literacies with other media” (p. 9). Eschet-Alkali (2004) stated, “Digital literacy requires skills beyond just the ability to use software to operate digital devices” (p. 1). Eschet-Alkali and Amichai-Hamburger (2008) asserted that in order to develop digital literacy attention is required to enhance and support the development of five types of literacy—photovisual, reproduction, branching, information, and socioemotional. Photovisual literacy is the ability to construct and represent meaning in a visual-graphical form—“to use vision to think” (p. 422). This requires the ability to “read” visuals in a way that is intuitive and associative (e.g., children’s video games). Reproduction literacy is defined as the ability to reconstruct meaning through a process of combining information that already exists in various media forms (e.g., text, graphic, or sound). Branching literacy requires skills for navigating nonlinear, hypermedia technologies. Information literacy requires the skills necessary to identify false information and bias, as well as to become a “smart” information consumer (p. 422). Socioemotional literacy requires knowledge of “the rules of the game and [how to] survive the hurdles that await . . . in the mass communication of cyberspace” (Wallace, 1999, p. 11).

Digital literacy can also be viewed as a socially situated practice supported by skills and strategies that enable the representation and understanding of ideas using a range of modalities enabled by digital resources (Lankshear, Gee, Knobel, & Searle, 1997). Some of the skills required to become digitally literate are the same as those required to develop effective communication using pen-and-paper technologies. For instance, we have used reproduction literacy for years to synthesize meaning from multiple sources in order to construct and disseminate knowledge in the form of new articles, academic essays, posters, and other print media. Lankshear and colleagues stated,

Talk of technological literacies seems to arise from the fact that the technologies integral to conventional or “normal” literacy practices have become “invisible,” as a result of their always having “been there” in our practice. Hence, we now take them for granted and they do not stand out as *technologies*. When *new* technologies come along, however, they stand out in relief from our conventional practice, and notions of applying them to and incorporating them into literacy practices strikes us as introducing a technological dimension, as constituting “technological literacies.” (p. 139)

Thus, there are many ways in which digital literacy extends and modifies traditional literacy practice. As new technologies emerge it becomes increasingly necessary to explore what is distinct and similar about constructing and representing meaning in both print and digital environments. This is a requisite step toward better understanding how we might draw from the affordances of DLT for the purpose of improved DLT integration. In the following section I explore how identifying and understanding threads and distinctions between digital and print literacies help elucidate the complexity and possibilities of DLT integration.

1.4.2 Continuities between print and digital literacies

All literacies are social technologies (Tuman, 1992). Lankshear, Gee, Knobel & Searle (1997) suggested, “If we think of literacies as socially constructed conceptions and practices of engaging semiotic texts in processes where some kind of technology is integrally involved, then (virtually) all literacies have to be seen as ‘technological’” (p. 139). Using technologies to express and communicate meaning through the production of print and digital texts is not new. Historically, people have used various technologies for writing (from chisel and stone to keyboards) to express, represent, and communicate meaning. Implementation of these technologies has more often than not manifested in an assortment of visual displays or texts such as tablets, notebooks, and more recently, digital interface. Distinctions and similarities between print and digital literacies rest partially in the possibility of textual production. According to Dobson and Willinsky (2009), continuities exist between print and digital literacies that merit exploration:

Yet, what we see of [digital] literacy is remarkably continuous with the literacy of print culture, right down to the very serifs that grace many of the fonts of digital literacy. So begins the paradox that while digital literacy constitutes an entirely new medium for reading and writing, it is but a further extension of what writing first made of language. . . . We tend to look at the continuities and extensions achieved through the introduction of digital literacy into a print culture, while seeking to understand how these developments encourage what is most admirable about the nature of literacy. (p. 286)

Lanham (1995) suggested that the digital culture is less focused on the necessity to “pin down” information than was the prior era grounded in print media. Published books were traditionally fixed in form and difficult to replicate. This encouraged their retention by the elite as a commodity to be bought and sold. Literacy was associated with the ability to read and write

printed text, as well as with power and authority, because the ability to read printed text represented access to knowledge and power. The shift in control (from the elite to the masses) over authorship and access to texts marks a considerable distinction between print and digital culture. It is important to note that the difficulty of reproducing books, and the corresponding “fixed” nature of print culture, served as a collective catalyst for the contemporary understanding of intellectual property. According to Lanham, “The copyright structure dissolves when we introduce the changeable multimedia signal” (p. 7). This shifted hierarchical control over literacy from the social elite to privileging everyday individuals, which marked the onset of what would become the democratic possibility of literacy practice (Glenn & Kaviani, 2006).

Lanham (1995) observed that one of the distinctive features of digital literacy is that it “recaptures the expressivity of oral cultures, which printed books, and hand-written manuscripts before them, excluded” (p. 9). In effect, the possibilities of digital literacy allow for the inclusion and enhancement of oral culture while still drawing from and extending the possibilities of print culture. For instance, an autobiography can be constructed on a webpage with an option for the reader to hear the voice of the author narrating a moment of his or her life. This unique feature of the digital realm allows for the merging of oral and print based literacies for the purpose of creating innovative forms of meaning making and expression. Lanham explained,

The oral and written ways of being in the world have contended more rancorously throughout Western history, the rancor being driven more often than not by prejudice against the oral rules. Now the great gulf in communication and in culture organization that was opened up by unchanging letters on a static surface promises to be healed by a new kind of literacy, one that orchestrates these differences in a signal at the same time more energizing and more irenic than the literacy of print. (p. 9)

In this thesis, distinctions between digital and print culture become evident when participants struggle to reconcile their understandings of the purpose and practice of digital literacy within an institutional context that at times perpetuates a more teacher-centered model of learning. Each manuscript chapter elucidates the complexity of apprenticing pre-service teachers into thinking about DLT integration in a way that might disrupt and extend pre-conceived notions about literacy pedagogy and practice.

1.5 DLT Integration

In this next section, I review a disruptive and additive model of integration with particular attention to current studies conducted in K-12 schools and teacher education. I focused on research studies that draw from multiliteracies theory, new literacy studies, and transformative pedagogy as a way of narrowing the hundreds of available studies for review. I also draw from the Canadian Social Sciences and Humanities Research Council's (SSHRC) Image, Text, Sound and Technology (ITST) initiative in organizing my literature review in a way that emphasizes how we experience linguistic, visual and aural modes of meaning making. Such research with DLT is requisite to understanding how to develop student literacy in the “globalized 21st century.” According to SSHRC, “To examine and interpret individuals and their cultures, researchers currently use three fundamental kinds of digital information: images, text and sound” (SSHRC’s ITST research grant, 2009, para. 2). The transient and changing nature of new technologies requires research specific to how “innovative technologies have transformed the very definition of text in relationship to image and sound” (SSHRC ITST, 2009, para. 5). In keeping with this notion, the DLT explored in the subsequent chapters focus on linguistic (collaborative wiki writing and an electronic bulletin board), visual (stop motion animation), and musical (GarageBand™) systems of meaning making.

In order to conduct this review, I needed to establish a systematic process of inquiry (Flood, Lapp, Squire, & Jensen, 2005). I have outlined this process below to make explicit to the reader choices of inclusion and exclusion that I made along the way. I searched for peer-reviewed articles within major scholarly databases employing combinations of terms such as *digital technology*, *digital learning technology*, *educational technology*, *digital educational technology*, including their plural forms. Other key words and phrases included *elementary*, *secondary*, *K–12*, *teacher education*, *teacher preparation*, *pre-service teachers*, *in-service teachers*, *media* and *technology integration*. This search yielded hundreds of articles, which were narrowed with a specific focus on the term *literacy* (i.e., *literac**). As already stated, I then reviewed the remaining articles for studies that explore multiliteracies, new literacies studies and/or transformative pedagogy, specific to visual, aural, and linguistic systems of meaning making. The studies were examined to identify the prevalence of two distinct models of integration, which are referred to in this thesis as “disruptive” and “additive.”

1.5.1 Disruptive model of integration

In the following section I explore a disruptive model of integration. Hedberg (2007) described a model of disruption as a process of technology integration whereby students are encouraged to actively problem-solve and learn with DLT in ways not possible with other technologies. Such a model of integration challenges learners “to perform at higher cognitive development” (Hedberg, 2007, p. 7). Vrasidas and Glass (2005) observed that a disruptive model of integration requires a shift in perspective in how we view (and experience) teaching and learning with DLT. For instance, Hedberg conducted a study in order to explore how ICTs could be used to support disruptive pedagogy. In this study he states, “Instead of using ICTs just for *presenting* and *representing* information in a variety of modalities, it is important to explore their capacity for *generativity*” (p. 5). Hedberg advocates for exploring the affordances of DLT in

order to problem-solve and engage in new and innovative learning activities. In particular, he suggests that engaging in disruptive pedagogy requires a shift away from focusing on a process of information dissemination and acquisition toward an understanding of how DLT can provide new opportunities for communication and expression. This marks a considerable shift from the more dominant model of transactional learning.

In a number of studies exploring a disruptive model of integration, research is focused on reconceptualizing traditional notions of reading and writing. For instance, specific to the research literature in K-12 schools, Patterson (2000) explored how innovative reading strategies can be used to facilitate the comprehension, understanding and interpretation of electronic texts. Through a series of in-class multimedia projects, students were encouraged to reconceptualize their individual roles as readers within the transient space of digital text. Van Wyhe (2000) broadened traditional notions of poetry through the use of digital texts, hypermedia, and online communication channels. He moved beyond the exploration of words to the process of negotiating meaning through multimodalities. Students participating in this study then reflected on the potential impact of various images, texts, film, and media. Poetry became a vehicle of inquiry and collaboration through online communities. Lothereington, Holland, Sotoudeh, and Zentena (2008) conducted a research study during which students analyzed, interpreted and (re)wrote traditional stories from localized cultural and linguistic perspectives, creating innovative, individualized narrative forms through the use of various DLT. This experiment in multiliteracy pedagogy encouraged the students to reconceptualize preconceived notions of language and literacy education. Students were able to explore sociocultural perspectives while improving their critical understanding of the multiple possibilities for digital communication (rather than focusing on developing literacy skills as a process of encoding and decoding text, for instance).

In the context of teacher education, Whitin (2009) explored how pre-service teachers in a reading and language arts course used “multimodal response strategies” (p. 1) as part of their literature study. They responded to the multigenre text *Through My Eyes* (Bridges, 1999), using both traditional and digital literary responses. Online response prompts, collage, dramatic interpretation, a literature circle and discussion were all part of the preparatory process for finally constructing their own digital movies. Their topics for their digital movies emerged from discussions within the literature circle. Pre-service teachers were able to experience many of the traditional aspects of a literature unit while exploring DLT in ways that created new opportunities for teaching and learning. Whitin observed, “Through the use of multimedia software, visual, linguistic, audio, and temporal elements could be interrelated in ways not possible with nondigital media” (p. 409). Dobson (2007) conducted a research study with fifteen teacher education students who used wikis (a type of social software commonly used for collaborative writing) to compose e-literature. The wiki environment encouraged a process whereby pre-service teachers could work collaboratively and write complex, “multi-directional” narratives in a digital environment (p. 267). These studies help elucidate the importance of integrating DLT in ways that afford new opportunities for learning.

There are also a growing number of studies in the field of video gaming and education that provide examples of disruptive pedagogy. For instance, Sanford and Madill (2007) challenge existing assumptions about the negative impact of video games on boys’ learning by identifying the multiple ways in which boys are “learning highly sophisticated literacy skills through engagement with video games” (p. 1). Other researchers such as Compton-Lilly (2007) and Kerin (2005) focus specifically on how playing video games can encourage players to reconceptualize traditional notions of reading and writing. Alberti (2008) states, “video games most disrupt received ideas about writing and reading” (p. 3). This paper helps elucidate how

developing a “knowledge of games as distinctly interactive meaning-making spaces...fits well with a re-thinking of the task of designing writing and learning spaces” (p. 2). Researchers such as Barab et al. (2005) also suggest that online games and three-dimensional virtual worlds encourage disruptive pedagogy; such environments encourage students to construct and negotiate personally constructed worlds. This is not only motivating but encourages students to think critically and perform at “higher cognitive levels” (Hedberg, p. 7); such research tends to focus on how the visual aspect of video gaming challenges traditional conceptions of literacy learning (Vasudevan, 2007; Tallim, 2004; Williamson, 2004).

Rogers and Schofield (2005) also encourage us as researchers and educators to broaden traditional conceptions of literacy education, for instance, through a process of “rearticulating, transforming, and integrating” the stories, narratives and/or biographies of students’ lives into curricular texts (p. 3). This study demonstrates how encouraging students to engage in multiple literacies, including literacies they experience beyond the context of school, can help prevent them from becoming marginalized. In a research study conducted by Schofield and Rogers (2004), “youth pedagogies” are explored as a means of integrating the cultural and social literacies of students into education. Each of these studies provides an example of how traditional conceptions of literacy education are “disrupted” and extended to account for a broader understandings of literacy pedagogy and practice.

Marsh (2006) conducted a study during which three- and four-year-old children were introduced to iMovie 2™ (video editing software) for the purpose of creating a variety of short, animated videos. This study was informed by questions specific to whether the process of constructing these videos improved these students’ “knowledge and understanding” of multimodal texts (p. 6). As stated by Marsh, these students naturally negotiated the “visual mode

(relationship of objects to each other in space) and aural mode (adding very specific sound effects to their films)” while interpreting and constructing stories for each of their films (p. 10). This study demonstrates the ease with which students, even when very young, can construct digital texts in a way that naturally draws from how they are already “making meaning” in their daily lives.

In a study conducted by Sadik (2008), students used Microsoft Photo Story 3™ (an application that allows for the easy creation of stories from photos) to construct their own digital stories. Students constructed their stories, then presented, published and shared their stories with each other during class. The art of storytelling is not new; however, what is interesting in this study is the way in which the authors emphasized distinctions between oral, written and digital storytelling. For instance, “conventional storytelling” is typically taught as a process whereby the storyline unfolds as a linear sequence of events. Digital applications such as Photo Story (and wikis used in earlier studies reviewed in this section) allow for the “non-linear” construction of stories. Dorner, Grimm, and Abawi (2002) explore distinctions amongst oral, written and digital stories by encouraging audiences to view (and not just listen to) the story. In this study, the authors emphasize how ineffectual it is to evaluate digital projects according to print-based practice. After all, a digital story requires different considerations in terms of standards and assessment than a written story. It is necessary to understand such distinctions if DLT are to be effectively integrated. Disruptive pedagogy becomes evident when the teachers state that they are “willing to transform their pedagogy and curriculum to include digital storytelling” (p. 9).

Swan (2002) modified traditional standards for educational technologies, information literacy, and English-language arts to include standards for assessing non-print media. This involved an effort to expand existing notions of literacy and literacy instruction within schools.

Specific to disruptive pedagogy, teachers were encouraged to move beyond basic DLT skills to include critical literacy and construction skills. This involved developing an understanding of the particular benefits for integrating DLT. Swan's study provides an example of how teachers can move beyond a skill-based model of integration, and how to use DLT to facilitate learning not possible in a print environment. For the most part, students are required to navigate linguistic, aural, visual systems of meaning making for the purpose of text construction and representation. It is the ease with which students are able to navigate such multimodalities that helps elucidate the importance of adapting a student-centered model of teaching that empowers students to become authors, composers and constructors of their own (multimodal) texts.

Perhaps one of the limitations of the study conducted by Swan (2002) is that not enough attention is placed on developing a critical understanding and awareness of the affordances of DLT; yet I decided to include the above study as an example of a disruptive integration because participating teachers revealed a change in perspective about how, if and/or why to integrate DLT into their classroom practice. The process of evaluating the various DLT helped foster a critical awareness in teachers about the possibilities for DLT to improve and “interrupt” traditional conceptions of pedagogy and practice. Culp, Honey, and Mandinach (2005) emphasized the development of “pedagogical methods based on a more active, student-centered approach to learning that emphasizes the development of higher-order reasoning and problem-solving skills” (p. 128).

1.5.2 Additive model of integration

In the following section I explore an additive model of integration. An additive model of integration is characterized by uses of DLT intended to support literacy learning as it is traditionally experienced in print-based (non-media) environments. For instance, research studies

that demonstrate an additive model of integration tend to be focused on improving students' writing and research skills (Chambers, Cheung, Madden, Slavin, & Gifford, 2008; Chapman & Morien, 1999; Elliott, 2000; Lindsay & McLaren, 2000). Other studies reveal how DLT can support the development of student grammar (Lacina, 2005; Patterson & Pipkin, 2001) and editorial processes (Jester, 2002). In these studies, students are often motivated to use DLT; yet far too often, their role is to passively acquire "institutional knowledge." They are not positioned as constructors of digital, multimodal texts as a process to extend and challenge already existing literacy practices. Instead, DLT are used to replicate and perpetuate an institutional value system that privileges a linguistic, and primarily print-based, system of meaning making.

For instance, Mello and Marquis (2000) describe their use of DLT in their exploration of the play *The Crucible*. The study was based upon a multimedia resource created to guide student exploration and understanding of the text. In this study, students were required to construct and represent meaning through reading and writing print-based texts. They were subsequently encouraged to explore the multimedia site to work through individual tasks, read the additional resources located on the site, and participate in the virtual tour of a Salem witchcraft trial. Only the final essay and the student response journals were mandatory and graded. Despite the availability of the multimedia site, requirements for the final assignments were restricted to a traditional expository and/or narrative essay structure. Participating students were not required to critically examine, evaluate, nor synthesize information from various sites. The assignment was a series of information-seeking exercises embedded within a motivating virtual tour.

Agee (2003) investigated how DLT can support student exploration of literature through the use of e-books. Participating students were able to access classical literature in digital form. The underlying premise was the expectation that they would become more interested in literature

through the use of the e-books. In the Agee study, DLT were implemented to improve student motivation and support their comprehension of literary texts. Computers were used to replicate how we read in a print environment.

In another study, Thomas and Hofmeister (2002) described the process of DLT integration in the following manner: “Online education is becoming ubiquitous, not replacing traditional education, but enhancing and transforming it, thereby contributing to a paradigmatic shift in educational theory and practice” (p. 234). Participants were encouraged to replicate the traditional practice of engaging in a *literature circle* for the purpose of exploring reading and writing within a virtual space. The expectation was that students would be more motivated to write and, therefore, the process of writing on electronic message boards would, in turn, improve the “cognitive complexity” of their responses (p. 238). However, as revealed by the results reported in the Harasim study, an increase in the cognitive complexity of written responses appeared to have little to do with the integration of the message board and more to do with students’ interest in the books and the process of the literature circles. Interestingly, many of the advantages and setbacks confronted with the integration of DLT in this study were similar to those reported by using literature circles within print-based environments.

Benenson & Neujahr (2002) is one of a growing number of researchers focused on developing curricular guides with DLT that encourage students to become designers of meaning. These guides provide teachers with classroom activities and instructional strategies supporting the use of DLT to explore current issues within the realms of education and the environment. Consistent with the studies reviewed for this current research, DLT is primarily justified through its potential to improve student reading and writing skills, as well as their content-based knowledge. Lessons are created that are based on a model of information dissemination (i.e.,

teacher) and acquisition (i.e., student). Other curricular guides that demonstrate how DLT can be used to support traditional classroom practice are discussed in the works of Bennett and Tronfanenko (2002) and Bickart, Jablon and Dodge (1999).

The purpose of this section was to distinguish between two models of integration: disruptive and additive. Studies demonstrating a disruptive model of integration challenged traditional notions of text, textual practice, reading, writing and pedagogy. In each of these studies, attention was placed on what could be accomplished through the integration of DLT that would not be possible in a print-based, or non-media environment. In contrast, the additive model included studies in which DLT were used primarily to support a more teacher-centered model of classroom practice. Specific to literacy, these studies explore how DLT can be used to replicate learning as it might unfold in a non-media (print-based) environment. In this section I have created a distinction between a disruptive and additive model of integration for the purpose of highlighting distinctions in DLT integration as observed in my review of the research literature. However, it is important to note that I do not view these models as mutually exclusive. As will be explored further later in this dissertation, at times there are continuities between these two models of integration.

1.6 Methodology

1.6.1 Case study

The three papers presented in this dissertation are based on data collected in the context of a single research setting employing the method of case study. Historically, case study has influenced theory and practice within the field of medicine since before the time of Hippocrates (Flood et al., 2005). Anthropology, history, psychology, and law have also traditionally used case study as a prominent mode of inquiry. Volman and Ten Dam (2007) asserted that “much of

what we know about the empirical world is drawn from case studies and case studies continue to constitute a large portion of work generated by the disciplines” (p. 341). However, it was not until after the 1970s that case study became a prominent mode of inquiry within the social sciences (Birnbaum, Emig & Fisher, 2003). Volman and Ten Dam (2007) suggested that perhaps this shift toward case study as an increasingly popular research design has emerged from the possibility that quantitative approaches are less equipped to “analyze complex, multidimensional characteristics of a phenomenon” (p. 125). Since at least the 1980s, academic research communities have recognized the need for exploratory, holistic, and inductive research focused on determining significance of phenomenon within particular contexts (Merriam, 1988).

A number of definitions for case study have emerged from varying disciplines and within the field of education. A consistent theme among these definitions is that conducting a case study implies learning about a complex instance through a process of in-depth exploration, detailed description and contextual analysis. The final product of a case typically represents the manner in which a particular phenomenon (i.e., case) emerged and how it might be successfully explored in similar situations (Merriam, 1988; Stake, 2006). Within the social sciences, the phenomenon under study is usually referred to as an instance, event, instrument (i.e., teaching or learning), behavior, process, occurrence, or simply a situation. Case study is traditionally positioned as a qualitative approach. Merriam (1988) defined case study as a contextual rediscovery of a particular phenomenon for the purpose of exploration, explanation, and discovery.

Case study is a method of inquiry requiring multiple sources of data collection to investigate contemporary phenomenon within real-life contexts. Merriam characterized case study as typically particularistic, descriptive, heuristic, and inductive, as well as an “intensive, holistic description and analysis of a bounded phenomenon” (p. iv). The particularistic

component invites sustained focus on a particular phenomenon. The case itself becomes the lens through which to view, interpret and represent what is significant about the phenomenon under study. For Merriam, “thick description” becomes a critical property to the definition of case study (p. 11). The descriptive element allows readers to glimpse through the lens of the researcher to construct their own meaning of what the investigator observed (Donmoyer, 1990; Mertens, 1998).

Relying heavily upon thick description also facilitates improved understanding of the social, physical, and transient infrastructure of the experiences of the participants (Lincoln & Guba, 1985; Patton, 1990; Stake, 1995). Merriam asserted that the heuristic value of case study will “illuminate the reader’s understanding of the phenomenon under study” (p. 13). She views heuristic qualities as advantageous because they can explain the source of a problem, its background, and what and why particular events have occurred. The method helps elucidate reasons for the success or failure of an innovation and holds potential for the evaluation of an alternative explanation for the purpose of future application. In short, case study offers a “means of investigating complex social units consisting of multiple variables of potential importance in understanding a phenomenon” (p. 4).

1.6.2 Research site

This study was conducted within a 12-month elementary teacher education program within a British Columbia university. The program follows a cohort model. A cohort model is when teacher candidates are placed together according to “learning groups.” Pre-service teachers within each cohort take the majority of their coursework together. They are then assigned to schools for the purpose of practical teaching experience at two times during their program: (a) during the late fall or early in a new year for a period of 2 to 3 weeks (i.e., short practicum); and

(b) once during the spring for a period of approximately 12 weeks (i.e., extended practicum).

Over the past few years, instructors in the cohort where the study took place have invested in researching models of DLT integration, and transfer of innovation to practicum.

The cohort involved in this study is called CITE: Community of Inquiry in Teacher Education. CITE is a community of teacher educators who are committed to exploring, with school partners and teacher candidates, the ways in which a focus on community inquiry in teacher education can lead to educational change. Teacher educators in this program have a long-standing tradition of self-study for the purpose of improving instructional practice, and developing relationships between academic and professional communities. Darling, Erickson and Clarke (2007) stated that central to the success of CITE is the “ongoing collaboration, support and sense of responsibility inherent in the manner in which these teacher educators work and learn together” (Darling, Erickson, & Clarke, 2007, p. xv). They refer to CITE as a small-scale reform initiative whereby teacher educators are encouraged to explore their own instructional practice, and collaborate and share with their students and colleagues in ways that allow them to develop their understanding about teaching and learning in both K-7 and teacher education contexts. Instructors in CITE meet on a weekly basis, share and discuss teaching strategies as well as longstanding and newly funded research initiatives.

Teacher candidates are actively involved in the decision-making process for improving learning opportunities and the quality of their experiences in CITE. Student representatives are elected by their peers within the cohort in order to participate in weekly discussions about how to improve the program. During this time, they share any comments, questions, grievances or suggestions with instructors in the cohort. As a member of the community, I participated in these weekly discussions and was able to observe the degree of commitment from instructors within

the program to respond quickly and efficiently to students' requests and suggestions. At times, these discussions focused on inviting teacher candidates to co-author articles for peer reviewed publications and alleviating pre-service teachers' anxieties about their extended practicum. At other times, discussions were more pragmatic — focusing, for instance, on the feasibility of due dates. The relationships teacher educators developed with their students in CITE was remarkable; during the year, I observed the length to which instructors went to help CITE students (enrolled or already graduated) professionally and personally. Previous CITE students continued to invite instructors to workshops, conferences, academic papers and family celebrations; instructors had remained in contact with former CITE students long after their graduation from the program.

As stated earlier, the two research questions that guided this study are as follows:

1. How do pre-service teachers experience DLT in the context of a 12-month elementary teacher education program?
2. How do we disrupt and extend pre-service teachers existing conceptions of literacy?

To glean answers to these questions, I shadowed the cohort of 36 pre-service teachers over seven months (October 2006 - May 2007). I observed 80% of their campus-based coursework using DLT, and then observed some school-based sessions during the pre-service teachers' extended practicum. This prolonged engagement with participants is one criterion for case study research (Merriam, 1988), and was requisite to understanding how pre-service teachers adopted their use of DLT in different contexts, with different instructors, and for varying purposes.

The primary data source for this study was semi-structured exit interviews with participating pre-service teachers. The interview sessions were conducted after their extended

practicum during the final months of their teacher education program either individually or in groups of two to three individuals. Appendix A provides an example of interview questions. The assignments, lessons, and/or unit plans completed by the participating pre-service teachers for their course work and/or extended practicum were also reviewed as a secondary data source.

1.6.3 Role of the researcher

I was hired as a graduate research assistant to document DLT instruction and use in coursework and the uptake of DLT during practicum. At the onset of the school year, I initially assumed the role of direct observer. As time passed, I assumed a support role for pre-service teachers (and at times instructors) using DLT in the cohort. As a participant and observer, I supported the pedagogical and practical exploration of DLT by pre-service teachers both during and after class. Spradley (1980) suggested that researchers assuming such a role are faced with the challenge of “engag[ing] in activities appropriate to the situation and . . . observ[ing] the activities, people, and physical aspects of the situation” (p. 54).

1.6.4 Data analysis

Data analysis for this study was descriptive and interpretive. Merriam (1988) stated that descriptive data analysis is conducted by providing a “rich and detailed account” of the phenomenon under study (p. 7). Multiple perspectives are required, and researchers draw from ongoing observation to contextualize phenomena through a process of description (Erickson, 1986). Data analysis was also based upon an interpretive, inductive process (Creswell, 1998; Miles & Huberman, 1991). I developed an initial set of categories broadly based on organizing data from pre-service teachers’ exit interviews, separating, for example, coursework experiences from practicum experiences, and then isolating sets of comments having to do with the use of particular applications (e.g., digital video editing, music creating and editing applications, social

media, and so on). These categories tend to be subject-specific because instructors in different settings tended to take up different digital media. Eventually, I chose to focus on three applications of DLT that emerged as most dominant in the transcripts: the use of a wiki to facilitate a collaborative writing exercise in a course dealing broadly with principles of teaching; the use of stop animation to create movies on science concepts in a science methods course; the use of GarageBand™ and an electronic bulletin board to create and share music play lists in a music methods course. In consultation with individuals responsible for designing the method of DLT integration in each of these instances (co-authors of the subsequent three papers), I then analyzed transcripts with attention to identifying emergent themes and patterns within sub-categories.

1.7 Trustworthiness and Credibility

Recommended techniques were applied in this study to establish the trustworthiness of the research design. For instance, Creswell (1998) recommended the building of trust and an avoidance of distortion through prolonged engagement within the field and persistent observation (p. 201). To prevent biased observation, I spent 7 months, on a nearly daily basis, with pre-service teachers. I also used “multiple and different sources . . . investigators, and theories” in order to “shed light on a theme or perspective” (p. 202).

1.8 Statement about the Selected Papers

As noted earlier, three instances of DLT integration emerged as most profoundly influencing student attitudes toward pedagogy delivered via such technology. They are (a) a collaborative wiki project; (b) a project employing a form of stop animation (i.e., Slowmation) to represent science concepts; and (c) a music project employing the GarageBand™ software. Three papers are therefore included in the manuscript portion of this thesis.

The first paper examines the manner in which a community of learners working collaboratively within a wiki environment establish social hierarchies and negotiate power. Student engagement in this activity revealed much about social negotiation within such settings, and about the affordances of such software for formal education. This paper is included in its published form.

The second paper explores the experiences of participants with “Slowmation” (a form of stop-motion animation). Findings reveal that most of the pre-service teachers enjoyed using slowmation for the purpose of coursework but only a few used slowmation during practicum. Reluctant uptake of slowmation on practicum by pre-service teachers appeared to be because of the weak support structure for the pedagogy and the lack of encouragement from some sponsor teachers.

The third paper troubles notions of literacy and the manner in which they are enacted through a combined use of electronic modes of learning within the context of a 3-month curriculum and instruction course in music education. The results reveal that the integration of digital learning technologies facilitates a reconceptualization of music education as well as a sociocultural interpretation of music literacy.

Finally, it is important to note that this dissertation is a manuscript (and not traditional) thesis. As a manuscript thesis, it is composed of three manuscript chapters that are already published or under review for publication. Each manuscript chapter is co-authored. These chapters are a negotiation of multiple voices and perspectives. Each manuscript chapter is written in accordance with the requirements of the journals to which they were submitted; thus there are necessary inconsistencies in use of terms, the organization of headings and sub-headings, and even style of writing between the manuscript chapters.

In the final chapter, I draw comparisons across each of the manuscript chapters in light of current research in the field. The final chapter also provides an opportunity to reconsider each of the manuscript chapters in light of the theoretical framework outlined in Chapter 1.

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2 FIRST MANUSCRIPT CHAPTER

SOCIAL NEGOTIATIONS IN A WIKI ENVIRONMENT: A CASE STUDY WITH PRE-SERVICE TEACHERS¹

2.1 Introduction

The increasing popularity of social software applications through the past 15 years or so has provoked interest in how social hierarchies are developed and modified in Internet-based communication environments. In this paper, the phrase “social negotiations” refers broadly to the interrelations and negotiations that take place amongst individuals in the form of their establishment of social hierarchies and their negotiation of authority. Some have argued that the Internet has an unsettling effect on patterns of behavior and identity, which in turn modifies social negotiations (e.g., Gackenbach, 1998; Turkle, 1995). The anonymity of the Internet, for example, allows participants to “try on” alternate identities and potentially to liberate themselves from their “real-life” social status. Examples of such shifts are many, from the reserved, small-framed man who assumes the image of a body builder in order to woo a desirable correspondent (e.g., Turkle, 1995), to the woman who gender switches in order to escape sexism in online forums (e.g., Herring, 2003).

The nature of how groups establish social hierarchies and rules of engagement in online settings, and the implications of this for learning, is still little understood. Clearly there are pragmatic reasons for this: the range of ways in which individuals can collaborate and communicate online has grown exponentially since the inception of social software (beginning with early examples of Internet-based social software environments, such as the “MUD” [Multi-

¹ A version of this chapter has been published. Vratulis, V. & Dobson, T. (2008). Social Negotiations in a wiki environment: A case study with pre-service teachers. *Educational Media International*, 45(4), 285-294.

User Dungeon, Domain or Dimension] or “MOO” [MUD, Object Oriented], and extending through more recent examples, such as Blogs and Wikis), and the nature of social negotiations in these spaces varies greatly depending on the nature of the environment. In formal education contexts, understanding of social negotiations in online spaces is limited, as well, because application of social software spaces in such settings has become widespread only in the last decade, and particularly since the rise of Web 2. In this paper, we consider the social negotiations of a community of learners working collaboratively in a wiki environment to generate a communal response to the set of professional standards outlined by their local college of teachers. The students’ engagement in this activity over the course of 10 months revealed much about social negotiations in such settings, and about the affordances of such software for education.

2.2 Literature Review

In this paper, we wish to examine the nature of social negotiations when collaboration takes place among a group of learners who are in an established face-to-face learning Community. We are particularly interested in communities of learners in teacher education settings whose interactions are mediated through the use of wikis. We focus on wiki software in particular because Dobson’s research (Dobson, 2007) has demonstrated that wikis are highly versatile and open spaces for facilitating collaborative writing that encourage students to interrogate established notions of authorship and authority. Dobson (2007) has noted that further examination of their merits in this regard would be beneficial. Moreover, although there are discussions of the possibilities for wikis and other forms of social software in formal education (e.g., Richardson, 2006), these do not focus on patterns of social negotiation in collaborative writing spaces such as wikis. To contextualize our study, we will first review some of the literature on learning communities and the construction of social hierarchies, with a particular

focus on studies in a teacher education context.

2.2.1 Communities of learning

The benefits of community learning have been well documented since the 1990s (e.g., Schmitz, Baber, John, & Brown, 2000). Little of the research, however, focuses on how such communities are developed and sustained. What we do know is that there is evidence of a process of “self-organization” resulting in a sense of collective identity in both online and face-to-face communities (Pape, Reinecker, Rhode, & Strauss, 2003).

Social-learning theorists have asserted that community learning is realized through a complex process of interaction implicit in the process of social negotiation (Maclellan & Soden, 2004). Within any given community, note Lave and Wenger (1991), there is a continuum of involvement among members from legitimate peripheral participation to active participation (p. 4). Wenger (1998) notes that learning is “most personally transformative” when the process of learning involves active participation in a community to which one feels a sense of belonging (p. 4). Moreover, it is critical for members to negotiate a role within the community and view themselves as contributors to the creation of the community if they are to feel and sustain this sense of belonging (Webb & Mastergeorge, 2003; Wenger, 1998; Wenger, McDermott, & Snyder, 2002). Community learning thereby becomes a manifestation of networked social relations where any given participant can modify the community dynamics by renegotiating their role, sense of identity, belonging, and power within the community (Etelapelto, Littleton, Lahti & Wirtanen, 2006). Ingram and Gilding (2003) suggest, as well, that ongoing negotiations are at play within any given community between individual members and the collective identity of the community. The challenge thus becomes discovering a process whereby the individual voice and perspective of community members is not silenced by the collective and potentially more

dominant voice of the community.

Wenger (1992) has suggested that traditional teacher-centered models of learning contradict the natural way of learning as a socially negotiated practice; thus, community learning requires an understanding of how communities develop and are sustained based on a practical or experiential knowledge base with which many educators and pre-service teachers are unfamiliar (Webb & Mastergeorge, 2003). The study we will discuss shortly provides one example of the challenges students and instructors may face as they attempt to reconcile the differences between their practical experience with teacher-centered models of learning and their initial forays into engaging as a community of learners in a wholly collaborative learning exercise.

2.2.2 Learning, social negotiation and hierarchies

Drawing upon the field of psychology, Hubscher-Younger and Narayanan (2003) suggested that learning is a social process. Through the ongoing process of negotiating meaning, social roles, norms, and conventions are clarified, often at a young age as self-identity is negotiated in relation to others. The understanding of authority within a learning community is broadened by an inclusion of research that positions social negotiation patterns as hierarchical relations of power (Chase, Tovey, Spangler-Martin, & Manfredonia, 2002). Such hierarchical relations of power are often referred to as social hierarchies. Among social hierarchies, the linear hierarchy is likely the most common — one that develops when a particular “pecking order” is formed within a group (Haley & Sidanius, 2005). The emergence of a linear hierarchy occurs quite naturally within contemporary community networks. According to Chase and colleagues (2002), the greater the number of hierarchical structures within a group, the less opportunity there is for network relations to build.

In the next section of this paper, we turn our attention to an example of linear hierarchy

formation in the context of a community of learning situated in a teacher education setting. In this study, notions discussed above came into play as participants engaged in a process of social negotiation while completing a collaborative project in a wiki environment.

2.3 Methodology

2.3.1 Setting and participants

This study was conducted within the context of a 12-month teacher education program offered by a large metropolitan university on the west coast of Canada. Approximately 800 teacher education students are enrolled on an annual basis. The elementary program follows a cohort model whereby clusters of up to 36 students undertake the majority of their campus-based coursework, which comprises approximately 8 months of their program, together. Students are placed in schools to garner practical teaching experience twice: once in the late fall or early new year for a period of 2–3 weeks (short practicum) and once in the spring for a period of approximately 12 weeks (extended practicum).

The study was conducted in the context of the “CITE” (Community of Inquiry in Teacher Education) cohort. Two features characterizing CITE are “full participation by all CITE members in all aspects of program design and implementation”, and “integration of all curriculum areas within and across two distinct learning contexts (i.e., campus-based instruction and practical experiences)” (CITE, 2007).

2.3.2 Procedure

In the context of their campus-based coursework, all students in the Bachelor of Education program at the institution in question were required to engage with and respond to a set of standards established by the provincial College of Teachers. The document consists of a series of

statements (standards) meant to govern professional practice, such as “Educators are role models who act ethically and honestly” (BCCT, 2006). We will refer to this document henceforth as the BCCT Standards (BCCT, 2006).

Rather than requiring students to respond individually to the document, the class was divided into groups, each of which focused on one or two of the standards. As a group, students were required to do the following: (1) review the assigned standard, (2) remark on its meaning, (3) identify its most significant aspect, (4) envision how it might be contextualized in practice, and (5) discuss issues and challenges associated with the statement in practice. Later in the term, they were asked to select artifacts from their coursework that demonstrated understanding of the standard in question and to link these artifacts from the wiki. After groups had worked with one or two standards for a period of time, they switched standards and a second group of students were able to build on or revise notions established by the first group. The aim of this process was to develop a cohort response to the standards — one that, insofar as it was possible, downplayed the importance of individual authorship and encouraged students to think of the document as belonging to the community.

2.3.3 Data collection and analysis

The wiki project described above was conducted in a course focused on principles of teaching and communication. A researcher observed about 95% of campus-based classes focusing on this project over a 5-month period. The researcher also made school visitations during the practicum period and interviewed the students and instructors at the end of the program. These interviews were conducted with participants either individually or in small groups of two to three. The interviewer employed a set of questions to guide the discussion. These questions invited participants to remark, in turn, on their use of various digital learning

technologies introduced throughout the 12-month program. To prompt participants' discussion of the wiki in particular, the interviewer began with the question "Can you tell me about the process of working on the wiki this year?" The remainder of the discussion about the wiki was open-ended — the interviewer interjected only to prompt clarification or expansion of ideas. Data sources included field notes, interview transcripts, the wiki, and student artifacts linked from the wiki. This paper focuses primarily on the transcript data, which was closely examined by two researchers to reveal patterns of response. An examination of the transcripts shed light most particularly on how linear hierarchies were formed and negotiated through the duration of the project.

We applied an exploratory case study approach in conducting this research (Merriam, 1988; Yin, 2003). This implies learning about a complex instance through the process of in-depth exploration and contextual analysis. Transcripts were reviewed and analyzed with attention to how participant responses to using the wiki were embedded in a year-long context of community building. As suggested by Guba and Lincoln (1994), reviewing transcripts with attention to themes that can situate findings within specific contexts is an important process for constructing case study. Two researchers examined the transcripts for emergent themes. Three were dominant as evidenced by their recurrent appearance in a number of transcripts: (1) developing community, (2) hierarchies and negotiating authority, (3) role negotiation.

2.4 Findings

2.4.1 Developing community

Encouraging a sense of community in CITE was an ongoing initiative even prior to the onset of work with the wiki. Students, who selected their own pseudonyms for this study, appeared to develop a sense of belonging to the community in the context of a 3-day retreat held

before the start of classes. As one student stated, “Orientation was like the ‘glue’ that stuck us together from the start” (Marriette). This pre-existing sense of community appeared to be a positive influence on students’ interactions around the wiki; however, although students’ feeling of belonging to a community appeared to position them well for success with this highly collaborative project, they nevertheless struggled to orient themselves to a paradigm of learning that was beyond the traditional methods of instruction to which they had become accustomed.

Remarked one student,

For the most part, we had to figure it out on our own... Now I get it. We were supposed to make the connections on our own. That is tough when you are used to teachers telling you exactly how [many] “hoops to jump through.” (Tamara)

Instructors and the students noted that the negotiation of content and roles (e.g., peripheral or active [Lave and Wenger, 1991], as discussed earlier) was a difficult part of writing in a communal space. One instructor remarked about the need to balance the community effort with the need to ensure the space reflected an understanding of the BCCT Standards consistent with contemporary educational theory and excellence in teaching practice: “We never wanted to devalue what someone said, so we spent a lot of time talking about how to change things that were posted in a way that wasn’t going to be offensive” (Instructor 1). The sense of community, however, also appeared to present challenges for students in regards to making their own voices heard within their individual groups and within the broader collaborative space of the wiki.

2.4.2 Hierarchies and negotiating authority

Allowing one group member to control the computer laptop during class created an unexpected linear hierarchy within several groups. This hierarchy developed from assigning tasks within the groups, one of which was “recorder.” Group recorders were necessary because,

in a wiki environment, editing conflicts can occur if two individuals attempt to edit a single page simultaneously. About 60% of the groups functioned with self- or group-selected recorders. In these groups, the recorder appeared to be responsible for ensuring content posted by the group was representative of the ideas contributed by all members and that the content was clear and coherent.

In all groups with recorders, decisions by the recorder were to be based upon group discussion; however, this was not always the case. Designating a recorder within these groups created a linear hierarchy with veto power in the hands of one individual. This hierarchy was further reinforced with each instance of a recording that did not match the intent of the contributing group member, whether or not that recording error was intentional. In some instances group members asked that the recording be read back to allow an opportunity for missing details to be added. Group members also rotated through the position of recorder. Both of these practices helped prevent the establishment of linear hierarchies, although they did not dispel them altogether.

Linear hierarchies also became evident when individual group members were particularly invested in the ideas they contributed for posting on the wiki. There were several instances of group consensus about text changes, which the recorder made at the time only to alter them later without group consent. The students became frustrated and, at times, uncertain in terms of how to proceed when it became apparent that the new changes altered the meaning of the text. As one student observed, “Well, like, for my group it was like, ‘OK, when you finish your blurb you just send them to me and I will put it together.’ But sometimes the way it ended up was not the way you intended” (Carri). Another student remarked,

We would all scribble on the paper. Then one group member just volunteered and said, well, why don't I just type this all up and see if it all works. Then they would say, Ok, I agree with this but I don't agree with that ... in my group at least that is how it worked. But mind you, the person who volunteered was the same person who vetoed my stuff at the beginning so I am not sure how democratic that is. (Ellis)

Students also became frustrated when their ideas were misrepresented to the balance of the community. In some instances, they worked to re-edit the text to express their ideas without formally interfering with the role of the recorder. In other instances, the development of the linear hierarchy forced students to renegotiate their roles within the group. Some students in this study appeared to renegotiate their role from legitimate to peripheral participation when they felt their participation was interfering, or at least not contributing, to the completion of a coherent text. As is often the case with linear hierarchies, community sustenance superseded the needs of individual community members. This has significant implications for community learning because movement away from legitimate, active participation may compromise students' potential or desire to learn.

About 40% of the groups decided to avoid the development of a linear hierarchy in the first instance by delegating individual responsibility for a written component of the text to individual group members. Each member responded to one of the four questions provided by the instructors. Once again, tension arose around the process of working toward a seamless text. Each group member brought to the process his or her own conception of the tone and purpose of the text. In one instance, a group member composed a response in formal prose. A second group member responded in point form, while the final two members responded with working drafts of their thoughts revealing minimal attention to conventions of writing. One student remarked with frustration upon the resulting scenario:

Then after when we had to post our other reflections or edits, or whatever we wrote up — our stuff — and then we passed it to the person who was going to post, but then, as a group, we had to go through it again. That is when we realized that we hadn't really all done the same thing. So to make it work, we had to make our stuff fit into the bigger piece. But then that means changing what you have written a bit. I don't know; I just think that, by the time it ended up part of the posted reflection, it wasn't really my work anymore. I mean, I only wrote a few lines and those were changed. I mean, I think he only wanted to change the grammar, but then he ended up changing the meaning, by accident maybe. (Julie)

Each group member felt invested in the text he had created and most felt strongly that the focus should remain on allowing individual voices to emerge within the cumulative text. As one participant expressed, “The focus should be on including everyone’s ideas, not on the conventions of the text.” This comment demonstrates the struggle in which the students were engaged as they attempted to negotiate their individual roles within the group, as well as their collective roles within the community. As we note elsewhere (Dobson and Vratulis, 2009), we do not see this role negotiation as necessarily a negative thing; on the contrary, while many students remarked on difficulties of the nature we have just described, they also stated that this form of negotiation was in part what made the learning experience profoundly meaningful. Consider, for example, Julie’s comment: “... with the wiki it was about the process — you know what I mean? It was all about working together and trying to figure out how to say what we mean better and stuff. It modeled collaboration, which I really liked.”

Community membership does not always ensure the same rights amongst community members (Webb & Mastergeorge, 2003). This is because negotiating an understanding with other community members is not always an egalitarian process (Peterson & Miller, 2004). In fact, “individual participants’ subjective experiences of participation, as well as their learning

outcomes, can be diverse, even within the same group” (Etelapelto et al., 2006, p. 2). Clearly not all students within the CITE cohort viewed the process of working on the wiki as egalitarian. Nevertheless, the large majority — over 90% — of interviewees described it as highly valuable, some remarking that it was one of the most profound learning experiences of their formal education.

2.4.3 Role negotiation

Observation of the student participants in this study revealed differences in how students negotiated their roles within their individual groups and within the CITE cohort more broadly. Examining closely the case of one student, Julie, gives a sense of the way in which the stages of the process might manifest themselves. Julie stated that her group elected to write separately and send their individual materials to the “person who was going to post it” (Julie). By completing this process, she demonstrated commitment toward both her group and the community through active participation in the development of the group response. The ideas she shared within her group and the community, as well as the text she intended to post on the wiki, would contribute to the overarching identity of the CITE cohort as represented on the wiki. However, Julie was positioned in a peripheral role within the community because she was not the dominant voice in her group hierarchy. As she remarked, “In our group it was the controlling student who really decided what [got] to be put in” (Julie). According to the group dynamics described by Hubscher-Younger and Narayanan (2003), to renegotiate her role, she would need to feel more control over content posted on the wiki.

Although she referenced a “controlling” member of the group in this instance, Julie also indicated that she felt her voice would be heard by her group and represented to the larger community: “What I thought was kind of interesting about the process was how every person in

the class got to put in their own input ... That way we would all have a chance to put in our ideas ... I think that is really great" (Julie). Her collective remarks suggested that she felt she held an active, participatory role as an equal member of the group and the community until she was faced with the challenge of asserting her voice on the wiki. Her struggle to assert her voice during the final edit and composition of the wiki text to be shared with the community appeared to shift her position to a lower authority level within her group hierarchy. As a result, her role within the CITE cohort was also altered. When members of other groups responded to the postings of her group, they were ultimately responding directly to the member with the dominant voice. Although her transition to a peripheral participant would not necessarily have been noticed by other CITE members or an outside observer, it did appear to affect her sense of belonging and her creative contribution to the collective identity of the community.

Julie struggled in asserting her voice within her group because of dominant-member control over the group postings. As long as the ideas and engagement process of each group member fit easily within the meaning making constructs of the dominant member, issues of ranking and hierarchy were obscured. The challenge for educators contemplating such an exercise in their own teaching practice is that if a linear hierarchy is created that does not allow for "transient" negotiations, the egalitarian "right to contribute" is compromised.

Nevertheless, in spite of Julie's concerns about the dominant member, she also revealed that students felt free to take highly creative and varied approaches to the project:

We all wrote up our section and that was great, but then, like, some people wrote just paragraphs. I only wrote a couple of lines, but then another member of our group went and wrote about a page. They had all these crazy links and ideas about how to connect what we wrote to other standards. (Julie)

Where the ideology of the egalitarian “collective” community and the emergent hierarchy of the group came into play was in the degree to which Julie and other less dominant members eventually asserted their voices more fully into the final negotiations surrounding the content to be posted on the wiki, finding a way around the dominant member by posting their own work after the final version had presumably been posted: “So that was great for him, but then for us, we ended up just letting him do his think [*sic*] … For us, we just included what we had written up in class” (Julie). In this scenario, the merit of the wiki as software that facilitates the dispersion of authority was evident.

Over time, a shift in student orientation to learning was evident. Students were forced to assume more active roles in negotiating the process of learning. The instructors stepped back from any traditional role as “gatekeeper of knowledge” to ensure that students maintained control over the development of the wiki, in the process becoming decision makers in a constructivist learning environment and negotiating new ways of redefining the transient, multiple, iterative network of power relationships within the classroom. This renegotiation of authority is discussed at greater length in Dobson and Vratulis (2009).

2.5 Conclusion

A challenge central to teacher education is the need to translate theoretical ideas into classroom praxis. The challenge rests in “unpacking” the nuanced tensions that are implicit in any theoretical practice in ways that transform classroom application and student learning. In this study, the wiki enabled instructors to build on the community values central to the learning cohort and to disperse power among the group. Although new social hierarchies formed and were negotiated within groups, and particular students assumed dominant roles in the usual fashion of group dynamics, non-dominant group members nevertheless found ways of subverting

hierarchies employing the wiki. In spite of some perceived difficulties in negotiation of power and finding voice, almost all students deemed the exercise highly valuable.

Ultimately, the wiki experiment was pivotal for both instructors and students, revealing the challenges and merits of negotiating knowledge and social relations within a learning community. The example we have just provided demonstrates that social software environments that truly subscribe to community values can never be easy or straightforward. The learning therein is challenging and garnered in the context of and as a result of difficult social negotiations. This is not to be construed as an insurmountable problem; on the contrary, it is what makes learning in collaborative social software environments such as wikis most valuable and likely to yield a transformative learning experience.

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3 SECOND MANUSCRIPT CHAPTER

AN EXPLORATION OF “SLOWMATION” IN TEACHER EDUCATION AND PRE-SERVICE TEACHERS’ EXTENDED PRACTICUM²

3.1 Introduction

One of the main goals of a teacher education program is to introduce pre-service teachers to new ways of teaching and learning so that they can use these approaches in their own pedagogical practices as classroom teachers (Darling-Hammond, 1995). To achieve this goal, pre-service teachers require an understanding of the complexities of teaching and learning and how to adapt pedagogy and practice to suit varying classroom contexts (Clarke & Mitchell, 2007; Russell, 1997). For example, over the last 20 years, pre-service teachers in universities have been introduced to digital learning technologies (DLT) in their programs including social media (i.e. wikis and blogs), programs such as PowerPoint™, databases, spreadsheets, and electronic portfolios. However, introducing pre-service teachers to instructional strategies that incorporate technology to create new ways of learning in their teacher education program does not necessarily mean that they will be able to adopt these as teaching approaches in schools. Extensive research (Hall, 1987; Fullan, 1982; Fullan & Stiegelbauer, 1991) has shown that DLT integration is a complex process, especially when there is resistance by influential others.

The field of teacher education is inundated with DLT initiatives. As digital technologies enter the arena of education, advocates spend time and funding exploring how they can provide solutions to existing or emergent educational challenges. Similarly, skeptics frame their position with rhetoric about how “the new” is replacing “the old” in educational contexts. Goodyear and

² A version of this chapter has been submitted for publication. Vratulis, V., Clarke, T., Hoban, G., & Erickson, G. & Dobson, T. *An exploration of “Slowmation” in teacher education and pre-service teachers’ extended practicum*.

Ellis (2008) asserted that both positions are problematic because they contribute to the following mind-set: “Each technological innovation is accompanied by questions about whether it is *better* than what exists, rather than questions about how it should *integrate* with what exists” (p. 2). We suggest that this predilection for positioning DLT as either a *solution to* or *catalyst for* educational change contributes to a simplistic understanding of DLT integration. What is required is an exploration of the complexity of pedagogies that incorporate digital technologies as they relate to successful or unsuccessful integration into educational contexts.

Pellegrino, Goldman, Bertenthal and Lawless (2007) conducted a longitudinal case study in order to explore the “instructional and learning experiences” of pre-service teachers in eight teacher preparation programs. For the purpose of their project, pre-service teachers were shadowed during their teacher preparation program, their extended practicum (i.e. field placement) and their first few years of teaching. Their study helps elucidate the complexity of “transfer” from what is experienced during teacher preparation to subsequent classroom practice. Pellegrino and his colleagues noted, “There is virtually no empirical data on the degree to which teachers actually do implement what they have learned in their teacher preparation programs, nor the conditions that facilitate as compared to inhibit their ability to do so” (p. 6). Results from this study revealed that although there was considerable effort to integrate DLT into classroom practice, and there was general consensus that DLT integration should be an integral part of K-12 teaching, pre-service teachers were uncertain of how to integrate DLT in ways that support student learning. As stated by Pellegrino et al., the problem of transfer and integration often rests in not knowing how to “capitalize on the power of new media and tools to support learning with understanding” (p. 6).

Mishra & Koehler (2006) also provided a conceptual framework for DLT integration by exploring the complexity of pedagogies which use innovative technologies. This five-year study explored how teachers integrate DLT into their pedagogy. In this study, Mishra & Koehler explore “essential qualities of teacher knowledge required for technology integration in teaching” (p. 1). They suggest that DLT integration requires an understanding of Technological Pedagogical Content Knowledge (TPCK). Results from both research studies indicated that improving DLT integration in K-12 schools and teacher education requires a complex exploration of DLT in relation to pedagogical practice.

3.2 The Challenge of Introducing DLT into Teaching and Teacher Education

A review of the research literature revealed that despite current expectations that teachers use DLT in their classrooms to support their teaching and improve student learning, barriers to technology integration persist (Hew, Brush, 2007; Keengwe, Onchwari & Wachira, 2008; Wright & Wilson, 2007). The most prominent challenges to the process of innovative technology “take-up” in educational contexts are as follows: Inadequate pedagogical understanding of how to integrate DLT in ways that support student learning (Pelligrino et al, 2007; Mishra & Koelher, 2006); the belief that DLT offer only minimal educational benefit (Ertmer, 2005; Lumpe & Chambers, 2001; Van Braak, 2001; Vannatta & Fordham, 2004); and a lack of technology support networks amongst teachers within schools (Lowther, Inan, Strahl & Ross, 2008; Ringstaff & Kelly, 2002; Sandholtz & Reilly, 2004; Van Melle, Cimellaro, & Shulha, 2003). Researchers such as Earle (2002) suggested that teachers are at times reluctant to integrate DLT because they are embedded in a school culture that does not foster peer support or in-school collaboration. In effect, DLT are often used as a reward in classrooms after so-called “content area” or “real learning” is completed (Vratulis, 2008). This model of DLT up-take ignores the pedagogical constructs that are required in order to utilize the many affordances of DLT (Mishra

& Koehler, 2006).

3.3 Two Models of Integrating Pedagogies with ICT: Additive and Disruptive

In the following section, we distinguish between an additive and disruptive model of pedagogy incorporating DLT. Hedberg and Freebody (2007) described a pedagogical model of “disruption” as a process where technology integration creates “change in teaching approaches because (they) encourage new ways of teaching and learning” (p. 8). In contrast, an additive pedagogy of DLT integration refers to a process whereby DLT are integrated to facilitate existing, often teacher directed, classroom practice.

For instance, specific to the exploration of students’ literacy practice with DLT, studies that fall within an additive model of DLT integration frequently allude to research on how DLT can be used to improve student print-based writing and research skills (Chambers, Cheung, Madden, Slavin & Gifford, 2006; Elliott, 2000; Guinee, 2004; Lindsay & McLaren, 2000). In this same field there exists a group of studies that focus primarily on improving student’s grammar (Allender, 2006; Lacina, 2005), and processes of editing (Finley & Felix, 2005). Minimal attention is placed on how the use of DLT can broaden conceptions of literacy as primarily alphabetic text.

In contrast, a disruptive model requires that learning is altered to account for the affordances of DLT. For instance, a research study conducted by Hedberg & Freebody (2007) involved a year long project with 20 participating teachers during which they explored the use of whiteboards, interactive learning materials, and a variety of digital resources (i.e., pictures, movie clips and sound bytes). The teachers in the study were provided with a “curriculum consultant” who helped them envision ways (and reasons) for DLT integration that extended and at times challenged existing pedagogical practice. The purpose of this study was to determine if

and/or how the integration of information and communication technologies might impact existing pedagogy and classroom practice.

Results from this study indicated that there are certain “signs” associated with disruptive pedagogy. Teachers engaged in disruptive pedagogy understand that DLT “encourage new ways of teaching and learning” that could bring about a pedagogical shift (p. 8). The following five “shifts” are listed in Hedberg and Freebody’s (2007) article “Toward a Disruptive Pedagogy: Classroom Practices that Combine Interactive Whiteboards with TLF Digital Content”:

1. From content management systems to digital repositories
2. From learning objects (with content embedded) to learning activities that are generic pedagogical sequences that can be applied across curriculum areas
3. From information delivery to interaction that enables the social construction of meaningful knowledge
4. From assessment of the end product to assessment of the learning journey (through keeping running portfolios of products that reflect changes in understanding and reflection)
5. From an emphasis on teaching facts and principles to an emphasis on benchmarking learning performance against other groups or other classes. (p. 7)

In this study, the authors suggested that using DLT creates an opportunity to engage in learning activities that provide “disruptive pedagogical options in which the learner not only experiences views of the world that are multimodal but requires a range of literacies to understand the different representative descriptions and to construct and communicate their ideas

with others” (p. 10). Adapting a model of disruptive pedagogy requires that students shift from a position of passive participation toward a process of active engagement whereby they are “constructors(s) of their own experiences” (p. 10). Hedberg and Freebody (2007) emphasized the necessity to pay closer attention to the “nature of the learning activities, an exploration of how interactions are managed and facilitated, and a choice of the right tool for the pedagogical task.” (p. 10)

Specific to teacher preparation programs, successful technology integration that falls within a model of disruptive pedagogy relies on an ongoing model of sustained and continuous up-take by teachers (Strudler & Wetzel, 1999; Rogers, 2000). This requires that conditions, strategies and resources are made available to overcome the abovementioned barriers (Schmidt, Thompson & Chuang, 2004). What becomes increasingly complex, however, is the process of supporting and preparing prospective teachers for using DLT during their extended practicum. The time during practicum is critical to their eventual efforts to integrate DLT into their classroom practice (Clarke & Mitchell, 2007). It is during this time that pre-service teachers can experience, observe and explore the use of DLT in a constructivist and student-centered context for teaching (Vratulis, 2008). Research reveals that pre-service teachers are being introduced to student-centered models of learning with DLT in their courses; yet often this is not enough to “disrupt” an already existing pedagogy constructed from years of teacher-centered classroom practice (Strudler & Wetzel, 1999).

This raises an interesting question: How do pre-service teachers experiment with pedagogical approaches learned in teacher education – especially those that use DLT – if they are not evident in schools and may not be supported by cooperating teachers on practicum? Perhaps it is necessary for sponsor teachers to share a vision of technology integration which

challenges pre-service teachers' existing conceptions of teaching and learning. We suggest that pre-service teachers are being introduced to more DLT than ever before in teacher education programs; yet these efforts are not translating into application to classroom practice in schools (O'Dwyer, Russell, Bebell & Tucker-Seeley, 2005). This is because a disjuncture remains between technology integration as it is introduced in teacher education programs and the culture of resistance for pedagogical change embedded in our K-12 schools (Russell, Bebell & O'Dwyer, 2005).

3.4 A Case of DLT Caught Between the Two Models at UBC

3.4.1 Introducing “Slowmation” to teacher candidates

Slowmation is a form of stop-motion animation that greatly simplifies the complex process of animation, allowing for the creation of simple animation projects by pupils (Hoban 2004; 2006). The term “slowmation” is a portmanteau of “slow animation.” In this study, university students constructed slowmation projects by researching information, scripting narratives, storyboarding, designing models, photographing still images, and using QuickTime ProTM to generate an animation. Using the image sequence in QuickTime ProTM, a type of “multimedia framework” developed by AppleTM, rather than manipulating stop-motion animation projects using a more complex digital video editor, eases the process considerably. Students then uploaded their projects to a web site and shared their projects with their peers, instructors, prospective students and sponsor teachers.

In this study, slowmations consisted of *short form videos* explaining specific science topics and averaging between 2-3 minutes. In order to construct their projects pre-service teachers were asked to select a topic and storyboard their ideas while gathering appropriate materials to construct a “stage scene” for each individual frame of their slowmation. In this context,

storyboarding involved organizing their ideas into individual frames and deciding which materials and resources to use to represent their ideas. The next step involved manipulating the materials within each frame and taking photos of each manipulation. As a final step, students used digital animation software (i.e., QuickTime Pro™) to open a sequence of the still images. Participants ran their slowmation image sequences at approximately 2 frames per second (i.e., 120 frames per minute). Many then added spoken narrative, music and/or sound effects. This process was modeled for pre-service teachers as a student-centered approach during their program orientation and reinforced during their science method class. The intent was for university and school students to represent their understanding of scientific concepts using alternate modalities (Hoban, 2006).

3.5 Method

3.5.1 Context, setting and participants

This qualitative case study was conducted in the context of a 12-month elementary Bachelor of Education program within a metropolitan university located in British Columbia, Canada. The university offers 15 different cohorts to prospective teachers wishing to pursue an elementary-school teacher certification. Of these 15 groups, the cohort known as a Community of Inquiry in Teacher Education (CITE) served as the study group for this research. The CITE cohort emphasizes community, inquiry, and innovative use of DLT. Instructors meet weekly to review course work and discuss potential improvements of the program for CITE students. Two student representatives are invited to these meetings to ensure a student voice in decision-making about the program.

During 1999, DLT were introduced to CITE as an important element of the program. The premise was that CITE students were less likely to obtain the requisite skills for integrating DLT

into classroom practice if they did not develop a comfort and competence with such technology during their teacher preparation. Since then, CITE has researched and modified their model of DLT integration on an annual basis to optimize support of teacher candidates. In 2006, the instructor who facilitated the slowmation workshop during the program orientation (one of the authors, Hoban), along with the instructor who was already part of an ongoing research initiative to improve DLT integration in the cohort (one of the authors, Clarke), and the instructor who used slowmation as an assignment in his science methods course (one of the authors, Erickson), decided to explore the innovative possibilities of slowmation within the CITE cohort. It was during the 2006-07 school year that data was collected from CITE pre-service teachers for this study. All reference to pre-service teachers and the program are for the 2006-2007 year.

3.5.2 Data collection

Data were collected as follows: field notes were taken during orientation when the pre-service teachers were first introduced to slowmation and during the development of their slowmation videos in their science methods course; semi-structured interviews were conducted upon completion of the program. Field notes were taken at two points: 1) during orientation (documenting participants' introduction to slowmation; 2) during the science methods course (documenting participants' approach and process of construction). Data were subsequently used to contextualize comments from the semi-structured interviews conducted at the end of the year.

3.5.3 Data analysis

Data analysis was based on an inductive process (Creswell, 1998; Miles and Huberman, 1994). Pre-service teachers' comments were organized into thematic categories according to dominant patterns of response. For instance, the first two broad categories emerged from comments specific to DLT during coursework and practicum. Sub-categories specific to

coursework emerged as follows: community building, DLT skills, purpose for using DLT, process of construction, personal comfort and potential use for classroom practice. Data within sub-categories was then reviewed with attention to emergent patterns of response. This process of identifying and creating subcategories according to emergent themes is outlined by Creswell (1998) and Stake (1995). The dominant themes and patterns identified within each of the categories provided a framework for organizing the results section of this paper. The following two questions guided this research study:

1. How did pre-service teachers experience the introduction to slowmation in their teacher education program?
2. What factors determine if and how pre-service teachers use slowmation as a new teaching approach during their extended practicum?

3.6 Results

3.6.1 Phase 1: program orientation

The CITE students were introduced to their prospective instructors and peers during a 3-day orientation at the beginning of the school year. During the first day of orientation, the pre-service teachers participated in activities intended to develop peer relationships such as name games, cultural roadmaps, and creating iMovies™.

The slowmation introduction during orientation consisted of a workshop conducted over 2 days and in four stages. Examples of slowmation projects were presented on Day 1 with a brief synopsis of the history of slowmation. Time was allotted for the students to meet in groups to decide on a topic and begin storyboarding. During Day 2, the participants completed the following four steps of a simple slowmation project:

1. Creation of an individual or group storyboard with attention to the materials and/or specific content-area information required.
2. Outlining the type and number of visuals (i.e., models) required for each frame.
3. Developing a narrative to accompany the slowmation visuals.
4. Capturing and importing the slowmation images employing QuickTime Pro™.

Student comments on this process reveal that their comfort and competence with DLT helped shape their varying roles within the CITE community. For instance, one of the technology coaches (a pre-service teacher hired for the year to provide technical support for his/her peers) commented that his knowledge of technology helped him take on a leadership role within the class: “You can’t just be an anonymous student in the back when you can do things with technology. That was great for me because I tend to be a bit shy, especially at first” (Randy). Another teacher candidate commented on her reluctance to reveal her competence with DLT at the start of the year because of her efforts to foster her role as an artist: “I didn’t want others to see me as the tech person... I am the art person...once you become the tech person, I don’t know, everything else disappears” (Emma).

These quotations reveal how even at the start of the year pre-service teachers began to negotiate their social and professional identities within the cohort. However, part of the challenge rests in trying to distinguish between role and identity (Danielewicz, 2001; Wright & Viczko, 2003). Britzman (1991) described the distinction between role and identity as follows: “The newly arrived teacher learns early on that whereas role can be assigned, the taking up of an identity is a constant and tricky social negotiation” (p.54). Pre-service teachers’ initial effort to connect with certain peers and distance themselves from others appeared to be part of the

process of negotiating their identity within the cohort. In part, they were negotiating tensions amongst existing assumptions about teaching and learning, theory and practice, knowledge and experience, for instance. Britzman (2003) suggested that it is through a process of negotiating such tensions that “teachers come to understand their practice and the subjectivity of identity through that practice (p. 23).

As well, pre-service teachers appeared to draw from their existing assumptions about what it means to be a content-area teacher; what was clear was that even at this early stage there were multiple identities at play. For instance, Randy identified himself as shy and used his expertise and comfort with digital technologies in order to try and prevent others from viewing him that way; Emma has distanced herself from engaging in the role of digital technologies expert because of her existing conception that these two content-areas (i.e., technology and art) are mutually exclusive. The process of constructing professional identities as teachers is complex, socially negotiated, and constantly changing (Ellis & Allaire, 1999). These quotations demonstrate how pre-service teachers’ existing conceptions of “content specific roles” has already informed the construction of their professional identities within this cohort.

During orientation, slowmation was introduced as a way to model for pre-service teachers how DLT would be integrated during the year. For instance, the focus on community inquiry with the slowmation project alleviated anxiety for pre-service teachers because of the degree to which they could turn to their peers for support. “It made a big difference that you didn’t have to go up to an instructor every 5 minutes. We were really encouraged to ask our peers” (Laura). A number of the instructors were also learning slowmation for the first time alongside the students, which also allayed student fears. It encouraged the students to focus more on the process of creating their slowmation projects than on the expected final product. One of the pre-service

teachers explained, “When you see your instructor learning for the first time too, you realize ...It is more about learning and getting to know each other” (Kelly). Another pre-service teacher added that orientation helped her connect with her peers and alleviated concerns about technology: “We learned so much from each other creating that project. No one could hide. I guess that is what they mean about learning in a community of inquiry” (Tania).

3.6.2 Phase 2: The science methods course

Pre-service teachers were introduced to slowmation again during their science methods class. The instructor included the completion of a slowmation project as a term assignment. This provided the CITE students an opportunity and incentive to practice what they had learned about slowmation during orientation. It also provided a potential resource for pre-service teachers to use during their extended practicum. Pre-service teachers were encouraged to use their slowmation projects with their own prospective students during practicum as a “working demonstration” of the process for constructing slowmation.

CITE students selected a concept for their slowmation projects that their sponsor teacher had already suggested they teach, or they ‘defaulted’ to the science curriculum of the grade they would be teaching. The term *default* was most commonly used by the students to describe their use of curriculum in their concept selections for their projects. Curriculum was often described as “binding” and “limiting.” A pre-service teacher commented, “Constantly focusing on curriculum doesn’t let you teach creatively with technology. Too much focus on getting the facts across” (Heather). This comment revealed pre-service teachers did not view themselves as “curriculum designers” (Koehler & Mishra, 2006). Instead, they viewed curriculum as a body of knowledge to be acquired.

While some of the pre-service teachers were relieved that curricular mandates could

dictate their selections of concepts for their slowmation projects, others viewed the curriculum as merely a “stepping stone.” Several students voiced concern over applicability during practicum if they moved beyond the curriculum with their slowmation projects. For example, Amy commented, “you worry if your sponsor teacher is going to wonder what you’re doing, you know, if you are not doing exactly what’s in the curriculum.”

Pre-service teachers were uncertain about the purpose for constructing slowmation projects. They were uncertain of how to select a topic for their projects because they were preoccupied with “getting it right” (Laura). They found the process engaging, but were unclear about how slowmation might inform their own teaching, or the learning of their prospective students. Laura claimed, “we loved doing it, but just weren’t sure what it would mean for our kids.” This demonstrated a lack of understanding of educational benefits for constructing a slowmation.

It is interesting to note that although pre-service teachers experienced slowmation as a student-centered process (i.e., working in groups during the construction of their projects, sharing and commenting on each others’ completed work through in class discussion once their projects were completed), many maintained an understanding of slowmation that is consistent with an additive model of integration. We suggest that this was in part because they continued to view slowmation as an instructional resource, whereas the educational benefits of slowmation rest in the process of construction.

One of the benefits of constructing slowmation projects is the development of students’ proficiency for constructing multimodal texts with digital technologies (Callow, 2008). Students are already engaged with a multiplicity of multimodal texts both in school and at home (Leu, Kinzer, Coiro, & Cammack, 2004). As stated by Callow, these texts range from multimodal

representations on a cereal box to the multiple modes (i.e., audio, visual, written and gestural) of representation found in video games. Yet research suggests that they are uncertain of how to engage with such multimodal texts in critical ways (Thompson, 2008). For instance, what visual literacies are required to construct multimedia presentations? The task of visual representation becomes even more complicated when trying to represent concepts and ideas that are content-specific (Williams, 2007).

Thus, there are many educational benefits to constructing slowmation projects (Hoban, 2006; 2004). The process of constructing slowmation projects, for example, encourages a practice of collaborative learning and requires that students negotiate what content to include and how to best represent their ideas in multiple modalities (Walsh, 2006). The process of construction also encourages problem-solving because students have to decide how to combine modes of representation according to intent and purpose (Kozma & Russell, 2005). The process thus required the pre-service teachers in the study to negotiate the use of different media for the purpose of constructing their projects. The generative process of slowmation appeared beneficial to student learning.

3.6.3 Phase 3: application during practicum

Data for the following section is based primarily on semi-structured interviews at the end of the year. Specifically, pre-service teachers responded to the following questions: Did you intend to use slowmation during your practicum? If so, how? If not, could you please explain why?

Before their practicum began, the majority of the CITE students participating in this study stated that they hoped to use slowmation during their extended practicum. Even if they did not expect prospective pupils to create their own slowmation projects in class (a potentially

disruptive model), CITE students intended to use their projects as aids during classroom instruction (a potentially additive use). As one pre-service teacher explained, “Slowmation gave us a chance to motivate kids and get them interested... The kids loved it” (Jane). Only two CITE students asked their pupils to create their own slowmation projects. In both cases, their sponsor teachers were concerned as to whether sufficient time would be available to complete the projects. In both cases, pre-service teachers were able to complete the slowmation projects with their students on time and their sponsor teachers felt that the process was valuable to student learning. One pre-service teacher commented that he was “relieved that (his) sponsor teacher was so supportive in the end. She was happy the kids were so excited about writing myths” (Jane).

3.6.3.1 Competing use for classroom instructor time

One of the CITE students participating in this study, Tiffany, voiced concern over using a new approach such as slowmation during practicum when there is already so little time to focus on the development of content-area skills like math, reading, and writing. Tiffany commented that she “really wanted to use slowmation during practicum, then thought, there is just no time to play with technology. Half my kids have trouble reading.” This comment revealed that for some pre-service teachers it is not a question of *how* to integrate DLT (i.e., disruptive or additive models), but whether there is even any educational value in using DLT.

Pre-service teachers were uncertain of how to proceed when their use of slowmation might conflict with the understanding of their sponsoring teachers in terms of teaching and learning priorities within their classrooms. This is expressed in the following quotation: “I wanted to ask my students to create their own projects as part of our anti-bullying unit, but my sponsor teacher felt strongly that I only use mine to teach them about the life cycle” (Karen). As

might be expected, some sponsor teachers are readily open to the prospect of DLT application and others are reluctant. One pre-service teacher stated, “I wanted to use technology during practicum, but I was way too stressed out because I knew my sponsor teacher wasn’t really into it” (Kelly). Another pre-service teacher responded: “That is a big risk to take during practicum, don’t you think?” (Sarah)

3.6.3.2 Slowmation content

For CITE students whose slowmation projects were moving beyond expected curriculum outcomes, uncertainty existed. For instance, one group wanted to create a slowmation project on the physical impact of environmental pollution. Because the topic was not an explicit aspect of the curriculum, the teacher candidates were concerned as to whether parents or their sponsoring teachers might question, for example, the graphic images of dying crows they hoped to include. In the end, these CITE students incorporated more text than images due to their uncertainty regarding which images were appropriate for a fifth-grade class. One teacher candidate demonstrated her uncertainty about appropriate content to teach in her class during extended practicum: “Like with environmental pollution, that would be something I would love to do it, but then, I don’t know if it is OK to really show kids those kinds of images” (Tania). Another participant described the complexity of the issue: “They are still pretty young... but if you just tame it down, what is the point? It is tricky, especially during practicum” (Amanda).

Two groups of CITE students revealed anxiety over concerns of their sponsoring teachers about representing inaccurate information in their slowmation projects. They felt their sponsoring teachers may attribute any inaccuracy in the slowmation to a lack of content-area knowledge. For instance, one group of pre-service teachers created a slowmation project that did not accurately represent the number of eggs laid by frogs during the spring. Their sponsoring

teachers had various responses to the representation. While one did not view it as a problem, another suggested the creation of an alternate teaching resource to the slowmation. One teacher candidate remarked, “We can’t just include three eggs and say they lay thousands. My sponsor teacher would not be OK with that. I did that on one of my pictures and she said to me that the picture is what the kids are going to remember more than the words” (Michelle).

In short, the appropriateness of using slowmation within the realm of science when it is sometimes difficult to accurately represent information was a concern for pre-service teachers during practicum. Interestingly, this issue provided an intriguing forum for pre-service teachers to consider the challenges associated with representation in other media, not just digital video such as slowmation; this provided an unanticipated disruption of their own conceptions of how to teach and learn in a science classroom. One pre-service teacher observed, “Sometimes I think we are so busy trying to make things, information and concepts, you know, accurate, that we forget there is more to science than that” (Ralph). Apparently some sponsor teachers and some pre-service teachers had content-specific understandings about the appropriateness of “particular texts” when representing knowledge. We suggest that this “content specific” notion of how to represent knowledge is problematic to a model of disruptive pedagogy with DLT.

The comment also reveals that the sponsor teacher recognized the impact of visual imagery on student learning; yet this sponsor teacher was uncertain of how to modify his understanding of “appropriate representations of knowledge” for the purpose of constructing and representing meaning visually. In effect, what is required of sponsor teachers and the pre-service teachers is an understanding of how constructing and representing knowledge using visual imagery is different from constructing and representing knowledge using other modes of meaning making, such as with written and/or spoken language. Such an understanding is important to a process of

understanding how to integrate digital technologies in ways that extend pre-service teachers' already existing literacy practices.

3.6.3.3 Sponsor teacher support

Student interviews conducted upon practicum completion revealed disjuncture between how particular CITE students envisioned using slowmation during practicum and their actual implementation of this teaching approach within their own classrooms following teacher preparation. During their extended practicum, these CITE students were guided by their relationship with their sponsoring teachers. For nearly all of the students, their decisions as to whether to use slowmation depended upon the comfort and competence of their sponsoring teachers with DLT. As may be expected, the sponsoring teachers who were already avid users of technology were readily receptive to the slowmation initiative and all that it entailed. Conversely, those reluctant or unfamiliar with the integration of technology passed their anxieties on to the pre-service teachers. As described by one teacher candidate, "Anything else was OK, but then if I was going to use technology, I could just feel how stressed out she [sponsoring teacher] would get. Then I would get stressed out too... Just too much stress—not with the technology, but with using it with her" (Sarah).

Several CITE students viewed sponsoring teachers as applying different values or expectations for lessons involving technology use. For instance, one pre-service teacher described how she was often encouraged to take risks within the classroom in all other areas of her teaching; yet, with DLT, there was no room for "deviating from the plan of action" (Mandy). If she did not precisely follow her lesson plan, or if the technology did not work or another unexpected challenge emerged, she stated that she could almost hear the voice of her sponsoring teacher stating, "See, I told you; technology never works. It is a waste of time" (Mandy). This

was in stark contrast with how her sponsoring teacher reacted to unexpected changes in classroom practice when DLT were not integrated.

We suggest that perhaps this has less to do with the extent of technology understanding and more to do with how sponsor teachers view their roles. The role of a sponsor teacher is to provide support and constructive feedback to prospective teachers and to facilitate the development of their skills and expertise in teaching. Perhaps the sponsor teacher felt this would only be possible if the pre-service teacher were integrating resources with which he or she were already familiar. The following comments from a participating pre-service teacher seem to reflect that potentiality:

I notice that during lessons where I used technology, she didn't really write anything bad, but she was really stressed out, definitely. Actually, she didn't write much at all. I mean, when I was teaching kids reading, she had an entire book . . . of things [that] went well or that I could improve on and ideas of how to improve. You never know; maybe that was also the reason she got so stressed out when I mentioned technology. Maybe it comes from a really good place, from wanting to help and not being able to. (Carly)

The difference between how CITE students might use slowmation during practicum and in their own classrooms is that as practicing teachers they can implement DLT in a way that supports their own pedagogical positioning. One of the pre-service teachers stated that it will “make a big difference when someone else doesn’t have all the power. I want my students to create their own project, but not during practicum. Not with my sponsor teacher watching” (Laura).

It is natural that some sponsor teachers might demonstrate anxiety when pre-service teachers use DLT if they (the sponsor teachers) are uncertain how to support pre-service teachers in the classroom. We suggest that this is why it is especially important that pre-service teachers

articulate and demonstrate the educational value of such innovation. What is required is an understanding of the educational benefits of slowmation, and how to best use slowmation to achieve such benefits. The authors suggest that the educational benefits of slowmation for students primarily rests in the process of construction.

In particular, the process of construction encourages students to reconsider their topic from multiple perspectives: they are forced to reassess content continuously as they try to determine how to organize and represent their ideas. Students constructing slowmation also have to create their own objects, which means they have to translate their understanding of an idea from one sign system to the next. For instance, if they are representing a scientific concept such as the food chain, they would have to consider how to represent relationships amongst animals in the food cycle. They must also consider colour, special relations and size of objects. All of these considerations encourage students to think in new ways, fostering both creativity and comprehension.

3.6.4 Slowmation transfer to and application in elementary classrooms

One of the challenges with using slowmation during practicum was the uncertainty of pre-service teachers in regard to how to use it for teaching their pupils. In short, what is the appropriate pedagogy for a particular class? The majority of the participating CITE students felt comfortable with their technology skills, and a number of them worked within tech-savvy classrooms where the pupils were quite familiar with various DLT. However, pre-service teachers were uncertain how to adapt their knowledge as learners of slowmation and transfer this knowledge to settings to suit the needs of a specific grade/class. They had only experienced slowmation as adult learners during orientation to the program and in a science method class. They were equipped with a comprehensive handbook outlining a process for the creation of

slowmation projects, and they had practical experience from completing their own slowmation projects. However, both of these experiences were modeled for adult learning, a process radically different from the introduction of slowmation for teaching within classrooms serving kindergarten through seventh-grade classrooms. This is especially true if the intent is to have pupils create their own slowmation projects. As described by one CITE student,

I really wanted to use slowmation because I thought it was lots of fun, but like lots of us, I think we ended up not using [it] because we just didn't know what to do. I mean, we couldn't replicate what Gary did, even though that was great because that worked with us as adults. What does that look like in my Grade 4 class that has seven ESL students, a gifted boy, and half the class that knows more about technology than me? That would have really helped. I mean, to have an idea of how to change things for different grades, different students. I wasn't even sure if it was acceptable to ask kids who are that young to put together a project like slowmation.
(Heather)

In particular, how slowmation could be used to promote an interdisciplinary model of teaching and learning, a more disruptive approach, was not clear to participants. For instance, they were uncertain of how to choose an “appropriate focus” for pupils creating their own slowmation projects. In effect, their use of slowmation was primarily informed by an additive model of integration because they had not observed (or experienced) a model of disruptive pedagogy with slowmation during teacher preparation. Instead, the process was about fun and ease of use, and there was no sustained focus on learning benefits.

3.6.5 A shift in pedagogical approach

Developing an understanding of how to modify one’s pedagogical approach as it applies to the teaching and learning context of different classrooms is important. As noted earlier, this involves more explicit education on adapting the process of slowmation construction for various

grade levels and classroom contexts. However, there is also a requisite process involving an understanding of how teachers might shift from didactic to learner-centred approaches. This parallels a shift from an additive to a disruptive model of pedagogical practice. The analysis raised key questions: Does the degree to which the instructor controls the process of pupil learning depend upon the grade level or purpose of the slowmation? What resources are required? What questions must be asked and what assessment strategies are required? In short, some CITE students elected not to integrate slowmation into their classroom practice during practicum because they were uncertain as to how to adapt their teaching pedagogy. This is reflected in the following participant comments:

As a teacher with slowmation, I wasn't sure what to do with myself. I knew I had to change my teaching from what I was doing when I was teaching math, for instance, but then I didn't know how. That is what I really needed help with. How much should I talk or model? I didn't know where to start with how to change my teaching, so I didn't start at all. I mean, I couldn't teach it the way Gaalen did because they are only in Grade 5. So then, what do you do? I sure wasn't going to guess on practicum, at least not until I have my own classroom. (Lorna)

This last comment points to the challenges associated with any disruptive pedagogy and the conceptual shift requisite for adapting disruptive pedagogy in one's own classroom practice.

3.7 Discussion

The findings from this study outline the challenges for pre-service teachers when they are introduced to new pedagogies in their teacher education program, especially those that incorporate technology. Although the process of students creating their own animations of science concepts was engaging and equipped pre-service teachers with an alternate mode of thinking about and teaching science, they were not always able to transfer knowledge acquired at

the university to practice in their respective classrooms. In part, we suggest that this is because they held firmly engrained notions about teaching and learning that remained unchallenged during their use of slowmation in their teacher education program. We suggest that what is required is an improved understanding of how to modify our pedagogical approach when incorporating ideas about planning, technological resources, coping with classroom management and ways to scaffold the learning in a disruptive versus an additive model of DLT integration. Such a framework would increase the likelihood of adapting a “disruptive” pedagogical approach (Neuman, 1990).

Loughran and Russell (1996) suggested that teacher education programs have tremendous influence on the views pre-service teachers carry with them into their future classrooms. It is during teacher preparation that prospective educators are apprenticed into particular pedagogies and practices, literacies, and DLT. It is partially their perspectives of the relevance of their teacher preparation that will inform their future practice. Teacher education programs must equip prospective teachers with not only practical and experiential skills of using technology, but also the support structures that need to accompany the introduction of new pedagogies. It is the responsibility of teacher preparation programs to ensure that prospective teachers be aware of the presuppositions they bring to their classrooms. In addition, it is necessary for teacher preparation programs to work more closely with sponsor teachers to ensure that academic and professional communities are working toward the same goal: to prepare pre-service teachers to teach in 21st century classrooms. As stated by Loughran and Russell, this requires “appropriate ways and times of challenging their beliefs about teaching and learning” (p. 4). The multimodal process of constructing a stop animation provides such an opportunity.

Findings from this study also highlight the influence that faculty advisors and sponsoring

teachers have on the expectations and practice of pre-service teachers on practicum (Pence & Macgillivray, 2008). They may provide guidance, assurance, and constructive criticism when lessons do not unfold as expected. Practicum allows pre-service teachers to engage in professional development with “seasoned” educators. The hope is that they will draw from their experiences within the teacher-preparation program that they view as valuable and effective. In the case of slowmation, this requires understanding of the purpose for the teaching technique and how it might be modified to better meet the unique needs of pupils. For instance, the process of constructing slowmation projects encourages students to represent their understandings of information and/or concepts in multiple ways; they have to navigate multiple texts in order to make decisions about which ideas to include in each frame and how to best represent those ideas. The process involves researching, analyzing, synthesizing, and representing information and ideas using multiple modes of representation.

As demonstrated in this study, focusing too much on engagement, or ease of use, is not enough to justify a pedagogical approach, and does not necessarily lead to transformative learning. As a study participant expressed, “It is really fun and I know I learned a lot but I really wasn’t sure what my students were going to learn, and well, my sponsor teacher always says, ‘If you can’t explain it to yourself, you probably shouldn’t do it yet’” (Faerah).

The majority of the pre-service teachers participating in this study voiced concern over the ability of their sponsoring teachers to support their use of technology with slowmation and other DLT. In fact, a perceived inexperience and discomfort amongst sponsoring teachers with DLT was one of the primary reasons the student participants avoided use of slowmation during their extended practicum or used it solely as a two-minute instructional tool or lesson introduction. While the majority of the prospective teachers in this study described supportive and collegial

relationships with their sponsoring teachers, a “common thread” throughout the exit interviews was the understanding that the sponsoring teachers acted differently toward the pre-service teachers as soon as the use of technology in the classroom was approached.

3.8 Conclusion

We began this paper with a discussion of disruptive pedagogy as a prospective model of integration that could lead to innovative “up-take” of DLT in educational settings. As illustrated throughout this paper, one of the challenges for teacher preparation programs is that pre-service teachers may still meet resistance from cooperating teachers on practicum. As indicated at the start of this paper, the majority of teachers subscribed to an additive model of DLT integration whereby existing pedagogical practice remains largely unaltered. This is problematic for pre-service teachers who may wish to experiment with disruptive pedagogical practice during their practicum. After all, it is not enough to engage in disruptive pedagogy in the context of teacher preparation if these experiences rest within the confines of campus-based coursework and collaborative projects. Instead, what is required is a way to encourage cooperating teachers into a model of apprenticeship whereby they, as well as their pre-service teachers, are working toward the collective goal of creating meaningful learning opportunities for their pupils.

The pre-service teachers participating in this study engaged in a collective process of negotiating the construction of their own slowmation projects. This was an important step; however, it was not until they described the process and responded to related questioning that they were able to identify the merits of the teaching technique and its potential challenges within their prospective classrooms. The majority of the pre-service teachers used their slowmation videos as an instructional resource; they did not encourage their pupils to construct slowmation projects despite the student-centered approach to using slowmation during the program.

The study findings revealed that introducing pre-service teachers to alternate instructional strategies employing DLT as learners in a teacher education program is not enough for them to take advantage of the full range of possibilities of such technologies in schools. Use of DLT in teacher education programs needs to be accompanied by appropriate theory and practical application in grade-specific examples to increase the likelihood that pre-service teachers will successfully implement DLT use in school contexts to the greatest possible advantage (Rogers, 1995). This should occur in teacher education courses through explicit modeling and through a process of active reflection and discussion. Perhaps the notion of exploring use of a new instructional strategy on practicum could be negotiated in advance of the practicum with the cooperating teachers.

This paper provides an important lesson in how we might think about the introduction of alternate instructional methodologies incorporating DLT in teacher education. The additive/disruptive distinction provides a useful sensitizing frame for examining and highlighting the challenges faced when pre-service teachers try to implement instructional strategies that they learn in their teacher education course but may be unknown to their cooperating teacher. It is hoped that the outcomes of this paper enrich and support continued experimentation with and research on the use of DLT in teacher education.

3.9 Bibliography

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4 THIRD MANUSCRIPT CHAPTER

A CASE STUDY EXPLORING THE USE OF GARAGEBAND™ AND AN ELECTRONIC BULLETIN BOARD IN PRE-SERVICE MUSIC EDUCATION³

4.1 Overview

This study is an exploration of the merit and shortcomings of using a combination of GarageBand™ and an electronic bulletin board to facilitate musical and peer learning in a 3-month elementary music methods curriculum and instruction course. A pedagogical objective of this assignment was to increase the interaction among pre-service teachers for the purpose of improving the following: (a) their understanding of musical vernacular, genres, and cultures; (b) their appreciation of the relationships among personal, social, and cultural identities; (c) an introduction to digital learning technologies (DLT) as a platform for community building. Specifically, sharing their playlists online (as well as their thoughts, feelings, and images about these musical selections) encouraged reflective practice and a process of peer learning, providing opportunities for students to learn about their peers and broaden their participation in a *community of inquiry*.

This study was designed to examine whether the integration of digital learning technologies in teacher education programs enhances a larger educational mission to foster pre-service teachers' understanding of music and digital literacy. According to Gomez, Sherin, Griesdon, and Finn (2008), the core of all communities is their literacies: "In each of these

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communities, and sometimes across them, we speak, write and compute in certain ways because we share common literate practices” (121). Accordingly, one responsibility of teacher education programs is to encourage an understanding of literacy across (subject) content areas, including both traditional and emergent literacies (Selfe & Hawisher, 2004).

4.2 Conceptual Framework

4.2.1 Troubling notions of literacy

Consensus has grown among researchers and educators about the inadequacy of conventional notions of literacy for describing cultural, visual, aural, music, and digital literacies, as well as related practice informing daily life (Cope & Kalantzis, 2000). In this paper we explore the complexity of digital literacy (i.e., digital communication and expression) as the ability to construct and represent meaning from multiple sign systems: aural, visual, and linguistic. Responding to this broadened concept of literacy, the New London Group (1996) suggests that a model of pedagogy is required that positions learners as “active designers of meaning” (p. 65). We suggest that a sociocultural approach to teaching and learning is requisite to broadening students’ traditional conceptions of literacy to include a process of negotiating multiple literacies in both face-to-face and online environments.

4.2.2 Sociocultural theory

Sociocultural theorists describe learning as a process of purposeful, social interaction (Lave & Wenger, 1991; Vygotsky, 1978, 1986; Wertsch, 1985). “Purposeful” here is understood to describe interaction that is not simply casual but rather provides opportunities to learn outside the context of directed learning. Learning and development are not independent of social, cultural and historical contexts (Kong & Pearson, 2003). Learning is a process whereby individuals purposefully interact with others who are more knowledgeable as a way of

reconstructing their own understanding. This process of sharing and negotiating meaning is how higher (internal) psychological processes are achieved (Vygotsky, 1978). Therefore, learning is both an individual and social practice.

The notion of learning as an individual and social practice is broadened in this study to include subject-centered and collective learning as “co-emergent processes” (Davis, Sumara, & Luce-Kapler, 2008, p. 829). For instance, the public arena of an electronic bulletin board can be used to encourage individual, subject-specific, and collective (social) “purposeful” learning. Davis and colleagues elucidate the relationship between individual and collective, social learning through a description of how language is used. Language is not simply social in nature; it is a collective phenomenon. Davis and colleagues observe,

Constructionists do not regard the individual as the locus of learning but as a learning system within a grander learning system. . . . Much less preoccupied with individual sense-making than constructionist theories, constructionist theories focus on conversation patterns, relational dynamics, social habits, and other collective phenomena. In this frame, cognition is always collective: embedded in, enabled by, and constrained by the social phenomenon of language; caught up in layers of history and tradition; confined by well-established boundaries of acceptability; defined by joint interests, shared assumptions, and common sense. (pp. 102–103)

This encourages a notion of literacy as a set of social and cultural practices or skills, learned not simply through formal schooling at the level of individual cognition, detached from social interaction (Street, 1995, 2005), but also through sociocultural practices internal and external to school. For example, students arrive to school already equipped with multiple ways of constructing and representing meaning (i.e., experiencing literacy) in their daily lives—phone calls, MSN, playing an instrument, playing video games, to name a few. Yet schools continue to perpetuate “philosophies of teaching” and “habits of mind” that can privilege linguistic systems

of meaning making. Such habits of mind are informed by traditional pedagogy and practice, including a view of DLT as not holding significant educational gains. The intent of this paper is to disrupt such habits of mind. Thus, sociocultural theory has significant implications for teaching because it calls into question the ways in which we inherit our beliefs about teaching and learning. In this paper, we suggest that “disrupting” such beliefs is requisite to changing teacher-centered pedagogy still prominent in schools, as well as broadening traditional conceptions of literacy to include music and digital literacy practice. An objective of this study is to broaden notions of literacy practice by examining music and digital literacies in a music education course for pre-service teachers.

4.3 Music Literacy

Within traditional curricula, music literacy is often understood as an ability to read and write—more specifically, an ability to read and write music notation. Music education curricula are often heavily invested in developing music literacy from early elementary experiences to high school band and, finally, to postsecondary programs, including curriculum and instruction courses in teacher education. A common objective in training to become a music-education specialist and, by extension, in training young music students, is to cultivate the ability to “hear” what is seen on the page as musical notation. Conversely, the goal is also mentally to “see” in musical notation what is heard. The scope and purpose for developing music literacy is often coached in terms of artistic, cognitive, social, and political objectives. Choksy (1999), a well-known North American music educator and proponent of music literacy, explains the significance of developing musical literacy based upon the philosophy of a Hungarian composer and educator, Zoltán Kodály. Choksy (1999) states,

teaching music literacy will aid in the well-balanced social and artistic development of the child, and . . . produce the musically literate adult—literate in the fullest sense of being able to look at a musical score and “think” sound, to read and write music as easily as words. (p. 9)

Expanding upon the common definition, many music educators ground their work in a perception of music literacy as “the ability to read, write, and *think* music” [italics added] (Nolet, 2007, p. 6).

Swanwick (1999) observed that Suzuki, Orff, and Jacques-Dalcroze are all music educators who believed that fostering aural/oral and technical skills should precede literacy curricula. He places Kodály within another category where the pedagogical focus is on developing music literacy, both earlier in the learning process and ultimately as an artistic and cultural goal of music education (p. 56). For scholarly supporters of Kodály, such as Choksy, the aim is not simply literacy, but ultimately rendering music accessible to all. Secondary to this goal, but also very important, is the understanding of the utilitarian role of music education in sustaining musical heritage and national unity (Kodály, 1939/1974). Thus, the development of music literacy, as with other types of literacy, appeals to both utilitarian and aesthetic ideals (Labuta & Smith, 1997).

Music education programs teach students how to read and write music to varying degrees and along different developmental timelines. Researchers have suggested that fostering music literacy has also commonly supported the development of music understanding, specifically “to make meaning out of musical experiences and to use music as a means of personal expression” (Nolet, 2007, p. 1). Yet, others within the field of music education have suggested that musical notation can inhibit the early and intuitive inclination of children to explore musical creativity, expression, and imagination. Pure notation offers few opportunities for increasing musical

understanding through the examination of the sociocultural contexts of music. The challenge rests in competing notions of literacy: (a) literacy as a means of empowerment, creativity, and expression; and (b) literacy as conventional practice void of sociocultural contexts. Wiggins (2001) suggested that music literacy is a means of developing *musical understanding*, which seeks to “empower students so that they can become musically proficient and eventually musically independent of their teachers” (p. 3).

This current study hypothesizes that digital learning technologies (DLT) such as the GarageBand™ computer application combined with electronic bulletin boards can be used to support the conventional understanding of music literacy while fostering the aesthetic and creative enterprise of developing music literacy. This would be accomplished through digital modes of music composition and expression, as well as public platforms for communication and reflection.

4.4 Curricular Context

The prescribed learning outcomes for music education within British Columbian public elementary schools (British Columbia Ministry of Education, 1998) are organized in three categories: (a) structure; (b) thoughts, images, and feelings; and (c) context. Structural elements focus exclusively on fostering traditional, music-literacy skills (i.e., how to read, write, and think elements of rhythm and elements of melody). Curriculum and instruction courses for pre-service elementary teachers present this as a key component of every class. It is noteworthy that music-education specialists also incorporate structural elements as a key aspect of their classroom instruction. Their own musical training focuses on literacy development, and this is a priority in their teacher training. The question then emerges as to who is best trained to teach the other two categories of learning outcomes. Young students also need instructional time focused on helping

them to articulate, understand, and appreciate the emotional, kinaesthetic, cultural, and/or political import of music. Consequently, the elementary teacher education instructional methods course for music in which this study was situated included an assignment to explore thoughts, images, and feelings surrounding musical selections. This also afforded students the opportunity to experience various contexts of musical reception: specifically, the context of self and community, as well as historical and cultural contexts. The primary objectives of the course were articulated as emphasizing the importance of cultivating critical-thinking skills in students, as this ability relates to the social context within which individuals create, share, and appreciate music. The course also sought to teach students how to examine and articulate the educational implications of diversity within the context of music creation and reception.

4.5 Methodology

In the following section we describe our research questions, the population sample and context, as well as data sources, process of data collection and analysis.

4.5.1 Research questions

1. What are pre-service teachers' existing notions of (music) literacy teaching and learning?

2. How do pre-service teachers experience digital literacy in the context of their music methods course?

4.5.2 Population sample and setting

This study was conducted within an elementary teacher-education cohort known as CITE: A Community of Inquiry in Teacher Education. The CITE cohort was composed of 36 pre-service elementary teachers and their teacher education instructors, including the authors. DLT is a strong initiative for CITE instructors and pre-service teachers and DLT instruction was delivered in a separate weekly class as well as integrated in various courses. Throughout the year, instructors assigned mandatory and/or optional projects that encouraged the pre-service teachers to apply what they learned within the context of their DLT class to their coursework for eventual application within their prospective classrooms.

In keeping with the cohort focus on DLT integration, the music education course had the support of a graduate research assistant (GRA) who introduced pre-service teachers to the GarageBand™ application and the online bulletin board at the onset of the school year. As one of their assignments, pre-service teachers were asked to upload one-minute excerpts (in accordance with copyright regulations) from three favourite musical selections to a shared electronic bulletin board. Without the bulletin board, the assignment would have been cumbersome, if not impossible. Each student participated in three one-hour labs where they learned to “rip” one-minute sections from their favourite recordings using the GarageBand™ software application, splice the segments, and upload them to the class bulletin board. They were required to upload three reflective musical reviews of approximately 200 words for each selection they chose to highlight. One objective of this exercise was to facilitate community building through exploring the musical identities of the pre-service teachers. Another aim was to provide an opportunity for practice with using musical vernacular and social insight to describe, in this case, the significance of their personal selections. Another objective was to provide an environment conducive to community learning. The ultimate purpose of sharing musical tastes

and insight within the forum of an online public bulletin board was to encourage peer learning, community building, and a broader understanding of musical literacy.

Three class periods were devoted to the DLT instruction in split sessions, allowing for smaller classes and providing a total of three hours of instruction over three weeks to enable the pre-service teachers to post their playlists and comments. They were also required to respond to the music and comments of two classmates; however, they were free to listen and respond to any of the other postings, as well, upon completion of their assigned responses. The GRA was available for additional assistance outside class time; many students availed themselves of the opportunity for assistance. The intent of the online bulletin board was to introduce the participating pre-service teachers to a communicative tool they could subsequently employ during their extended practicum. They would be able to compose and post music excerpts with the expectation of peer response. This encouraged both an individual and social (i.e., collaborative) model of learning, where the instructor was not the sole “audience” for their work.

4.5.3 Data sources, collection and analysis

Data analysis for this study was an inductive process (Creswell, 1998; Miles and Huberman, 1994). Erickson (1986) suggests that researchers conducting case study should draw from a number of different perspectives. I draw from observation, pre-service teacher exit interviews, ongoing communication, an interview with the instructor, and pre-service teachers’ final assignments. The first step of analysis involved developing a set of categories loosely based on organizing data from pre-service teachers’ interviews, separating, for example, comments about pre-service teachers’ use of GarageBand™ and the electronic bulletin board. These were then reviewed in order to identify sub-categories for further analysis. Sub-categories specific to pre-service teachers’ comments about GarageBand™ included the following: purpose of DLT,

role of music educators, perspectives on music education and notions of music production and recreation. Specific to the electronic bulletin board, sub-categories included notions of “role” (i.e., role of the teacher, role of technology, etc.), benefits, challenges, comfort with DLT, writing (i.e., process, negotiation, convention, postings, power), and identity (i.e., negotiation, musician, professionals). This process for creating categories and sub-categories is outlined by Creswell (1998) and Stake (1995). Transcripts were analyzed for emergent themes within each category.

Participants for this study included the music education instructor and 17 of the 36 pre-service teachers enrolled in her class. All 36 pre-service teachers were interviewed as part of a larger study exploring pre-service teachers’ use of DLT during their 12 month program. Semi-structured interviews took place near the end of their program, after their extended practicum. During this interview, 17 pre-service teachers mentioned GarageBand™ and/or the electronic bulletin board. These interviews were the primary data source for this study. The discussion of the technology was not even: one of seventeen pre-service teachers, for example, mentioned only GarageBand™ without discussing the bulletin board. Secondary data sources included documents such as the instructors’ lesson plans, and pre-service teachers’ completed assignments (i.e., responses to their peers’ music selections, online postings of their music selections). These secondary data sources provided additional context for pre-service teachers’ comments.

4.6 Findings

This section is organized as follows: First, pre-service teachers’ experiences with GarageBand™ are explored with particular attention to existing assumptions about music education, music selection and identity construction, and contrasting views of music education.

Second, we describe pre-service teachers' representations of the advantages and "adverse features" of using an electronic bulletin board for this activity.

4.6.1 GarageBand™ assumptions about music education

Eleven of the seventeen participating pre-service teachers in this study stated that the traditional use of instruments was an integral component of music education. Nine of these eleven participants also revealed they were initially skeptical with regard to exploring the digital-composition capabilities of the GarageBand™ application. They were in fact introduced to both traditional instruments and digital software; nevertheless, eleven of the pre-service teachers complained that an important component of their music instruction—that is, learning to teach with traditional instruments—had been eliminated by the introduction of the GarageBand™ application. They raised specific concerns about abandoning what they identified as a central objective to music education—teaching students to read and write music. As one pre-service teacher stated,

How are they going to learn to play classical pieces if they never learn to read music? That is the purpose of music class, so I still don't get where the technology stuff fits in, or at least I didn't until the end. (Lorna)

The interview respondents referred to digital and traditional music literacy as though they exist in diametric opposition, adopting a rhetoric of how "the new" is replacing "the old" Marsh (2002). One pre-service teacher commented,

I think there is always that worry, you know. I mean, if we are working with GarageBand™, well, that is really fun and kids would love it, but we are working on GarageBand™ instead of what? Working with instruments? Isn't that like replacing books with, I don't know, a Leap Frog™? (Randy)

These comments reveal that Randy is uncertain of the educational benefits of using DLT, particularly in school settings. As well, he exhibits a highly conservative attitude in relation to what constitutes appropriate disciplinary knowledge.

In this study, the majority of participating pre-service teachers subscribed to an understanding of music literacy based upon traditional values of developing students' notation skills—reading and writing—and fostering their appreciation of “the classics” and “the masters”. This perspective is devoid of a sociocultural understanding of music literacy that includes cultural and historical constructs of music. It upholds a process of learning to play and read music by conventional means common in western cultures, especially using musical instruments. This problem resonates with Jorgensen’s observation that while there is a practical component of training in music education, which directly relates to the role of musicians, it is the teacher-directed, hierarchical structure that prevents the inclusion of reflection, analysis, and speculation (Jorgensen, 2002, p. 12). She points to enculturation, which “involves two sometimes conflicting processes, transmission and acculturation, the first emphasizing tradition and the second underscoring change” (p. 24), as representing an improved model for contemporary music-education classrooms.

4.6.2 Music selection and identity construction

Two factors guided the music selections of the participants: their familiarity with the selections and the anticipated response from their peers. The majority of the pre-service teachers invested time outside their formal classes to explore music selections for their projects pertaining to this study. However, they typically selected music with which they were already familiar. Only four participants selected music they identified as unfamiliar, which they chose based upon the suggestion of friends. As Lisa explained, “I would never have used something so ‘punk,’ but

then, well, [peer named] recommended it to me and I thought it would work well.” The criteria for the assignment necessitated an exploration of at least two genres of music, which was intended to encourage the participants to explore music beyond their routine repertoire; yet, the selections demonstrated a degree of resistance to this particular criterion. Tania stated:

I know that [the music course GRA] suggested that I listen to some classical music, but no way. I would find something that was rock and roll that would fit. There was no way I was going to spend time on classical, you know? (Tania)

In some cases it was clear this concern over music selection stemmed from personal insecurities in regards to what the music might imply about an individual’s character. For example, one pre-service teacher decided to change her music selection after discovering that the composer may be a Communist. Kelly explained,

I thought the music was great, but like, I don’t want people thinking I am a Communist. I mean, they didn’t really know me then. “Punk rocker,” I wouldn’t have cared, but Communist, no. There was something in the back of my head telling me that was wrong. I also wasn’t sure if I would use that in the classroom, with kids, I mean. I don’t know. Still struggle with how I want kids to see me. (Kelly)

Of the seventeen pre-service teachers in this study, thirteen mentioned that they selected music with which they were already familiar; ten of these thirteen, however, did not select music they personally enjoyed or listened to on a regular basis. Rather, their selection was guided by the image they hoped to convey to peers. For example, Cindy stated that “I couldn’t use Barry Manilow, even though it would fit. I don’t know if I would want [student named] knowing that I listen to Barry on my spare time, you know” (Cindy)? Laura remarked, “I actually really like Britney Spears, but no way. I wasn’t going to set myself up for that at the start of the year” (Laura).

The majority of the pre-service teachers in this study selected music they felt would glean a positive reaction from peers or create a contrasting image to how they imagined they were perceived by colleagues. For example, Mary was concerned at the onset of the year as to whether she came across as too shy or quiet. Consequently, she selected music she felt was controversial:

I could easily have just selected Bob Marley, but then, I bet that is what everyone would expect me to pick, you know. So, I was talking to a friend of mine and decided to include this band that would, I don't know, make them [peers] think about if they really knew me. (Mary)

Amanda revealed a similar motive in her selections:

I mean, I just wanted to include something that would make them go, I don't know. I didn't expect that, you know? I mean that early on we were trying to figure each other out, and music, well, it is a great way to do that. (Amanda)

The selection of music material also became important to the study participants in terms of defining themselves as prospective educators. Roger stated, "I just wanted something to show that I was a bit controversial... Not just for the class, but also if I were to use it in the classroom. I mean, that is how I would want my students to see me." Such comments are consistent with an already existing body of literature focused on exploring the relationship between music selection and identity. For instance, music education students often struggle to reconcile "tensions" in their identity as musicians and as prospective teachers (Bouij 1998; L'Roy, 1983; Prescesk, 1997; Woodford, 2002). Bernard (2005) explores how our personal understanding of "audience" and "role" contribute to the process of identity construction. In her article, "Making Music, Making Selves," she places considerable attention on the complexity of preparing pre-service teachers for their prospective role as music educators. She identifies the way in which pre-

service teachers struggle amongst various personas, uncertain of how to adapt or recreate their persona to “fit” their emergent role as a teacher. Bernard (2005) suggests that a central challenge for instructors and their students is that in our attempts to navigate multiple identities we tend to “compartmentalize our various identities” (p. 4).

A final challenge faced by the participating pre-service teachers was trying to establish a process of negotiation in determining whose music to include within their final small-group presentations. While their individual selections were partially driven by a process of identity construction, their group selections became a process of social negotiation. Deciding whose selection to include became a point of contention for a number of pre-service teachers. This was partly because they felt personally invested in the music they selected. The pre-service teachers who were invested in constructing a particular image struggled to negotiate a new identity on behalf of the group. This was especially true for groups who wished to include music that conflicted with the values and/or beliefs of individual members:

At first I was so excited to be working in groups because it was such a great way to get to know everyone... I felt sometimes that if I picked something really personal, it would reveal too much about me. Then, I mean, when we were working in groups, that was really tricky because we didn't know each others' music that well. I mean, in our group, I found out that one of the songs [another member of our group] wanted to include was really a Communist rock band. I mean, I don't want that. I wouldn't even know what to say about that. But then, I mean, they really didn't want to use my Bob Marley rendition. So, it was tricky. (Tania)

The research literature on using electronic bulletin boards to facilitate identity construction is extensive; there are studies that explore the way in which language use impacts identity construction amongst second language learners (Bloch, 2004; Hanh & Kellogg, 2005; Lam, 2004; Turkle, 1995; Warschauer, 1999), K-12 students (Hughes, McLeod, Brown, Maeda, &

Choi, 2005; Whitlock & Powers, 2006), pre-service teachers (King, 2001; Slovacek, Doyle-Nichols, 1991) and other adults (King, 2001; Weisskirch, Milburn, & Seidman, 2003). As stated by Spiliotopoulos & Carey (2005), electronic bulletin boards have a greater impact on identity construction amongst students than what typically occurs in a face-to-face learning environment (Spiliotopoulos & Carey, 2005). The majority of these studies explore how electronic bulletin boards can be used to empower learners (Pena-Shaff & Nicholls, 2004; Suzuki & Calzo, 2004). There are also a growing number of studies exploring how the public forum of the electronic bulletin board may create anxiety, or even silence learners; a significant number of these studies focus on ESL learners (Groen & Li, 2005; Keller, 2005). Pre-service teachers' comments in this study reveal how electronic bulletin boards can perpetuate patterns of negotiation that silence, not empower, pre-service teachers. However, it is important to recognize that there are also an abundance of studies that demonstrate how electronic bulletin boards can empower learners (Hoadley & Linn, 2000; Murray, 2000; Lantolf, 2000), improve students critical thinking skills (Yang, Newby and Robert, 2007) and positively impact learner disposition (Rowley & Urquhart, 2007). Research reveals that electronic bulletin boards are also beneficial to those second language learners who prefer writing to speaking for the purpose of sharing their ideas (Zha, Kelly, Part, & Fitzgerald, 2006; Repman, Zinskie, & Carlson, 2005).

Pre-service teachers participating in this study had varied, and at times even conflicting, understandings of the educational merit and/or purpose of school music programs. There were those who cared more about developing student appreciation of the social and cultural significance of music education. These participants were primarily invested in teaching notation and introducing students to “the greats” of the western tradition for the purpose of eventual imitation:

I remember spending 3 months in school learning, what's his name again? The famous one by Schubert? That's what students need to know coming out—who he was and how to play that piece, but I guess trying to learn that piece also taught me I will never be a musician. (Heather)

In contrast, there were those who felt that school music was a vehicle for positive socialization and a way of creating opportunities for collaboration with peers:

You don't really have to even know music to teach music these days. What you need to know is how to build community, or at least that is what my sponsor teacher would say, but maybe that was because none of us could play an instrument. She was really kind. (Jody)

In the above scenarios, pre-service teachers have identified two views of music education: one includes the development of social and cultural understanding of music; the other focuses on imitation of the (European) masters. As one student remarked,

You have to know what you're teaching. Do you want them to know who the great musical composers are, or is it more important to use music as a way to connect? I don't think we can have it both ways. (Risa)

So, even though the pre-service teachers were encouraged to think outside of the traditional model of music education and music literacy, their tendency was to “default” to western notions of music literacy inherited from their early (music) education. In other words, “practice makes practice,” in that it is difficult to implement new ideas or change habits of mind once they are established (Britzman, 1991).

Their introduction to GarageBand™ forced pre-service teachers’ assumptions about music literacy to come into play — in particular, their comments about the possibilities for composition

helped elucidate what they identified as problematic and inspiring about the affordances of GarageBand™. For instance, pre-service teachers who stated that the traditional use of instruments was an integral component of music education were skeptical about exploring the possibilities of composition with GarageBand™. Several students who enjoyed the process stated that they felt too much would be lost in replacing instruments with digital software. In particular, these students suggested that “putting sounds together” using GarageBand™ was not composing: “it doesn’t take any skill, well at least musical skill, to compose. Actually, it is not composing but mish mashing with GarageBand™” (Farah). Participating pre-service teachers also expressed anxiety over using GarageBand™ within the context of music education due to fear of losing what Amy referred to as “our cultural heritage.” Remarked Tara, “What if students aren’t taught the violin anymore, and instead, they only know how to use GarageBand™? Mozart will be ‘rolling in his grave,’ you know?” Kelly explained that “Music class is how kids learn about our cultural heritage. We can’t lose that because it can never be replaced. Besides, what would we perform?” Another student stated that she was “not sure about all the technology… I love it. I think the kids would love it, but I mean that would be like replacing Shakespeare with some online, unknown author. Can we do that? Do we want to do that?” (Helen)?

Remarks Leonhard (1999), contemplating such conventional attitudes, “many music educators have been unable to adjust to a changing social structure, the revolution in communication, and contemporary developments in music itself” (p. 4). He adds that many educators have struggled to conform to a notion of music education that is intended for the general public, rather than the education of a talented few. The challenge is to allow a shift in the purpose of education away from what Leonhard referred to as “the elitist virus” (p. 7). Consider the following comment by Leonhard:

[this] affects the implementation of school music programs so that the music is no longer for all children; it is for those who choose to specialize and perform. . . [In particular] this virus is present in too many departments and schools of music, and it contributes to the development of students who learn only to perform and rarely develop the broad understanding of music that constitutes music literacy. (pp. 6–8)

However, in this paper we suggest that it is necessary for such perspectives to change. In current times, access to the Internet implies that individuals have almost unlimited access to music from around the world. It is easy to download software in order to compose professional sounding music within a relatively short time frame. Individuals can post a clip on YouTube and share their music with the world. In many ways, digital technologies have created the possibility for hybrid forms of music. For instance, students can use GarageBand™ to recompose or “mash up” music from a variety of genres. This has created extraordinary potential to reconceptualize the very concept of music and has created almost unlimited possibilities for creativity and innovation in the field of music education.

4.7 Bulletin Boards

4.7.1 Fostering dialogue and inquiry

Pre-service teachers initially welcomed the prospect of peer review and sharing their music selections through this online collaborative venue. Laura observed, “It is great. We would be able to hear what everyone else came up with. That is cool, you know.” However, challenges emerged in negotiating the written component of assignments. Although fifteen of the seventeen pre-service teachers perceived value in sharing their work on the online bulletin board, they resented the requirement to write within the context of a music methods course. Sarah explained that “it was really cool to see what everyone did, but writing—that has no place in a music methods course. I get using blogs in English, but in [a] music class, I don’t get it.”

The concern about writing reviews and responses was apparently grounded in fears about what the documentation might reveal in terms of their status as prospective educators. One pre-service teacher observed, “I get stressed whenever I have to write... when other people are going to read my writing. With a teacher you know what to do, but doing this, I don’t know, it’s like casual and formal at the same time . . . besides, I don’t want them to think I am clueless as a teacher because I am not a writer like [student name]” (Tania). The written component of the bulletin board assignments also created stress as the concerns of the participants shifted from posting their music to evaluation of their writing. A persistent focus on the expected length of their responses, which was defined within the course outline, also emerged, along with concern over whether evaluation would consider grammar. Comparatively less concern was voiced regarding the content of their responses. Doug explained that “once we knew that we weren’t going to be writing essays and stuff about music, then I think we felt pretty OK about just writing what we thought.” However, the sensitivity of the pre-service teachers toward their peers did, at times, cause them to question the manner in which they critiqued the work of colleagues on the bulletin board:

If I wanted to say something and wasn’t sure if it would be construed as negative, then it took me forever to post it up. I mean, on a bulletin board, the person can’t see that you are smiling, so it might come across rude or something. I didn’t want that.
(Tamara)

These comments draw attention to one of the affordances of the electronic bulletin board: learners can disguise, reveal, and/or manipulate how others view them (and their emotional state) only through the use of symbols and characters on a key board. As stated by Myers (1987), the electronic bulletin boards require that student “meanings are continually negotiated through symbolic interaction” (p. 251). This is different than during a face-to-face interaction — we have

learned to pick up social, behavioral cues that are part of how we naturally communicate meaning to each other (Garcia & Jacobson, 1999; Hale, 1992; Jones, 1998). Tamara's comment is consistent with current research studies that demonstrate how some learners struggle to negotiate "emotion" or "an emotive state" online; some students also struggle to negotiate "social norms" in the community, online space of the electronic bulletin board (Hutchby, 2001).

For two other pre-service teachers, their uncertainty about how their posts would be received resulted in the use of e-mail as a way to replicate some of the non-verbal communication that would have taken place in a face-to-face interaction. These two students used e-mail to ask the students if they were comfortable with the critique and/or if they wanted anything changed. The following excerpt provides an example of this moment in the interview:

4.7.1.1 Ellis' interview: e-mail as social negotiation

E. Well, that night I sent an e-mail. I mean, I didn't write anything in the post that was bad, but still, I don't know, all this online stuff you get a bit paranoid. I mean, it is up there for what seems like forever, you know.

V. By any chance, do you remember what you wrote in the e-mail?

E. Well, I could probably find it for you, but it was something like, "Hey, wanted to send you this YouTube" or something like that. Then, I would have asked her if she wanted to change anything that I wrote [on the electronic bulletin board]. I probably did a smiley face thing after.

V. So then the smiley face would let (name) know . . .

E. Well, I guess just, we're friends, or happy, or something. I don't know. Weird. Never really thought of it, what it means. I use it all the time, though. But I wouldn't really want to use it on the bulletin board?

V. Really, why not?

E. Maybe because I wouldn't want to be smiling at everyone, you know? That would be creepy. (Chuckle) Seriously, I think it is more about the smiley face being between us, the two of us. On the message board thing, that is more about completing an assignment with everyone, everyone can see what is up there.

Pre-service teachers were also uncertain as to how to respond critically to the musical selections of their peers. Craig asked, "What are we supposed to look for? I mean, as a musician, I might have different things to say than someone who is looking at it from the position of, "Would this work for my Grade 4 class?" This demonstrates how pre-service teachers are constantly in a state of negotiating their roles (and identity) within the community in relation to their peers and instructors' expectations and the task at hand.

A number of pre-service teachers struggled to distinguish between responding to music created with traditional instruments and responding to music "spliced" together with the GarageBand™ application. These pre-service teachers were uncertain as to how to negotiate their understanding of music in relation to GarageBand™. They were not convinced that the resulting sound could be perceived as "music," as the following comment reveals:

You can't just create music. Calling GarageBand™ music is like picking up a fork and banging it on the table and creating a beat and then saying, "Yeah, that is music" — but it's not, you know? That doesn't mean you can't use it to teach students things about music, like how to create a beat. But it is not music. (Ellis)

When asked what would make it music, Ellis responded, "Well, a piano in the background." This, of course, is a highly conservative perspective. For centuries people have been known to

use found objects to play music. Music is not dependent on the availability of a classical instrument; music composition is about intent and creation (Barry, Taylor & Hair, 2001).

The pre-service teachers participating in this study suggested five benefits for using a bulletin board as a community space for postings intended for peer review. First, it encouraged them to think more critically about a variety of music genres, as well as their own biases or assumptions about music education and literacy in general:

It was really cool because [student named] originally put up folk music, and I wasn't expecting it. I would have been embarrassed to say I like folk music, but then, well, now I will use [it] in the class. We all loved it. (Marcy)

Ellis commented that “[the instructor] forced me to think of folk music in a different way. I don’t even think she meant to, [it] just happened.” Kelly offered the following thoughts:

I have always thought of writing as an English class thing, never would have thought to use it in music class, but then weren’t we taught in [our English] class that, you know, expressing yourself in more than [one] way improves learning. We definitely wouldn’t have learned as much if we just talked about it in groups. Well, maybe that’s because we wouldn’t really have talked about it. (Kelly)

The second benefit of the online bulletin board as described by participating pre-service teachers was that writing responses to the music postings of their peers nurtured collaborative support within the music education course. Although they were aware of the priority for assignment completion, they were also sensitive to the reactions of their colleagues:

I knew that if I wanted to say something that could [in] any way be taken negatively, I wanted to make sure that there was already something awesome written. If not, I

would put it in. You want to make sure there is a balance, especially when everyone is watching. (Kelly)

The third benefit of the bulletin board assignment was that the online venue facilitated the creation of a learning experience that shifted the role of the teacher from a “top-down” director to a facilitator and guide:

What I really thought was cool, now that I think of it, is that we couldn’t just bug [instructor named] about answering all our questions. You know, even my Grade 5 students do that all the time. You give an assignment, and if you want them to have some ownership over it, it’s a big problem. They want you to tell them how to [do] everything, even what color of pen to use, you know. . . . If the teacher gives the assignment and you are sort of forced to look at the rest of the students in your class for answers, or to get through it, that makes a difference. I mean, we saw that quite a few times in the program, with BBs, with the wiki. It is one of those things that you don’t get it until it is done, you know? (Jody)

The fourth benefit was accessibility outside of class hours. Ellis observed that “sometimes you are just having an off day, or you just aren’t done with the music part. So it’s great to know you can go home and enter the discussion, or hook up with the class at any time.” Danielle added that “sometimes I was surprised that someone else was reading a post at 3:00 a.m. That was really cool, I mean to have a chat at that time.” Laura explained:

I found that because I could access it at any time, I would check it at weird hours, like 1:00 in the morning, more ‘cause I was curious if anyone had responded to my work, but also what was posted about someone else’s work. (Laura)

This comment speaks to the personalized nature of the electronic bulletin board. Pre-service teachers felt invested because they had posted work that was personal to them — their selections

of music and their written rationales. However, as noted by Caswell (2001), one of the drawbacks then becomes increased workload resulting from online accessibility.

4.7.2 Adverse features

Two pre-service teachers also voiced concern over the lack of response to their posts. Although all participants were required to respond to a minimum of three music selections, the postings of these two pre-service teachers did not receive a response until nearly the end of the required time period. This not only caused concern for these participants posting their selections for peer critique, it also caused them personal anxiety. One pre-service teacher, Farah, expressed feeling a degree of embarrassment: “It was probably just in my head, and it probably wasn’t even on purpose, but it just bugged me, you know. For about a week my post was sitting there while other students’ music was responded to right away.” The instructor, however, suggested two reasons for some delayed responses: First, some of the musical selections were musically challenging (i.e., unfamiliar to their “ears”). Second, some of the reviews were of a very personal nature and required more time to compose a thoughtful response. This reason was revealed in the interview with the instructor. “I know when (student name) came to me I was relieved to know that she was just thinking of what to write. It was personal to her so it took a while” (Instructor).

Three participating pre-service teachers voiced a concern that written communication is not appealing to all learning styles. While some are empowered through written modes of expression, others are intimidated about writing or being evaluated in a public venue. Consequently, bulletin boards might unintentionally disempower student voices, as one student intimated:

I love the idea of the bulletin board, or like what we did with the wiki, but writing is just so stressful for me. I never think what I am thinking is actually going on paper,

you know. That is a problem because then I sometimes just don't end up saying anything, or at least not what I meant. (Risa)

This is consistent with the research literature on how electronic bulletin boards appeal to many different learning styles and can facilitate or inhibit student writing (Carey & Morgan, 2005; Carey & Guo, 2003), communication (Ebenezer, Lugo, Beirnacka & Puviraja, 2003) and peer relations (Weisskirch, Milburn & Seidman, 2003).

Finally, twelve of the seventeen pre-service teachers participating in this study changed their opinion with regard to the use of online bulletin boards. After the project they conceded that the pedagogical and social relevance of the exercise became significant only as they worked through the assignments and completed the process. While they were initially frustrated, they understood the value of the process after experiencing their classrooms during practica:

At first, I just remember being really stressed out that I was going to have to write in front of my peers. That is stressful. There is so much judgment with writing, or maybe that is just me, I don't know, but then reading all the responses, and making the three responses, or evaluations of whatever, then I got it. It was really cool. That's what it should be about, figuring out your own opinion and not having to look at a teacher to tell you what to do. Anyhow, I would use bulletin boards again, or blogs or something, for sure. (Mary)

Craig concurred with this understanding:

I didn't really get it until I got into my school. Then I was like, OK, now I get how this does everything we talked about in the program. How better to get kids thinking about music literacy than having an online debate, or something. I will definitely use it and GarageBand™ in my own classroom. (Craig)

4.8 Conclusion

Pre-service teachers participating in this study initially experienced discomfort with the DLT assignment because they were required to work independently without direct teacher instruction. Although a framework for learning was in place, the process was designed as organic, developing with each exchange of musical selections and accompanying reviews and responses. For those accustomed to teacher-centered instruction, this created a measure of initial anxiety. Furthermore, although the majority of the pre-service teachers viewed the process as a valuable experience and acknowledged the potential for GarageBand™ and electronic bulletin boards, thirteen of the seventeen participants commented on the time required to learn the software and adjust to the notion of using DLT within their music methods course, as well as for the independent learning process as a whole.

Another necessary shift in perspective was a reevaluation of the purpose of music education, as well as subject-specific literacy practice. Some pre-service teachers began to realize that to develop music literacy in all children rather than performance ability in a few their students would need (a) to develop critical listening and thinking about diverse musical samples, and (b) to participate in musical communities of inquiry (with and/or without DLT) to encourage a democratic, collaborative approach to music education. As Leonhard (1999) states,

[u]nfortunately, music educators have not been fully prepared by music teacher education programs to accommodate these developments. Many music educators and programs are unfamiliar with African American music and other ethnic music, popular music, contemporary art music, and jazz. Also, few are up-to-date on the contemporary popular music from which their students are gaining a musical education outside school through MTV, VH1, radio, and CDs. In that extra-school phase of their music education, children and young people are doing on their own what we should have been helping them do in school through the music we teach;

that is, they are experiencing a variety of music, responding naturally to its expressive effect, thinking about it, talking about it, serving as critics of it, making choices about it, and using it to enrich their lives. (p. 14)

We suggest that it is not enough to be aware of the ways in which learners can now access, share and experience music from around the world. Instead, it is important to develop an awareness of the affordances of the various DLT now used to *compose* music (e.g. GarageBand™). Developing critical awareness and engaging in reflective thinking about music requires time. In order to foster communities of inquiry across curricula and to disrupt conventional notions of literacy, pre-service teachers as well as their future students will require greater control over opportunities to express and develop ideas using multiple literacies, including musical and digital literacy.

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5 CONCLUSION

5.1 Analysis of Manuscript Chapters

Ware and Warschauer (2005) posited that our understandings of literacy are governed by personally held, firmly engrained values and beliefs. In each of the three manuscript chapters we observe that pre-service teachers arrive at their teacher education programs with traditional understandings of literacy. In addition, they demonstrated a tendency toward using digital technologies for the purpose of supporting an additive model of integration. Dobson & Vratulis (2009) stated that digital technologies typically “play a pragmatic role in facilitating communication and access to materials” (p. 4). For instance, it is not as common to use digital technologies in ways that disrupt existing conceptions of literacy. The present research suggests that it is necessary to identify and disrupt existing, traditional conceptions of literacy with a view to integrating digital technologies in ways that foster creativity and innovation. This is particularly important in the context of teacher education because research suggests that pre-service teachers typically adapt attitudes toward digital technologies modeled by their university-instructors. As noted by Dobson and Vratulis (2009), these attitudes and perspectives are then perpetuated within K-12 classrooms. If the intent is that we move from traditional conceptions of literacy toward a multiple literacies perspective it is necessary to reconsider existing notions of authorship, publication, multimodal knowledge construction and dissemination. This is an important step toward understanding how digital literacies are similar and distinct from existing literacy practice.

In the following sections, I will trace themes across manuscript chapters in light of current research in the field. Themes emerging from this analysis are organized into the following broad categories: Community building and learner/instructor positioning in collaborative learning

environments with DLT; Power relations in collaborative learning environments with DLT; Literacy practices in collaborative learning environments with DLT and pre-service teachers' Technological Pedagogical Content Knowledge (TPCK). These themes are represented in a series of tables accompanied by discussion.

At the start of this dissertation I stated that the following two research questions guided this study: a) How do pre-service teachers experience DLT in the context of a 12-month elementary teacher education program? b) How do we disrupt and extend pre-service teachers existing conceptions of literacy? The manuscript chapters provided examples of how pre-service teachers experienced DLT in the context of their 12-month elementary teacher education program. Each manuscript chapter also revealed a degree of uncertainty from pre-service teachers about how to negotiate multiple literacies when using DLT. In part this is because pre-service teachers struggled to reconceptualize their understandings of literacy to account for the (digital) multimodal possibilities for negotiating, constructing and representing meaning in a variety of digital environments. In the following section we explore the abovementioned themes with attention to how each theme contributes to our understanding of how to disrupt and extend pre-service teachers' existing conceptions of literacy.

5.2 Community Building and Learner/Instructor Positioning in collaborative Learning Environments with DLT

Table 5.1 (see below) reveals the ways in which pre-service teachers and their instructors worked toward developing a sense of community within the cohort. Many researchers have commented on the importance of community building in developing effective learning environments (Bruffee, 1993; Reid & O'Donoghue, 2004; Tinto, Russo & Kadel, 1994). There is also existing research literature specific to the impact of digital technologies on community

building (Arnold, Gibbs, & Wright, 2003; Blanchard, 2008; Matei & Ball-Rokeach, 2002; Quan-Haase, Wellman, Whitte & Hampton, 2002) and the development of personal identity (Johnson-Eilola, 1997; Turkle, 1995). In each of the manuscript chapters, we observe that pre-service teachers experienced a student-centered and collaborative approach to DLT integration. The process of negotiating with their peers about how to use DLT took place from before the start of the year (i.e., orientation) until the end of the program; therefore, DLT were integrated into a variety of subject areas and at different stages throughout the year. Pre-service teachers worked together to support each others' skills and proficiency with DLT. The ongoing process of problem-solving and negotiation amongst peers while using various DLT facilitated a process for community building within the cohort.

Table 5.1: Community building and learner/instructor positioning in collaborative learning environments with DLT: Matrix of argumentation and representative participant quotations for manuscript chapters 1, 2, and 3

	Manuscript Chapter 1	Manuscript Chapter 2	Manuscript Chapter 3
Community Building	The collaborative wiki writing process fostered community, although it did appear to marginalize particular group members.	The collaborative slowmation production process facilitated community building. Participant comment: “We learned so much from each other creating that project. No one could hide. I guess that is what they meant about learning in a community of inquiry” (Tania).	Posting music clips on the bulletin board encouraged interaction among peers. Participant comment: “I just wanted to include something that would make them go . . . that early on we were trying to figure each other out, and music, well, it is a great way to do that” (Jody).
Learner Positioning	Students were required to take ownership of their learning in the wiki, relying primarily on their peers for support. This was deemed challenging at first, but eventually the pedagogical advantages of this learner-centred approach became clear. Participant comment: “For the most part, we had to figure it out on our own. . . Now I get it. We were supposed to make the connections on our own” (Tamara).	Students were encouraged to rely on their peers for support. Participant comment: “It made a big difference that you didn’t have to go up to an instructor every 5 minutes. We were really encouraged to ask our peers” (Laura).	Students were encouraged to rely on their peers for support. Participant comment: “If the teacher gives the assignment and you are sort of forced to look at the rest of the students in your class for answers, or to get through it, that makes a difference . . . we saw that quite a few times in the program, with bulletin boards, with the wiki” (Laura).
Instructor Positioning	Course instructors chose not to become proficient with the wiki and did not model work with the wiki, which at times appeared to negatively affect student confidence. The project designer, the technology coaches, and the GRA provided instruction and support with the wiki throughout the year.	The course instructor was not an expert user, but was willing to take risks with the technology, which appeared to positively affect student confidence. Participant comment: “When you see your instructor learning for the first time too, you realize you aren’t really being graded or anything. It is more about learning and getting to know each other” (Kelly).	The course instructor was highly proficient with the technology; however, she invited a GRA to facilitate the GarageBand™ and bulletin board project.

Pre-service teachers' comments reveal that they struggled to negotiate their personal and professional roles within the CITE community. In the first manuscript chapter, we observe how pre-service teachers struggled to negotiate and represent their individual ideas as they collaborate with their peers. The process of trying to negotiate their ideas into the written text of the community wiki helped position students' roles (legitimate and/or peripheral) within the community. Similarly, in the second and third manuscript chapters, pre-service teachers' comments reveal that how they negotiate their ideas with their peers helps determine their social and professional roles within the community. For instance, in the second manuscript chapter, Tania remarks that "it is hard to hide" when working closely together to construct a slowmation project. Within each group, pre-service teachers were constantly forced to problem-solve about how to construct their slowmation projects. They had to negotiate what ideas to include and how to represent those ideas using available resources. Students within each group did not always agree; this meant discussing, arguing, and compromising during the process of construction. The success of the project was reliant on a process of ongoing group participation. The process of constructing slowmation helped community building within the cohort.

In the third manuscript chapter, we observe that one of the pre-service teachers negotiated her role within the community by challenging what she perceived as others' assumptions of her. The very process of negotiating her role within the community by purposefully interrupting (and broadening) others' perceptions of her ultimately changed relations within the community. Pre-service teachers' comments also illustrated a type of transition whereby a pre-service teacher's role within the community shifted from "regulation by others" (i.e., purposeful negotiation within a community) toward a more "self-regulated participation within the learning

community” (Rogoff, Matusov & White, 1996). The process of developing “self regulation” within a community is a critical step toward the development of pre-service teachers’ professional identities. Biddulph & Osborne remarked (1984) that students are able to “assume increased responsibility for their learning through heightened awareness of both personal and shared meanings . . . as they move toward becoming experts within the [classroom] community” (p. 7). The third manuscript chapter also reveals how this process contributed to the development of participants’ professional identities.

Table 5.1 also includes comments which reveal how the process of community building in this cohort disrupted traditional teacher-student roles. Pre-service teachers felt encouraged to (re)negotiate their roles (as learners) within the CITE community so that they were less dependent upon the instructor for direction. This is another necessary step toward the development of pre-service teachers’ professional identities (Weber & Mitchell, 2007). Their role as (potential) passive learners was disrupted and they assumed a more active role . Comments included in Table 5.1 are especially significant if we consider that current research literature in the field of teacher education suggests that pre-service teachers’ experiences in teacher education most significantly contribute to their (eventual) professional selves (Beijaard, Meijer, & Verloop, 2004; Burn, 2007; Dam & Blom, 2006). Thus, acquiring a more active learner position in the teacher education program is likely to influence positively the professional lives of new teachers.

5.3 Power Relations in Collaborative Learning Environments with DLT

In this section, I will refer to Table 5.2, “Power relations in collaborative learning environments with DLT.” Beyond power relations negotiated between peers, there are also external forces impacting how pre-service teachers (re)negotiate their role amongst their peers

and within the cohort. Sponsor teachers, teacher instructors, and faculty advisors are amongst those who are trying to shape participants' identities as prospective teachers. Sumara and Luce-Kapler (1996) suggested that pre-service teachers arrive in teacher preparation programs negotiating at least three teacher identities: "there are those they bring with them into teacher education, those they develop while doing university course work and those they develop during student teaching practicum" (p. 65). Pre-service teachers are also confronted with "cultural myths" about teaching which influence and inform the development of their teaching identities. Negotiating such power relations significantly influences how pre-service teachers come to develop their professional identities as teachers. Elbaz (1991) stated that at times teaching is viewed in particularly problematic ways: teachers are static, unchanging; our identity as teachers becomes confused with "role and function" (p. 42). Britzman described the distinction by stating that a role is assigned, but personal identity is in a constant state of transition (p. 42). Recognizing this distinction is an important part of the development of pre-service teachers' professional identities in teacher education.

Table 5.2: Power relations in collaborative learning environments with DLT: Matrix of argumentation and representative participant quotations for manuscript chapters 1, 2, and 3

	Manuscript Chapter 1	Manuscript Chapter 2	Manuscript Chapter 3
Peer to peer power relations	<p>The wiki project allowed all students opportunity to contribute ideas; some students, however, expressed concern about power relations within groups.</p> <p>Participant comments:</p> <p>“What I thought was kind of interesting about the process was how every person in the class got to put in their own input” (Julie).</p> <p>“In our group it was the controlling student who really decided what [got] to be put in” (Julie).</p>	<p>Power dynamics appeared to be even: peers drew on each other for support.</p> <p>Participant comment:</p> <p>“We had to work together with technology . . . We learned so much from each other creating that project. No one could hide. I guess that is what they meant about learning in a community of inquiry” (Tania).</p>	<p>Some students were threatened by the prospect of writing in front of their peers.</p> <p>Participant comment:</p> <p>“At first, I just remember being really stressed out that I was going to have to write in front of my peers. That is stressful. There is so much judgment with writing, or maybe that is just me. I don’t know” (Laura).</p>
Student – instructor power relations	The classroom was learner-centred. Instructors represented themselves as facilitators and encouraged peer mentorship (see Table 5.1).	The classroom was learner-centred. Instructors represented themselves as facilitators and encouraged peer mentorship (see Table 5.1).	The classroom was learner-centred. Instructors represented themselves as facilitators and encouraged peer mentorship (see Table 5.1).
Student – sponsor teacher power relations	Students felt unable to implement the project on practicum because they feared they would not have the support of their sponsor teachers.	<p>Students felt unable to implement the project on practicum because they feared they would not have the support of their sponsor teachers.</p> <p>Participant comment:</p> <p>“It’ll make a big different when someone else doesn’t have all the power. I want my students to create their own project, but not during practicum. Not with my sponsor teacher watching” (Sarah).</p>	Students felt unable to implement the project on practicum because they feared they would not have the support of their sponsor teachers.
Gender and Power	Female instructors of a course on principles of teaching chose not to learn how to use the wiki. They did not wish to teach the wiki or use it in front of the class.	The male instructor of a science course was willing to take risks and model use of the technology in spite of not being an expert.	The female instructor of a music course was highly proficient with GarageBand but deferred teaching of the software to a GRA.

A second theme that emerged concerned the gendered uptake of DLT by instructors in the teacher education program. For instance, in the first manuscript chapter we observe two female instructors who demonstrated reluctance and a degree of anxiety about using the wiki with their students. Pre-service teachers commented, as reported in a related study drawing on the same data (Dobson and Vratulis, 2009), that they thought the wiki would be complicated and difficult to learn because of the degree of reluctance demonstrated by these two instructors. One of the instructors used digital technologies in sophisticated ways in the context of her subject area; however, she revealed great reluctance to demonstrate her knowledge of digital technologies in the context of using the wiki within the course she was team-teaching. The other instructor of this course was quite open about her reluctance to use digital technologies in general because she had yet to determine their educational value. Both instructors were competent users of digital technologies and their reluctance to model use of the wiki in class was in this respect surprising.

Similarly, the female instructor in the third manuscript chapter revealed that she was a proficient user of both GarageBand™ and the electronic bulletin board; yet she did not model use of either application in class, choosing instead to hire a GRA to teach GarageBand™ and the electronic bulletin board. In fact, although she was highly competent with DLT, she was not involved in the process of teaching students how to use any of the digital technologies in her class.

In contrast, the male science instructor described in the second manuscript chapter, although by his own account not an expert with DLT, modelled use of digital technologies in his class and demonstrated a great deal of comfort and engagement in doing so. As noted in manuscript chapter two, pre-service teachers often commented on his playful and relaxed

approach to using digital technologies in the classroom. He often took risks and attempted tasks with digital technologies in front of the class that he was uncertain of how to complete. Pre-service teachers' comments reveal that they enjoyed the way he tried to "figure things out" even while presenting in class and that he admitted he was just "figuring it out" in the moment. A trend was therefore evident: instructors in manuscript chapters one and three, all of whom were female, deferred instruction of DLT to assistants while the male science instructor described in manuscript chapter two modeled use of DLT himself, even though he had no more expertise than his counterparts.

The object of this concluding chapter is to point out themes that become evident in examination of the three chapters, not merely to summarize the content of those chapters. Although discussion of gendered uptake of technology was not a focus of analysis in individual manuscript chapters, it was a noticeable theme on consideration of the three chapters together. It is not my intent to draw any conclusions about gender and uptake of digital technology on the basis of the above observations. Suffice it to say that the trend evidenced in these chapters serves as a reminder that the book is not closed on this subject and more consideration of this issue may be desirable. The observation of the gendered uptake of DLT in this thesis is certainly consistent with existing research literature specific to trends in digital technologies uptake in teacher education (Brous, 2005; Cockburn, 1985; Connell, 2002; Engelstad & Gerrard, 2005; Madanda & Kabonesa, 2007). It is also consistent with studies that reveal that female instructors, pre-service teachers and students in K-12 schools are less likely to demonstrate comfort and competence with digital technologies. For instance, Steele (2006) remarked that there are a disproportionate number of "computer coordinators" and "technology decision-makers" in the context of teacher education who are men (p. 12). Results from a survey conducted by Zhou and Xu (2007) revealed that full-time, female faculty and sessional instructors reported less

confidence and experience using digital technologies for the purpose of teaching than men. The authors stated: “they tended to learn how to use technology from others, whereas males were more likely to learn from their own experience” (p. 6). Similar “gender gaps” are identified in K-12 classrooms. Research conducted by Looker and Thiessen (2003), for instance, suggested that girls in school tend to use computers less frequently, and demonstrate less proficiency with computer skills. Others observe that digital technologies are far too often “left to the boys” in K-12 schools (Haugland, 2000). Kim and Bagaka’s (2005) study likewise revealed that from the time girls are in grade 4 they are already spending less time with computers than boys; as they become older (elementary and secondary school, college and graduate school) this “gender gap continues to grow” (p. 8). Therefore, it is especially important that women who are faculty, instructors, and sessional instructors demonstrate comfort, competence, and proficiency while exploring, teaching, and learning with DLT in the classroom. After all, students are impacted by their instructors’ attitudes toward digital technologies.

5.4 Literacy Practices in Collaborative Learning Environments with DLT

In the next section I will discuss literacy practices in collaborative learning environments with DLT, referring to Table 5.3. Weis, Benmayor, O’Leary, and Eynon (2002) stated that teaching and learning in educational contexts are currently shifting from “spaces of delivery to spaces of active inquiry and authorship” (p. 6). In each of the manuscript chapters we observe how the process of collaborative knowledge construction positions pre-service teachers as co-authors and publishers. Literacy researchers have asserted that literacy as a process of constructing, representing and communicating meaning is always socially situated (Gee, 2004; Luke, 2000; New London Group, 1996; Street, 1995). Therefore, students are engaging in authorship in ways that are no longer static or individualistic; instead, the notion of authorship in digital spaces is often collaborative, flexible, transient, and continually changing. As literacy

teachers it is no longer a question of how to apprentice students into authorship. Instead the focus has shifted to exploring how to support our students as authors within the digital realm.

Table 5.3: Literacy practices in collaborative learning environments with DLT: Matrix of argumentation for manuscript chapters 1, 2, and 3

	Manuscript Chapter 1	Manuscript Chapter 2	Manuscript Chapter 3
Authorship	The wiki required collaborative knowledge construction. Content was negotiated among peers.	Producing a slowmotion project was an act of collaborative knowledge construction. Content was negotiated among peers.	Music clips were collaboratively authored and responses on the electronic bulletin board were individually authored.
Publication	All writing was public and published openly on the Internet.	Group projects were shared within the class. Some were shown to practicum classes as well.	Individual music clips and responses were published in a password-protected space accessible only to instructors and peers.
Multi-modality	The wiki consisted primarily of written text. Some links to multimedia sites and to images of student work were included.	Student slowmotion projects were highly multimodal, requiring students to create a physical “set,” to record manipulations of the set through taking a series of digital photographs, and to edit the resulting image sequence to produce a movie.	The GarageBand project was somewhat multimodal, requiring students to edit sound clips and write about those sound clips.
Trans-mediation	The project primarily entailed writing in digital environments (word processor and wiki). Shifting between these environments necessitated consideration of how the hypertext feature of the wiki might affect navigation and representation of information. Some analogue artifacts from coursework were digitally photographed and linked to the wiki.	Producing slowmotion movies required students to recreate meaning in a variety of media (physical construction of the set, digital imaging, image sequencing, addition of sound, etc).	Digital sound clips were clipped and/or remixed digitally. Some clips were digital recordings of live performances; others were synthesized music or a combination of recorded and synthesized music. The bulletin board exercise did not necessitate shifting between media except insofar as music clips were uploaded.

In each of the manuscript chapters it is evident that there were moments of uncertainty among participants about how to collaboratively construct (and co-author) their projects. In the following section, I explore how authorship with digital technologies is in many ways aligned with authorship before the time of copyright laws and publication for the purpose of controlled (potentially profitable) distribution. Vratulis and Dobson (2008), following Siemens (2002) observe that in Europe “before our current methods of inquiry and knowledge diffusion were shaped, knowledge exchange was facilitated in large part by dialogue and the circulation of private manuscripts and correspondence” (p.3). Emphasis was not on ownership of ideas, but on circulation of ideas (Dobson and Vratulis, 2009). Similarly, before the time of writing, ideas were passed on from one generation to the next orally and conceptualized by multiple authors. It was not until the advent of moveable type (and copyright laws) that authors could profit from and control the distribution of their work (Miller, 2006a). Miller (2006b) stated, “western culture has generally required that written works carry specific information about who wrote them” (p. 3). The advent of the Internet has created new possibilities for knowledge construction and dissemination (e.g., Dobson and Willinsky, 2009; Warschauer, 2006).

In all three manuscript chapters we observe that pre-service teachers engaged in a process of collaborative knowledge construction. In the context of developing the wiki, pre-service teachers negotiated the process of determining how and what to represent on the wiki through a process of peer-collaboration within their smaller groups (i.e., original posts) and then within the CITE community (i.e., editing and responding to each others’ posts). Pre-service teachers struggled to negotiate their individual and collective roles as authors in the space of the wiki because of uncertainty about how to represent all of their ideas in a way that was organic and

inclusive of each of their voices (i.e., ensuring authentic co-authorship). They were also uncertain of how to individually and collectively negotiate the construction of a written text (i.e., transitioning from independent to collaborative authoring) within the community space of the wiki (Dobson & Vratulis, 2009).

Pre-service teachers were initially anxious over the complexity of constructing a wiki with multiple authors when the audience was not only their peers and the instructor of the course, but the general public, including members of the British Columbia College of Teachers. As well, the question of authorship troubled several pre-service teachers' conceptions of authorship in the sense that they could only collectively (not individually) claim ownership over the representation of their ideas (Dobson & Vratulis, 2009). This differed from their use of the electronic bulletin board. Successful completion of the assignment on the electronic bulletin board required that students identify their own posts, rationales, and responses. Therefore, there were no questions or concerns about authorship and ownership of ideas when using the electronic bulletin board because their understandings in this regard were not challenged in the same way as on the wiki.

Negotiating authorship in the context of constructing slowmation projects was also based on a collaborative process of knowledge construction. Constructing these projects in groups required a process of decision making about how to best represent their ideas using multiple modes of representation. In particular, students struggled with how to negotiate their use of images within each group. For instance, group members each had different understandings about how and when to use visual modes of representation within their projects. Negotiating the use of different media invited all group members to participate actively in the construction of their projects. In addition, the process of debating and discussing why and how to represent ideas in a particular way (using a particular modality) forced pre-service teachers to think more critically

about the process. Each of their slowmation projects was co-authored by all members of the group. Pre-service teachers were not as concerned about identifying who created individual images or objects, for instance, within the project. In this sense, there was far more discussion and initial anxiety about how to negotiate authorship as it applied to the wiki environment than with slowmation. The difference was that pre-service teachers were negotiating authorship within what ended up as a primarily written (i.e., wiki) versus a primarily visual (i.e., slowmation) environment. Thus, in manuscript chapters one and two, pre-service teachers' creative endeavors were focused on the process of collaborative negotiation for the purpose of knowledge representation and dissemination.

In all three manuscript chapters it was evident that using digital technologies creates opportunity for publication and sharing beyond just the scope of the instructor. The wiki is open to the general public; anyone with Internet access could read the wiki. A number of pre-service teachers used their slowmation project, even as an instructional resource, during their extended practicum. Pre-service teachers also posted their slowmation projects on YouTube. Several of them shared the music compositions they created during their initial introduction to GarageBand™ with their friends and family and posted them on personal Web Pages. (These music compositions were created during the demonstration for how to use GarageBand™). This meant that other practicing and/or prospective teachers, their students, researchers, and anyone else interested could access and view their use of digital technologies during the year. Some pre-service teachers also created wikis in their own classrooms as a way of connecting their students with students in other grade levels for the purpose of sharing and responding to each others' digital stories, for instance.

The three manuscript chapters also contribute to an existing body of research literature specific to investigating the affordances and constraints of digital technologies. In the following section I explore some of the characteristics and challenges of communicating with digital technologies such as those described in each of the manuscript chapters. For instance, in the first and third manuscript chapters pre-service teachers were uncertain of what register (formal or informal) their writing should reflect. They experienced moments of uncertainty about how to “appropriately” negotiate their use of written language in both spaces. Pre-service teachers felt the possible disorganization, chaos, and organic nature of the wiki was problematic, while others felt it was a more authentic representation of a community of inquiry (Dobson & Vratulis, 2009). Instructors in this setting allowed students to negotiate this issue themselves. In contrast, pre-service teachers’ anxieties about how to use language in the context of the bulletin board assignment were almost immediately addressed by the teacher. Because the assignment was individual, fewer concerns arose about how to appropriately use language (i.e., length of posts, quality of convention and style of writing).

Pre-service teachers (and their instructor) were more concerned about the redundancy and repetitive quality of postings on the electronic bulletin board than on the style, genre, or formality of writing. In the wiki environment, repetitive postings were edited almost immediately, so this was less of a concern. Perhaps this was because the wiki involved a process whereby pre-service teachers were posting and responding to each others’ work as an ongoing process. In addition, responses and edits had to directly connect to what was already written. Everything edited on the wiki (added, deleted, hyperlinked, for instance) had to work within the context of the rest of the wiki. Through the process of editing and responding to each others’ work, peers were providing feedback and evaluating each others’ work on an ongoing basis. In this sense, the wiki was never complete. In contrast, pre-service teachers posted their music

selections and rationales on the electronic bulletin board and then responded to each others' selections. Reading pre-service teachers' posts revealed that their comments were for the most part directed to the mandatory music selection and rationale to which they were responding; very few pre-service teachers responded to their peers on the electronic bulletin board beyond the scope of the assignment. In this sense, the electronic bulletin board read more as a series of disconnected comments rather than an interconnected community response.

Pre-service teachers' comments revealed that, although the electronic bulletin board fostered community in the sense that pre-service teachers could all view each others' posts, they also felt that submitting the final document to the instructor for approval (and evaluation) positioned the electronic bulletin board as more of a product-oriented approach. Pre-service teachers identified one of the benefits of both the electronic bulletin board and the wiki as the ongoing opportunity to discuss, share, and explore ideas with each other both within and beyond the classroom context. One of the limitations of such an environment, however, is increased workload (students stated they were checking responses in the middle of the night). This drawback has been noted elsewhere (e.g., Zappen, 2005).

Williams (2008) asserted: "there seems to be few ways of escaping the fact that we are living through a moment in which literacy practices are being fundamentally altered" (p. 1). The accessibility of online, virtual, hypermedia spaces is increasing opportunities for experiencing linguistic systems of meaning making in accompaniment with images and sound (Kress, 2003). The proliferation of social media in educational settings is increasing opportunities for knowledge construction and dissemination using multiple modes of representation. In chapter 1 I define *modes of representation* by the many ways in which systems of meaning making are constructed and communicated to others. When one or more of these modes are combined, the

term *multimodality* applies. Cope and Kalantzis asserted that language and other modes of meaning making are representational resources constantly “remade by their users as they work to achieve their various cultural purposes” (p. 5). In educational contexts, this requires a flexible understanding of literacy pedagogy and practice.

Current research in literacy education reveals that there are “changes in the literacy landscape” (Cope & Kalantzis, 2000; Jewitt, 2008). Kress (2003) stated that we are currently shifting from “the dominance of writing to the new dominance of the image” (p. 241). At the same time we have “moved from the dominance of the medium of the book to the dominance of the medium of the screen” (p. 241). This change has facilitated a shift toward the visual — for instance, images are dominating how we communicate using digital technologies. This emergence of multimodalities as they are experienced through digital technologies has created an additional need to better understand how we might integrate such modalities. This dissertation reveals that it is only by developing an awareness of how multimodalities might be utilized in digital spaces that we as educators, learners, and researchers can move from consumers to critical constructors of such environments.

Siegel (1995) describes transmediation as a process of “translating meaning from one sign system to another” (p. 455). The process of making new connections amongst sign systems encourages reflective thinking, social interaction, and a generative process of knowledge construction (Siegel, 1995). Siegel (1995) also suggests that “the emerging shift from transmission- to inquiry-oriented models of teaching and learning implies that students need more than words to learn” (p. 455). Finally, Siegel asserted that each mode, as well as how modes of representation are combined, provides a unique opportunity for meaning construction and representation. It is important to consider how “each sign system is based on a unique

organizational principle and involves elements that have no ready equivalents in the other sign system” (Leland, Harste, Ociepka, Lewison, & Vasquez 1999, p. 458). Transmediation occurs when meaning formed in one communication system is recast in the context and expression planes of a new sign system” (Leland et al, 1999, p. 340). Therefore, exploring multimodalities and transmediation in the context of the three manuscript chapters requires an understanding of how students negotiated sign systems when using digital technologies.

Each manuscript chapter provides an example of pre-service teachers’ use of a particular digital technology with a view to investigating how they negotiated meaning using linguistic (i.e., the wiki and the electronic bulletin board), visual (i.e., stop motion animation), and oral modes of representation (GarageBand™). This is not to suggest that modes function independently. Any singular mode is intricately connected to other modes of representation and that meaning is communicated in accordance with how modes are interconnected. However, focusing on the dominant mode of representation within the context of each of the digital technologies helps reveal how working in such environments (potentially) extends and disrupts pre-service teachers’ existing conceptions of literacy.

5.5 Forms of Knowledge (CPT & TPCK) Demonstrated Across Manuscript Chapters 1,2, and 3

In the following section I describe and build on Mishra and Koehler’s (2006) Technological Pedagogical Content Knowledge (TPCK) as a theoretical framework for understanding how knowledge of digital technologies integration extends beyond just “skill-based” expertise. The TPCK framework extends Shulman’s (1986; 1987) pedagogical content knowledge (PCK) framework by including technological knowledge. I use this framework to identify patterns in pre-service teachers’ comments throughout the three manuscript chapters in

relation to their existing conceptions of content, pedagogy, and technology (see Tables 5.4 & 5.5). Results reveal that despite their use of available digital technologies during their coursework and extended practicum, they were uncertain of how integrating digital technologies impacts, changes, or is even related to pedagogy and/or content area understandings. I conclude this section by suggesting that it is necessary to disrupt pre-service teachers' existing conceptions of content knowledge and pedagogy as unrelated bodies of knowledge. Instead, it is important to improve understanding about how knowledge of content and pedagogy exist in a state of "essential tension" (Kuhn, 1977) and "dynamic equilibrium" (Mishra & Koehler, p. 102). The TPCK framework helps elucidate the importance of understanding the relationships amongst content, pedagogy, and technology when integrating digital technologies into classroom practice.

Table 5.4: Forms of knowledge (CPT) demonstrated across manuscript chapters 1, 2, and 3

	Manuscript Chapter 1	Manuscript Chapter 2	Manuscript Chapter 3
Content Knowledge	The course in which the wiki project took place was a course on principles of teaching and communication applicable to all disciplinary subject areas. Students familiarized themselves with professional standards.	The course in which the slowmation project took place was a science methods class. Students expressed concern about how they might accurately express scientific concepts.	The course in which the GarageBand project took place was a music methods class. Tension existed in respect to appropriate content for a music class. Some students felt GarageBand was not an authentic form of music composition and should not displace traditional music instruction. There was also tension in regards to the appropriateness of a writing assignment in a music class.
Pedagogical Knowledge	Students struggled with a collaborative, learner-centred instructional approach initially, but eventually saw the value in the approach.	Students valued the collaborative, learner-centred instructional approach. The fact that the project was not graded appeared to play a role in their comfort level.	Students valued the collaborative, learner-centred instructional approach. Some tension emerged around the sharing of writing with peers.
Technological Knowledge	The students received two formal workshops on wiki use conducted by individuals other than the instructor. Ongoing support was provided. The instructors did not demonstrate technological knowledge of the wiki. Many students became proficient on the first day of use; others required more extensive support. Peer-to-peer instruction was also evident.	The students received formal workshops of several hours on slowmation conducted by individuals other than the instructor. Peer-to-peer instruction was evident.	The students received formal workshops conducted by individuals other than the instructor. Ongoing support was provided. Students and the instructor appeared to be proficient with the software.

Table 5.5: Forms of knowledge (TPCK) demonstrated across manuscript chapters 1, 2, and 3

	Manuscript Chapter 1	Manuscript Chapter 2	Manuscript Chapter 3
Pedagogical Content Knowledge	None noted.	None noted.	None noted.
Technological Content Knowledge	Students and instructors expressed concern about the organization of content in a wiki environment.	Students expressed concern about how they might accurately express scientific concepts in slowmation.	Students wondered if editing music in GarageBand is a valid form of music making.
Technological Pedagogical Knowledge	Some students noted that the fact that the instructors did not model use of the wiki eroded their confidence.	The instructor modeled the process and took risks with the software. This buoyed the confidence of the students.	
Technological Pedagogical Content Knowledge	Few pre-service teachers were willing to introduce wiki writing in their own teaching.	Very few pre-service teachers were willing to have their own students produce slowmation movies, citing concerns such as time commitment, displacement of standard curriculum, and approval of the sponsor teacher.	None of the students ran a similar project in their own classrooms (tensions expressed above may have influenced this decision).

Koehler and Mishra (2005) observed that current educational contexts are undergoing a period of “redefinition and redesign” (p. vii). Innovation in the area of digital technologies, with the possibility of unlimited access to the representation and transfer of information and knowledge, has created new opportunities for teaching and learning. While teachers are trying to determine how to use digital technologies in ways that will enhance student learning (Mishra & Koehler, 2006), students are discovering new, organic, and innovative ways to use digital technologies in their daily lives. They can Skype with friends and family from around the world. They can produce music videos, or pursue “fame” in ways not previously possible. A student carrying a cell phone can digitally record a triumphant (or embarrassing) moment and transfer the video clip or image to thousands within moments. The immediacy and virtual possibilities of digital technologies have created the necessity to critically evaluate how we integrate digital technologies into our classrooms. Hughes (2004) remarked that in order to integrate digital technologies in ways that improve student learning it is necessary for teachers “to acquire and develop *technological pedagogical content knowledge*” (p. vii). Such a process requires an understanding of how students (K-12 and teacher education) are taking up digital technologies beyond the context of the classroom in their daily lives.

Koehler and Mishra (2008) describe technological pedagogical content knowledge (TPCK) as a “framework for teacher knowledge for technology integration” (p. 3). They emphasize that expertise in content, pedagogy, and technology interacts to create a transient, flexible body of knowledge whereby technology is not positioned as a binary to either pedagogy or content. As illustrated in Figure 5.1, each body of knowledge (content, pedagogy and technology) is composed of fluid (sub)components: pedagogical content knowledge (PCK), technological

content knowledge (TCK), and technological content knowledge (TCK). This model is Angela Chritopher's adaptation of the model on page 12 of Koehler and Mishra's (2008) book *Handbook of Technological, Pedagogical, Content Knowledge (TPCK) for Educators*. Each body of knowledge (including sub-components) interacts to create a new and evolving body of knowledge. This body of knowledge then informs our understanding and application of “appropriate” technology integration.

Figure 5.1: TPCK Framework for Technology Integration.

Figure 5.1 has been removed due to copyright restrictions. It was a visual image of the Technological Pedagogical Content Knowledge Framework and its knowledge components. Original source: Koehler, M. and Mishra, P. (2008), p.12. *Handbook of Technological Pedagogical Content Knowledge (TPCK) for Educators* Routledge, New York.

In the following section I build on the TPCK framework by exploring common threads amongst pre-service teachers' comments about content, pedagogy, and technology. I draw from Koehler and Mishra's (2008) use of the TPCK framework because of their focus on interdisciplinary practice with digital technologies. In addition, Koehler and Mishra remarked, “one of the most important things to understand about technologies is that *particular technologies have specific affordances and constraints*” (p. 5). Drawing from Gibson's (1977; 1979) use of the term affordances, they suggest that certain technologies are better suited to complete particular tasks. It is integral for teachers to understand the affordances and constraints of various technologies (analog and digital) if the intent is “appropriate” technology integration in K-12 schools and teacher education (Koehler & Mishra, 2006). As already explored in Table

5.3, pre-service teachers in this study enjoyed the use of digital technologies during their program but were uncertain at times about the relationship amongst the following three bodies of knowledge: content, pedagogy, and technology.

Koehler and Mishra (2008) describe content knowledge as “knowledge about the actual subject matter that is to be learned or taught” (p. 13). They draw from the works of Shulman (1986) and suggest that content knowledge extends beyond just knowing what information and ideas to teach: “[CK is] knowledge of concepts, theories, ideas and organizational frameworks, knowledge of evidence and proof, as well as established practices and approaches towards developing such knowledge” (p. 13). Table 5.4 includes a general outline of content knowledge as it applies to each of the three different courses discussed in the manuscript chapters.

Typically, pre-service teachers did not discuss content knowledge when they described their experiences using digital technologies in the course which was the context for the first manuscript chapter. Perhaps this was because pre-service teachers had no working knowledge of what to expect of this course on “principles of teaching.” This was in marked contrast with pre-service teachers’ ongoing comments about appropriate (and inappropriate) content as it related to the two courses that served as the context for chapters 3 and 4 (respectively, science and music methods). Pre-service teachers’ comments in the second manuscript chapter reveal their understandings of the purpose of science as primarily the acquisition and dissemination of facts. The majority of pre-service teachers struggled to understand the subject of science beyond the scope of accurately representing (and memorizing) concepts and information. This trend in science education is noted elsewhere (Erickson, 2002). In their music methods course, pre-service teachers’ comments revealed that their understanding of content knowledge was

similarly based on a body of knowledge to be acquired (e.g., knowledge of major composers) and disseminated (e.g., memorization and performance of music).

Koehler and Mishra (2008) observed, “Pedagogical Knowledge is deep knowledge about the processes and practices or methods of teaching and learning and encompasses (among other things) overall educational purposes” (p. 14). Pedagogical knowledge refers to the practice of teaching as it unfolds and is experienced in all subject areas. For instance, how students acquire language, learn classroom management strategies, develop and implement lesson plans, modify instructional strategies according to students’ needs, and how they develop pedagogical knowledge, requires an understanding of how to identify and adapt student assessment strategies. The distinction between pedagogical knowledge and pedagogical content knowledge is that pedagogical content knowledge is specific to knowledge about how to adapt and modify pedagogy (outlined above) according to specific content areas. This includes understanding how different content areas, as well as how curriculum, assessment, and pedagogy, are connected (Mishra & Koehler, 2006; 2008).

In each of the case studies, pre-service teachers’ comments revealed uncertainty about the connection amongst content and pedagogical knowledge, as well as pedagogical content knowledge. In particular, comments from the second and third manuscript chapters indicate that participants were uncertain of how to adapt and/or change their pedagogical approach according to the content they were trying to teach. They viewed content and pedagogy as independent, separately functioning bodies of knowledge.

Technology knowledge (TK) is in part about developing skill-based expertise, comfort, and competence with digital technologies. Technology knowledge is in a constant state of flux. Koehler and Mishra (2006) stated that technological knowledge in educational contexts requires

an understanding of how a particular technology can “assist or impede the achievement of a goal” (p. 14). Mishra and Koehler (2008) asserted that the distinction between technological knowledge and technological content knowledge is an awareness of how technology and content influence and constrain each other: “Technology constrains the types of possible representations but conversely affords the construction of new more varied representations” (Koehler & Mishra, 2008, p. 12).

Technological Pedagogical Knowledge is about learning how teaching and learning changes when certain technologies are used (Koehler & Mishra, 2008). Table 5.4 traces several of the affordances and constraints of the digital technologies explored in this study. As noted earlier, pre-service teachers were at times reluctant to integrate the digital technologies they explored during their program into their own classrooms (i.e., extended practicum) because of uncertainty about how to modify their pedagogical approach in response to integrating the particular technology in a way that would benefit their students.

Technological Pedagogical Content Knowledge (TPCK) intersects all three bodies of knowledge (i.e., content, pedagogy and technology). TPCK requires an understanding of “the representation of concepts using technologies, pedagogical techniques that use technologies to teach content, and knowledge of what makes concepts difficult or easy to learn” (Koehler & Mishra, 2008, p. 12). TPCK is evident when teachers are able to adapt their use of technologies in the classroom in order to build on (instead of trying to replace) existing knowledge. Applying the TPCK framework requires a renegotiation of how and what we teach in response to fluid, changing, digital educational contexts (Koehler & Mishra, 2006; 2008).

Themes included in Table 5.4 reveal the complexity of developing TPCK amongst pre-service teachers. In part, the challenge rests in that technological knowledge is often positioned

in diametric opposition to content knowledge and/or pedagogical knowledge. The table also helps demonstrate that integrating digital technologies using the TPCK framework is not a unidirectional process (Koehler & Mishra, 2008, p. 12). Instead, each body of knowledge interacts with other existing and emergent bodies of knowledge to create an emergent, at times even new, body of knowledge for learning. The above discussion highlights the complexity of teaching. Exploring how pre-service teachers negotiate technological pedagogical content knowledge across different subject areas, with different instructors, and using different digital technologies helps elucidate the degree to which constructs of knowledge shift, change, and evolve in relation to varying contexts. I echo the cautionary note by Koehler and Mishra (2008) that in some ways trying to filter, distill, and separate bodies of knowledge as applied to the complexity of teaching is problematic. In part, this is because “these components exist in a state of dynamic equilibrium” (Mishra & Koehler, 2006, p. 102). They are related and interconnected in ways beyond what we are able to observe; in effect, change in any one body of knowledge requires reconsideration (and compensation) of the other two (Koehler & Mishra, 2008; Mishra & Koehler, 2006).

5.6 Discussion and Conclusions Relating the Manuscript Chapters to each other and to the Overall Field of Study

In the introductory chapter I state that the proliferation of DLT in society and in schools calls for a pedagogical shift from a more traditional teacher-centered model of instruction to pedagogical practice that empowers students to become critical constructors (and consumers) of digital multimodal representations. This requires an improved understanding of how to critically navigate visual, aural, and oral literacies in a variety of digital environments. Freebody (2007) remarked that access to digital resources is not enough to disrupt existing (potentially additive) model of integration. What is required is an understanding of how to adapt content, pedagogy,

and technological knowledge to account for the benefits for integrating digital technologies. In part, this requires (re)conceptualizing the relationship between literacy and technology. For instance, Conole and Dyke (2004) observe that since the emergence of Web 2.0 there is a “shift away from information and content toward the communicative affordances of technologies” (p. 1). Shifting focus from a process of information dissemination (and acquisition) to a model of interactive communication highlights the requisite shift from teacher-centred toward a more student-centered model of learning. As observed in each of the manuscript chapters, however, encouraging a student-centered model of learning is not enough to challenge pre-service teachers’ existing conceptions of “appropriate” literacy practice in content-specific subject areas.

In the following section, I explore the relationship amongst “sources of knowledge” (Schmidt & Gurbo, 2008) as a way of understanding how the TPCK framework might inform current understanding of literacy teaching as an interdisciplinary approach in teacher education. I build upon the works of Koehler and Mishra (2008) and describe TPCK as a framework for teacher knowledge for technology integration as it applies to multiliteracies and multimodal education.

Literacy teaching is already an integral part of all teacher education programs in British Columbia (Smidt & Gurbo, 2008); yet educators hold different ideas about what constitutes appropriate content knowledge for preparing teachers for literacy instruction. Developing an understanding of what constitutes “appropriate” content knowledge and pedagogical knowledge is a critical component to preparing prospective teachers to integrate digital technologies in ways that disrupt and extend existing literacy practice. For instance, as stated earlier in this dissertation, we have started to shift toward valuing literacies beyond just linguistic sign systems; however, such a shift potentially changes the content knowledge for teaching literacy.

And yet, writing in both print and digital spaces has long been multimodal. For instance, Harste, Woodward, and Burke (1986) observed that writing process for children has always involved dramatizing, drawing, talking, and gesturing. Therefore, children's written words were part of a larger, complex arena of interconnected sign systems that were requisite to the students' writing process.

Jewitt (2008) stated that *how* we decide to represent knowledge, in combination with our choice of mode and media, is a critical components of knowledge construction: "the form of representation is integral to meaning and learning" (Jewitt, 2008), p. 243). In this sense, developing an understanding of content knowledge for literacy education requires an understanding of how "the way something is represented shapes both what is to be learned (the curriculum content), and how it is to be learned" (Jewitt, 2008, p. 243). Presumably, we would choose to use a wiki, construct slowmation, use an electronic bulletin board and/or GarageBand™ for very different reasons and with particular goals in mind. We would not just use them for the sake of using digital technologies.

Contextualizing multimodal literacies as socially situated shifts the focus to the learner as meaning-maker. As stated earlier in this chapter, this shifts the student's role to that of active constructor and author (see Table 5.1). Understanding the social context for literacy teaching and learning is a central component of multiliteracies (New London Group, 1996; Cope & Kalantzis 2000) and multimodal education (Hull & Nelson, 2005; Jewitt & Kress, 2003; Kress, 2003); yet it complicates the matter of trying to determine content knowledge for literacy education.

Thus, developing content knowledge for teaching literacy as it applies to contemporary educational contexts requires an understanding of how to integrate DLT in ways that support students' multiple literacies (Schmidt & Gurbo, 2008). I draw from the literature review on

additive models of integration outlined at the start of this dissertation and suggest that we are already aware of how to use digital technologies to improve student reading and writing (Anderson & Speck, 2001; Schmidt & Gurbo, 2008; Wepner, Valmount, & Thurlow, 2000). Using digital technologies to reinforce an already established literacy curriculum is common in K-12 schools and teacher education programs. The challenge is that perhaps we are uncertain of what is required to advance students' literacy learning beyond conventional models in terms of content knowledge, pedagogical knowledge, and technological knowledge. This involves understanding the affordances and constraints of digital technologies as well as how such technologies extend and modify existing literacy practice

Drawing from the works of Shulman (1986) and Mishra and Koehler (2008), the question then rests in how to develop content, pedagogical, and technological knowledge for the purpose of literacy teaching in K-12 schools and teacher education when all three bodies of knowledge are constantly in a state of flux, intertwined and ever changing. One of the challenges is that teachers and students are challenged to adjust to the multiplicity of literacies afforded by digital and multimedia environments (Leu, Mallette, Karchmer & Kara-Soteriou, 2005). An example of how to design instructional strategies specific to disrupting existing perceptions of literacy is included in the final section of this chapter.

5.7 Presentation of the Status of Relevant Working Hypothesis

I did not begin with a working hypothesis that I intended to validate or disprove; my intent was to use an inductive approach to this exploratory case study. As is common with case study research, my intent was to engage in an exploratory study that would extend and inform existing theory and practice. However, I did have certain assumptions about the ease with which I would observe clearly defined moments of disruptive pedagogy and practice. My assumption was that

such moments would provide a framework for the study; yet, ultimately, this was not how the study unfolded. During my time with this cohort of pre-service teachers and instructors, I observed many moments of disruption: students coming to terms with hidden assumptions about teaching and learning; instructors changing their approach to DLT integration because of student feedback; and their students engaging in a year-long dialogue about how to improve the program, the cohort, and opportunities for prospective teacher candidates (and their pupils). However, moments of disruption were not as clearly evident as I initially anticipated. Oftentimes, I became aware of the moment only after a comment was made by a student or their instructor, meaning that I was unable to capture such moments at the time of inception. By the end of the study, I came to realize the degree to which there are stages of moments of disruption. For instance, despite an instructor's intention to engage all of their students in a process of critical inquiry and reflection, there will always be diversity in the classroom. Some students will readily accept change while others will resist. What becomes interesting is exploring what facilitates and inhibits movement toward (and away from) transformative learning and moments of disruptive pedagogy and practice.

5.8 Comments on the Strengths and Weaknesses of the Thesis Research

One of the strengths of this dissertation is that the process of construction was an authentic, collaborative process amongst co-authors. Collaborative learning and research is common in the social sciences and certainly is encouraged in graduate school; however, the traditional thesis is not particularly conducive to such a process. I believe that co-authoring manuscript chapters within this thesis, thereby allowing for formal documentation of the contributors to the work, was in many respects a more authentic and ethical process for writing a dissertation.

Another strength is that there are currently no existing studies that investigate one group (or cohort) of pre-service teachers' experiences using DLT in a variety of different courses, within a cohort where there are available cohort laptops, in-class technology coaches, and instructors who are part of a larger DLT initiative but who model different pedagogical approaches to DLT integration. This dissertation is also unique because it provides a glimpse into how one cohort of pre-service teachers experienced linguistic, visual, and aural modes of representation in a variety of digital environments. Therefore, one of the strengths of this dissertation is the "unique" and "particularistic" nature of the case.

The amount of time I spent with pre-service teachers during their program and their extended practicum also allowed for the collection of a rich data set. I was able to observe differences in pre-service teachers' reactions to the various DLT in relation to the instructors' pedagogical approach, and/or the change in comfort and competence of pre-service teachers' use of DLT. During exit interviews, pre-service teachers could also refer to moments of "shared experience" in order to contextualize their comments.

However, it is also important to note that my role changed during the program. At the start of the year my intention was to remain an observer in the class. Many advocates of case study research suggest that it is necessary to remain an observer (and not, for instance, a participant observer) if the intent is to develop a sense of objectivity. However, I believe that the gradual shift in my role from *observer* to *participant observer* became one of the strengths of this research study. As the year progressed, I believe that pre-service teachers developed a greater sense of trust. They started to confide in me more, which allowed for a more in-depth understanding of what was occurring in class.

There are certain limitations inherent in the use of case study. Establishing internal validity and determining if what is being observed actually represents participants' regular behavior must all be considered. For instance, there is no way to determine whether pre-service teachers were more (or less) inclined to use DLT because of their role as participants in a research study exploring the use of DLT. I am also uncertain of the degree to which participants' perceptions of my role in the program may have influenced their behavior during class or their comments during the exit interview. Pre-service teachers' comments may have been influenced by their perception of me as a researcher, secondary teacher, doctoral student, and advocate for DLT in schools, and so on. For instance, the interview transcripts reveal that participants made considerably more frequent (and longer) comments about the wiki project in comparison to the other two projects. In part, I assume that this was because the wiki project took place over the course of 12 months (Terms 1 and 2) whereas the other projects lasted for only 4-6 weeks. I also worked quite closely with instructors on the wiki project throughout the year. If there were any pre-service teachers who felt I was more personally invested in the wiki project, then perhaps they were inclined to comment on that project more often and/or in a more positive way. Therefore, participants may have been subject to reactivity (that is, participants may have adapted their behavior in accordance with their perception of me as a researcher. As stated by Denzin and Lincoln (2005), this is always a possibility when conducting case study research.

Walker (2003) suggested that the possibility of reactivity is a weakness of case study research. For Walker, case study is problematic because of the degree of subjectivity involved in collecting, analyzing, and reporting data. However, I draw from the works of Denzin and Lincoln (2005) by suggesting that to a certain degree research is always subjective. Stake (2003) suggested that the notion of "truth" in research is more useful as a discussion about the researcher's work ethic and the need for authenticity (Stake, 2003).

Another critique of case study research is the “lack of generalizability” beyond a specific context (Walker, 2003). I do not view this as a limitation of this dissertation because “replication of results” was not the purpose. Instead, exploring participants’ beliefs, perceptions, and behaviors in a particular context was the goal. The focus of my co-authors and I was on exploring human interaction and, as others have noted, human interaction cannot be reduced to objective numbers or numerical facts (Eckstein, 2000; McKee, 2004). There is no emphasis in this study on outcomes, specific variables, or what Merriam (1992) refers to as “confirmation” of knowledge (p. xiii). Instead, emphasis is on contextual framing and the teasing out of what is of relevance from what was directly observed (Eckstein, 2000). I recognize that case study can only provide a glimpse into the complexity of the context from which it has emerged. Thus, case study research may at times be ambiguous, complex, and messy; yet this is the necessary condition to elucidating phenomena that deal with human experience (Mertens, 2005; Patton, 1990; Stake, 1994).

5.9 Discussion of the overall significance and contribution of the thesis research to the field of study

In the introductory chapter I stated that there are still concerns about the educational value of digital technologies despite improvements in access in K-12 schools and teacher education. This dissertation reveals that in part this is because educators are uncertain of the particular affordances of digital technologies. In particular, we tend to integrate digital technologies in ways that perpetuate and support existing, print-based conceptions of literacy. Disrupting existing conceptions of literacy is requisite to the process of improving our understanding of digital technologies integration.

Bearne (2003) stated that in the midst of “rapidly developing technologies” (p. 365) it has become necessary that students learn to critically navigate 21st century literacies. This requires

an improved understanding of how digital literacies extend and modify existing literacy practice. In these papers, we suggest that such awareness builds from disrupting existing conceptions of literacy, teaching, and learning. Such a process will facilitate a shift toward an improved model of learning with DLT. Instructors who encouraged critical inquiry and reflection with DLT significantly impacted pre-service teachers' existing conceptions of literacy, teaching, and learning. Such reflection is an important step toward broadening existing conceptions of literacy to include multiliteracies as experienced in the digital realm. Finally, the significance of this research rests in that it helps reveal factors that facilitated and inhibited opportunities for translating theory into eventual teaching practice.

This dissertation raises important questions for further research in the context of teacher education. How do pre-service teachers' conceptions of literacy impact the way in which they navigate modes of representation in digital environments? How do we apprentice pre-service teachers into a model of disruptive pedagogy that is transferable beyond the context of the university to their prospective classrooms during their extended practicum and in their eventual teaching?

The International Society for Technology in Education (2002) recommended that teacher preparation programs provide ongoing opportunities for pre-service teachers to explore possibilities with DLT. After all, teachers develop their knowledge and experience with DLT by integrating DLT into their classroom praxis (Eagleton, Guinee, & Langlais, 2003; Hitchcock, Meyers, Rose, & Jackson, 2002). The challenge rests in that often there is too much focus on learning the hardware and software and not enough attention on exploring how to use DLT in ways that encourage critical inquiry and reflection (Darling-Hammond et al., 2005). This work reveals that it is important to articulate a model of DLT integration that explores how to adapt

pedagogical approaches in order to account for the ways in which we represent and communicate meaning in the digital realm. Exploring the effects of DLT integration on student learning is already a common focus in the research literature (Bitner & Bitner, 2002; Darling et al., 2005; Dawson & Ferdig, 2006; Bull et al., 2005; Schrum, 2005); however, there is comparatively less research that focuses on how shifts in pedagogical approaches might impact a singular cohort of pre-service teachers. As stated by Darling-Hammond (1999), “relying solely on standardized practice is malpractice” (p. 2). It is not possible for one model of integration to be appropriate for all educational contexts. There will always be culturally and linguistically diverse student populations in our classrooms; diversity creates necessary change and flexibility in how and what we teach. Darling-Hammond (1999) stated, “Effective teaching is not routine, students are not passive and problems of practice are not simple, predictable or standardized” (p. 2). The challenge rests in trying to identify how change in pedagogical practice ultimately impacts student learning. Perhaps teachers will be more inclined to integrate DLT into their classrooms in reflective and innovative ways if they observe the positive results of “effective technology use” with their students (Male, 2003).

5.10 References to other chapters and to the literature in the field of study

Two additional articles deriving from the data collected in the context of these cases studies are published or currently under review. In the following section I will describe each of these articles, and then discuss potential applications of the research findings. Both articles are co-authored qualitative case studies and continue to build on research from the doctoral dissertation. I conclude this section by describing potential applications of the research findings with particular attention to how we might design instructional strategies that disrupt existing perceptions and/or traditional understandings of literacy pedagogy.

The first article, “Interrupting Processes of Inquiry: Teaching and Learning with Social Media in Higher Education,” is published in *Digital Studies* (Dobson and Vratulis, 2009). In this article we describe how pre-service teachers negotiated the process of writing using the wiki with the intent of encourage critical inquiry and broaden existing conceptions of “textuality and intellectual property in a new knowledge economy” (n.p.). The article provides insight in relation to following issues:

. . . the uncertainty faced by instructors as they make shifts in teaching practice and the need to appreciate, validate, and find a way of assuaging these concerns; the importance of avoiding the establishment of conceptual and pragmatic boundaries between teaching and technology at the level of instructional design; the importance, especially in the context of organic writing spaces such as the wiki, of finding the balance between coherence and randomness that will allow for flexible response (cf Davis and Sumara, 2006: 148-149); the value of networked, social writing spaces in encouraging a shift in understanding around notions of textuality and intellectual property, bringing learners together in a community of inquiry and encouraging those individuals to negotiate understanding; the importance in formal education of shifting emphasis between product and process. (Dobson and Vratulis, 2009, n.p.)

The second article, “An interdisciplinary perspective of multimodal text construction using stop-motion animation,” was recently submitted to the *Canadian Journal of Learning Technology* (CJLT) (Vratulis, Clarke, Hoban and Erickson, under review). It extends the discussion about slowmation in the second manuscript chapter. In particular, we identify patterns in pre-service teachers’ decision making about multimodalities during the construction of their projects. The paper elaborates on patterns in discussions of modes of representation. In

particular, discussions about each mode tended to reveal that pre-service teachers held firmly engrained, content-specific conceptions of how to construct and represent knowledge in the context of science education. This finding was discussed in relation to pre-service teachers' descriptions of the purpose for construction their projects. They identified three purposes for constructing their projects: information dissemination, conceptual awareness, and entertainment. It is important to note, however, that the majority of pre-service teachers' responses were specific to information dissemination. Results specific to the relationship between purpose for constructing their projects and decision-making about how and when to use particular modalities were as follows:

- a. *Information dissemination*: Groups who identified information dissemination as the primary purpose for constructing their projects tended to select modes that would most accurately represent scientific information and/or concepts. These groups relied more on linguistic systems of meaning making in order to remain focused on the critical information that they wanted their prospective students to learn. When these groups were constructing their projects, their focus was on accurately disseminating information to their prospective pupils;
- b. *Conceptual awareness*. Groups focused on using slowmation to develop their students' conceptual awareness of scientific concepts tended to focus more on how to use images to represent their ideas;
- c. *Engagement*: Groups focused on engagement were less driven by scientific accuracy and conceptual awareness and more concerned about creating a teaching learning resource that could be used as a teaching "hook." These pre-service teachers' discussions were primarily focused on how to use sound effects and music in their

projects. Their intent was to use slowmation to motivate students about a particular topic.

We conclude this article by suggesting that it is necessary to disrupt pre-service teachers' content-specific understandings of literacy education. In particular, it is important to develop an awareness of their existing conceptions of how to negotiate multiple modes of representation in digital spaces if the intent is to integrate digital technologies into educational contexts in ways that are based on critical and reflective understandings of digital media.

These two articles , along with this thesis, contribute to the existing body of research literature having to do with meaningful integration of digital technologies into K-12 schools and teacher education. Kritt & Winegar (2007) stated that despite the growing possibilities for what we can achieve with digital technologies, through availability and ease of access to multimodal resources, there are many of us who remain uncertain of how to answer the basic question: what is the eventual impact of integrating digital technologies on student learning? In the words of a former CITE student, "how do we know if it (the integration of digital technologies) is working? How do we know if we are doing it right?" (pseudonym). Perhaps the only way to begin answering this question is to identify what we already know is working and then consider how we might improve upon that approach.

Research has suggested that eventual change in teaching and learning practices within K-12 schools is significantly facilitated through the efforts of teacher-preparation programs (Dottin, 2001; Peressini, 2005). Such programs prepare prospective teachers for new ways of knowing in this digital age (Clarke & Erickson, 2004). Teacher-preparation programs traditionally introduce prospective educators to "a body of knowledge that in principle can be very useful to [them as] practitioners" (Korthagen, Kessels, Koster, Lagerwerf & Wubbels, 2001, p. 4). The premise is

that prospective teachers will develop strong theoretical foundations that will subsequently inform their teaching. In this sense, teacher-preparation programs encourage the understanding of theory as it applies to classroom practice. The challenge is that the “unwritten curriculum” of teacher-preparation programs continues to promote the notion of teacher training with instructors as the knowledge experts (Bullough, 1991). Ben-Peretz (1995) postulated that, far too often, “knowledge is given [in ways that are] unproblematic. These views of knowledge are likely to become quite problematic as teachers gain experience” (p. 546). This model is problematic if the vision is to prepare prospective teachers to become catalysts for pedagogical change within their prospective schools (Bullough, 1991; Clark & Lampert, 1986; Doherty & Orlofsky, 2001; Sprinthall, Reiman, & Thies-Sprunghall, 1996; Wubbels, Korthagen, & Brekelnaus, 1997; Zeichner & Tabachnick, 1981).

Teacher-preparation programs would benefit from incorporating DLT as more than simply a supplementary instructional resource for an already-established course curriculum (Collier, Weinburgh, & Rivera, 2004; Costa, McPhail, Smith, & Brisk, 2005; Davis & Falba, 2002; Pederson & Yerrick, 2000). A more productive focus is the development of student technological skills and their understanding of the pedagogical implications of integrating DLT into K–12 classrooms (*International Society for Technology in Education*, 2000). Thomas, Schmidt & Hadjyianni (1995) asserted that in order for technology to become an integral facet of K–12 education, it must first become “an essential part of . . . teacher preparation programs” (p. 9). Willis and Mehlinger (1996) reported that pre-service teachers are far more inclined to use technology within their own classrooms when they have been introduced to it during teacher preparation. I suggest that in order for DLT to be integrated in ways that disrupt pre-service teachers’ existing assumptions about teaching and learning, it is necessary to critically reflect on the *why* and *how* of DLT integration in our schools.

In order to design instructional strategies that disrupt existing perceptions, or traditional understandings of literacy, it is necessary to explore similarities and differences in the process of constructing and representing meaning in digital and non-digital environments. For instance, in order to broaden students' content knowledge of literacy it might be useful to first explore foundational knowledge of both reading and writing in both digital and non-digital environments. Along these lines, Koehler & Mishra (2006) stated that reading page-bound printed texts requires an understanding of how to sound out words, read a write according to the rules and conventions of a particular language or just the ability to develop an understanding of the "mechanics of reading" (p. 62). This traditional understanding of learning to read is cited in abundance in the research literature (Anderson & Speck, 2001; Kinzer & Leander, 2003; Swenson, Rozema, Young, McGrail, & Whitin, 2005). Perhaps it would also be useful to describe how such definitions of reading are now broadened to include the process of constructing meaning using multiple sign systems (Kress, 2003). Students could then explore the collaborative writing space of a wiki in order to experience how processes of reading and writing are different. For instance, drawing from the works of Dobson & Luce-Kapler (2005) and Hayles (2002), perhaps students can be introduced to a process of reading and writing literary hypertext. This would introduce them to a process of reading and writing that may at first be frustrating, but that would inevitably challenge their existing conceptions of reading, writing and authorship. This is a broad example of the first step toward designing instructional strategies that might disrupt pre-service teachers existing conceptions of literacy. It is also necessary, of course, to develop practical and theoretical understandings of literacy as content knowledge. Each body of knowledge (technological, pedagogical, and disciplinary content), as well as their relations to one another must be considered if we are to facilitate a more critical process of digital technologies integration.

5.11 New directions

To end, I will consider my current knowledge and propose new ideas in relation to the field of study. At the start of this dissertation I reviewed two models of integration: additive and disruptive. At first I positioned these two models as mutually exclusive. After conducting this study I came to realize there is nuance and overlap between these two models of integration. For instance, it is possible to have moments of disruption even within an additive model of integration. Similarly, there may be evidence of additive integration even when observing a model of disruptive pedagogy. What distinguishes one model from the next is the pedagogical approach and potential for transformed practice. For instance, pre-service teachers' comments about their science methods course revealed fewer moments of disruption than in the class where pre-service teachers constructed the community wiki; yet during observations of their science methods course I observed many moments of disruption in pre-service teachers' conceptions of teaching and learning. These moments were not easy to capture during exit interviews because they were brief, demonstrated in a passing comment or moment of reflection; yet such moments were nevertheless significant. In order to further build on this research, I suggest that a more detailed (and ongoing) analysis of pre-service teachers' reflections and processes of construction with DLT is required. The challenge is trying to determine factors and conditions which improve frequency of moments of disruption. Improving opportunities for such moments is most likely to motivate educational change.

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APPENDIX 1: GUIDING QUESTIONS

Pre-service Teachers

1. Were you introduced to any digital technologies during the year? If so, could you please describe your experiences using those digital technologies?

2. Please describe the process and purpose of constructing your digital artifact(s).
Digital artifacts in this context refers to all mandatory and optional assignments using digital technologies.

3. Please comment on the CITE model of digital technologies integration.

4. Did the CITE program in any way contribute to your preparedness or willingness to integrate digital technologies into your teaching delivery, either during your practicum or in the future? Why or why not?

APPENDIX 2: ETHICS



The University of British Columbia
Office of Research Services
Behavioural Research Ethics Board
 Suite 102, 6190 Agronomy Road, Vancouver, B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - FULL BOARD

PRINCIPAL INVESTIGATOR: Gaalen L. Erickson	INSTITUTION / DEPARTMENT: UBC/Education/Curriculum Studies	UBC BREB NUMBER: H06-03777
INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:		
Institution UBC	Site Point Grey Site	
Other locations where the research will be conducted: Prospective Richmond elementary schools where pre-service teachers in the CITE cohort will teach for their extended practicum.		
CO-INVESTIGATOR(S): N/A		
SPONSORING AGENCIES: Faculty of Education		
PROJECT TITLE: Transformative Pedagogy and Literacy Practices with Digital Learning Technologies (DLT)		
REB MEETING DATE: January 11, 2007	CERTIFICATE EXPIRY DATE: January 11, 2008	
DOCUMENTS INCLUDED IN THIS APPROVAL:		DATE APPROVED: March 2, 2007
Document Name	Version	Date
Consent Forms:		
Pre-service Teacher Publication	1	December 1, 2006
Parental Consent	2	February 1, 2007
Instructor Publication Form	1	December 1, 2006
Instructor Consent Form	2	February 1, 2007
Pupil Publication	1	December 1, 2006
Pre-service Teacher Consent	2	February 1, 2007
Assent Forms:		
Pupil Assent	2	February 1, 2007
Questionnaire, Questionnaire Cover Letter, Tests:		
Interview Questions for Instructors	1	December 1, 2006
DLT Skills Questionnaire	1	December 1, 2006
Interview Questions for Pre-service teachers	1	December 1, 2006
Literacy Practices Questionnaire	1	December 1, 2006
Interview Questions for Pupils	1	December 1, 2006
Letter of Initial Contact:		
Parents Contact Letter	2	February 1, 2007
Pre-service Teachers Contact letter	2	February 1, 2007
Instructors Contact letter	2	February 1, 2007
The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.		
Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:		
<hr/> Dr. Peter Suedfeld, Chair Dr. Jim Rupert, Associate Chair Dr. Arminee Kazanjian, Associate Chair Dr. M. Judith Lynam, Associate Chair		



The University of British Columbia
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INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT: <table border="1"><tr><td>Institution</td><td>Site</td></tr><tr><td>UBC</td><td>Point Grey Site</td></tr></table>			Institution	Site	UBC	Point Grey Site
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Consent Forms:						
Pre-service Teacher Publication	1	December 1, 2006				
Parental Consent	2	February 1, 2007				
Instructor Publication Form	1	December 1, 2006				
Instructor Consent Form	2	February 1, 2007				
Pupil Publication	1	December 1, 2006				
Pre-service Teacher Consent	2	February 1, 2007				
Assent Forms:						
Pupil Assent	2	February 1, 2007				
Questionnaire, Questionnaire Cover Letter, Tests:						
Interview Questions for Instructors	1	December 1, 2006				
DLT Skills Questionnaire	1	December 1, 2006				
Interview Questions for Pre-service teachers	1	December 1, 2006				
Literacy Practices Questionnaire	1	December 1, 2006				
Interview Questions for Pupils	1	December 1, 2006				
Letter of Initial Contact:						
Parents Contact Letter	2	February 1, 2007				
Pre-service Teachers Contact letter	2	February 1, 2007				
Instructors Contact letter	2	February 1, 2007				
The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.						
Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:						
<hr/> <p style="text-align: center;">Dr. Peter Suedfeld, Chair Dr. Jim Rupert, Associate Chair Dr. Arminee Kazanjian, Associate Chair Dr. M. Judith Lynam, Associate Chair</p>						